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ENERGY POVERTY AND ECONOMIC GROWTH: A CASE STUDY OF NIGERIA
(1991-2019)

Nicosia
July, 2023

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Approval

We certify that we have read the thesis submitted by Freiderick Yohanna Letong titled "**ENERGY POVERTY AND ECONOMIC GROWTH: A CASE STUDY OF NIGERIA (1991-2019)**" and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

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Declaration

I hereby declare that all information, documents, analysis, and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute the of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

FREIDERICK YOHANNA LETONG

…. /...../2023

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List of Abbreviations

ADF-Augmented Dickey-Fuller

ARDL- autoregressive distribution Lagged

CVM- Contingent Valuation Method

FDI – Foreign Direct Investment

GDP – Gross Domestic Product

IEA - The International Energy Agency

IPCC- Intergovernmental Panel on Climate Change

LDC- Least Developed Countries

LPG - liquified petroleum gas

MTF -Multi-Tier Framework

MENA -Middle East and North Africa

MEPI-Multidimensional Energy Poverty Index

SDG- Sustainable Development Goal

PP- Philip-Perron test

WDI- Development Indicators

Abstract

Energy Poverty and Economic Growth: A Case Study of Nigeria (1991-2019)

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Using annual data from 1991 to 2019, the ARDL technique was deployed in the analyses to study the connection between employment, energy poverty, income, inflation, and economic development in Nigeria. In order to establish if the series is stationary, this thesis used the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. For both the ADF and PP tests, all variables were found to be stationary at first difference.

The outcome of the bound test indicates that cointegration exists, indicating that the variables are related over the long run. An increase in access to electricity has a small but statistically insignificant negative effect on Economic growth over the long run. On the other side, a rise in employment causes a rise in economic growth. When Income rises, so does economic growth, but when inflation rises, the opposite is true. According to ARDL estimations during the short- run, an

increase in employment increases economic growth though not significantly. The necessary diagnostics test carried out indicates stability in the model deployed in the study.

The ARDL regression models' results can be used to make critical policy recommendations for developing countries especially Nigeria. This outcome is key for the long-term progress of developing countries, particularly in Sub-Saharan Africa, where clean energy and other essential sources of clean fuel for economic activity are scarce.

Keywords: Energy poverty, Economic growth, developing countries, ARDL model, Nigeria

Özet

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1991'den 2019'a kadar yıllık veriler kullanılarak, Nijerya'da istihdam, enerji yoksulluğu, gelir, enflasyon ve ekonomik kalkınma arasındaki bağlantıyı incelemek için analizlerde ARDL tekniği kullanıldı. Serinin durağan olup olmadığını belirlemek için bu tezde Augmented Dickey-Fuller (ADF) testi ve Phillips-Perron (PP) testi kullanılmıştır. Hem ADF hem de PP testlerinde tüm değişkenlerin birinci farklarında durağan olduğu görülmüştür.

Sınır testinin sonucu, eşbütünleşmenin var olduğunu ve değişkenlerin uzun vadede ilişkili olduğunu gösterir. Elektriğe erişimdeki artışın, uzun vadede Ekonomik büyüme üzerinde küçük ama istatistiksel olarak önemsiz bir olumsuz etkisi vardır. Öte yandan, istihdamdaki bir artış ekonomik büyümede bir artışa neden olur. Gelir arttığında ekonomik büyüme de artar, ancak enflasyon yükseldiğinde bunun tersi doğrudur. ARDL tahminlerine göre kısa dönemde istihdamdaki artış önemli ölçüde olmasa da ekonomik büyümeyi artırmaktadır. Gerçekleştirilen gerekli teşhis testi, çalışmada dağıtılan modeldeki kararlılığı gösterir.

ARDL regresyon modellerinin sonuçları, başta Nijerya olmak üzere gelişmekte olan ülkeler için kritik politika önerileri yapmak için kullanılabilir. Bu sonuç, gelişmekte olan ülkelerin, özellikle ekonomik faaliyetler için temiz enerji ve diğer temel temiz yakıt kaynaklarının kıt olduğu Sahra Altı Afrika'daki uzun vadeli ilerlemesi için kilit öneme sahiptir.

Anahtar Kelimeler: enerji yoksulluğu, Ekonomik büyüme, gelişmekte olan ülkeler, ARDL modeli, Nijerya.

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CHAPTER 1

1.1 Introduction

As the environmental impacts of non-renewable energy sources, as well as the necessity of transitioning to a more sustainable energy model, are increasingly on the minds of people around the globe, global energy usage has been a topic of significant interest and concern in recent years. As a result, the growing importance of renewable energy sources is one of the most significant changes in the world's energy market. The proportion of renewable energy in the global energy mix has increased as people have become more aware of the detrimental impacts of using nonrenewable fuels on the environment and the climate (International Energy Agency, 2020). The percentage of global electricity generated by renewable sources such as hydro, wind, solar, and biofuels increased to 26% in 2019 from 24% in 2018. (IEA, 2020). This trend is expected to continue in the future years, with renewable energy sources contributing a greater share to meeting global energy demands.

The increasing importance of petroleum-based goods in the world's energy grid is another noteworthy trend. Natural gas is the fastest-growing fossil fuel, and by 2040, it's expected to make up 25% of all energy use worldwide, according to the BP Energy Outlook 2020. (BP, 2020). Petroleum-based form of energy is seen as a transition fuel since it burns cleaner than coal or oil and is increasingly used as a stepping stone to a more environmentally friendly energy mix.

Even if renewable energy sources are becoming increasingly significant, the majority of the world's energy consumption is still derived from petroleum. According to forecasts, the globe will continue to rely heavily on coal and oil for energy production. The IEA (2020) projects that

through 2040, oil consumption will increase by 1.2% year, while coal use will fall by 0.7% annually.

Finding a way to meet rising energy demand while also reducing emissions of harmful gases and cushioning the effects of environmental deterioration is a major problem for the energy industry. Significant changes to energy systems, land use, urban infrastructure, transportation and housing, and industrial systems would be needed to keep the worlds temperature rise well below 2 degrees Celsius and fulfill the aim of 1.5 degrees Celsius (IPCC, 2018).

Consequently, economic advancement is therefore crucial issue in all nations, but they are particularly important in developing nations, notably in Africa. Even though there is no consensus agreement by researchers on which factors are more important in achieving this growth and development, various factors have been identified as responsible for economic growth and development, including education, income, environmental quality, foreign investment, taxes, industrialization, technology, energy usage, and many others (Amin et al., 2020). Under the United Nations Sustainable Development Goals, (SDGs) both rich and poor countries have unanimously agreed to eliminate poverty as well as keeping the ecosystem in a sustainable state. But in the view to attain this goal of fighting poverty, developing countries have emphasized policies to boost industrialization to attain economic prosperity, thus harming the environment as a result of the emissions that accompany these economic activities and in turn the effect on the wellbeing of people in these countries (Baloch et al., 2020)

Energy is a critical component in the operation of production processes in every economy. However, it is therefore necessary to remember that the nature as well as type of energy resources employed for these productive activities have a tremendous effect on our eco system. When

compared to renewable energy, the environmental impact of petroleum-based energy sources—the dominant source of energy in the less developed African countries—is clear (Nathaniel et al. 2021). But one of the biggest issues is how easy it is to acquire renewable energy in these developing nations.

Energy poverty is defined as a lack of access to sufficient energy sources to meet basic needs. The researchers Hassan et al., (2022) stated that while efforts to combat energy poverty are focused on guaranteeing access to modern and clean energy resources in poor nations, in rich countries, the focus is on ensuring that these energy resources are monetarily cheap in these countries. Health care, schools, and even national defense all suffer when a country lacks access to affordable energy. Thirteen percent (940 million) of the global population does not have access to electricity, and three billion people do not have reliable sources of clean fuel for cooking and other household needs. This undoubtedly has a stronger detrimental effect on the environment as pollution rises as a result of CO2 emissions into the atmosphere, seriously harming human health. In Africa, about 20 million people are able to have electricity for the first time annually between 2014 and 2019. This progress notwithstanding, around 600 million people do not have access to electricity. This is because of the high outlay required to set up such energy infrastructure, especially when considering the long-term financial implications of such capital projects. (Frans Timmermans, 2021).

In many nations, it has been shown that people's income and access to energy are strongly correlated. In most countries, individuals or households that are poor or low income have a greater chance of having no access to clean fuel and electricity (Ritchie & Roser, 2020). Because these issues are interconnected and cannot be discussed separately, it is hard to completely exclude energy poverty from discussions of poverty in countries, even though these two issues have the

tendency of been curtailed at the same time, these two phenomena are mostly what characterized less developed nations (Amin et al., 2020). In light of this, ensuring that people have access to reliable sources of energy is a vital component that simply cannot be ignored in the fight against poverty, this can also be considered as a major factor for promoting economic growth, creating job opportunities, increasing the availability of social services as well as the general wellbeing of any nation (Doğanalp et al., 2021a).

1.2 Statement of the Problem

The region most affected by energy poverty is the African continent, and because its countries are primarily developing. It is essential to have a solid understanding of the short-term as well as the long-term relationship that exists between economic growth and energy insufficiency in this part of the world. This will aid in determining how energy poverty affects these countries' growth and prosperity. As far as the researchers are aware, there hasn't been a lot of research done on energy poverty and the impact it has on the economic growth and development of these less developed countries, thus adding to the literature is also quite important. As a case study, we decided to look at Nigeria. Because this country has the largest economy in the sub-Saharan area, the highest population, and the greatest number of people living below the energy poverty line, it is vital to evaluate how energy poverty affects the long-term economic development in this country.

1.3 Purpose of the Study

Economic growth is a major issue for every country on earth. however, they are particularly important in emerging nations, particularly in Africa. Every economy needs energy to run its production processes and experience the needed growth and development. The idea of living under energy deprivation is a very important issue that has a significant impact on the rate at which nations that are developing expand and advance. In light of the fact that Nigeria's economy is the

single most significant on the African continent, the purpose of this research is to investigate the ways in which lack of access to affordable energy hinders economic expansion in emerging countries.

1.4 Research Question

The following are the broad questions that this thesis will try to address:

1. What is the effect of energy poverty on economic growth?

2. What is the impact of income on economic growth?

3. What is the impact of employment on economic growth?

4. What is the impact of inflation on economic growth?

1.5 Research Hypothesis

These are the hypothesis to be tested:

H1: Energy poverty will affect economic growth negatively.

H2: Income will affect economic growth positively.

H3: Employment will affect economic growth positively

H4: Inflation will affect economic growth negatively

These concepts serve as the cornerstone upon which the scientific investigation is built. The purpose of our research served as the impetus for the formulation of the above hypothesis, which will be validated through the use of the relevant statistical and economic tests.

1.6 Significance of the Research/Research Contribution

Given the evidence of energy poverty's prevalence in countries that are developing, it is vital to comprehend the connection between economic progress and energy poverty. A regression model was used to conduct the research that was done on this association. The findings will provide the government and those in decision-making positions with the information they need to evaluate the policies that are currently in place about the connection between energy poverty and economic growth. As a consequence, policies will be enacted that will both combat energy poverty and ensure that these nations' economies continue to expand. This will consequently guarantee the welfare of these nations' inhabitants. To the researchers' knowledge, energy poverty's effects on Nigeria's economic development have not been extensively examined. This study additionally sets the groundwork for future research.

1.7 Global classification of countries

The World Bank (2021) states that nations are often categorized as developed, developing, or less developed based on a variety of economic and social metrics, including GDP, infant mortality rate, literacy rate, and access to education and healthcare. High literacy rates, low infant mortality rates, and high GDP, and access to healthcare and education are typical characteristics of developed nations. The United States, Canada, and the nations that make up the European Union are a few examples of developed nations.

Contrarily, compared to wealthy nations, developing nations often exhibit greater infant mortality rates and lower GDP levels. Additionally, they frequently have lower literacy rates and less access to healthcare and education. China, India, and Brazil are examples of developing nations. The highest infant mortality rates and the lowest GDPs are common characteristics of least developed (LDCs), also known as less developed countries. They frequently have poor literacy rates as well

as restricted access to healthcare and education. LDCs include nations like Somalia, Burkina Faso, and Nepal.

The fact that these divisions are not set in stone and can alter as nations undergo economic and social development is crucial to keep in mind. Countries are categorized by the World Bank (2021) based on their income levels, with the categorization thresholds being changed on a regular basis. The focus of this study is on the top ten economies of Africa which are mostly developing and less developed countries.

1.8 Review of the African Economy and Energy Consumption

The African economy is diversified and complicated, and a wide range of businesses and sectors contribute to the continent's overall economic expansion (World Bank, 2021). The energy industry, which is essential for supplying electricity to homes and companies across the continent, is one of the key drivers of the African economy. However, the continent's energy industry also faces formidable obstacles, such as severe energy poverty and a reliance on imported energy (International Renewable Energy Agency, 2020).

Despite these obstacles, substantial efforts have been made recently to improve energy availability in Africa and to encourage using sustainable energy sources like solar and wind electricity. There have also been initiatives to upgrade infrastructure and boost energy sector investment, which can aid in expanding access to power and enhancing the overall energy efficiency of African economies (World Bank, 2021).

The African economy is varied and complicated, with numerous obstacles to growth and development as well as possibilities. Energy will play a critical role in promoting economic

progress and enhancing people's lives all throughout Africa as the continent continues to expand and modernize.

In this review, we'll look at the essential elements of the African economy, such as its main sectors and industries, its problems, and its prospects for growth and development. We'll also look at how energy influences economic development in Africa and the possibilities for the spread of renewable energy sources there. We hope that this analysis will provide readers a thorough grasp of the African economy and the variables that influence its growth.

1.9 The key features of the African economy with main Industries and Sectors

The African economy is varied and expanding quickly, but it also confronts major obstacles and structural limitations. The diversity of the African continent's economies has been influenced by the variety of its cultures, languages, and economic systems. The African economy, according to a study by the United Nations Economic Commission for Africa (2019), is defined by a variety of distinctive characteristics.

The economy's quick expansion is one of the key characteristics. With GDP growth rates of about 5% annually in recent years, Africa's economy has expanded quickly (United Nations Economic Commission for Africa, 2019). Increased commerce and investment, as well as advancements in infrastructure and human resources, have all contributed to this prosperity. Despite this expansion, large levels of poverty are another aspect of the economy. With more than 40% of the population living in poverty, Africa continues to be a continent with a huge number of impoverished people (United Nations Economic Commission for Africa, 2019).

Structural difficulties are another important aspect of the economy. Numerous underlying issues, including failing institutions, inadequate infrastructure, and constrained access to financing, affect

the African economy according to the United Nations Economic Commission for Africa in 2019 These difficulties have impeded the growth of important businesses and sectors, such manufacturing and services. Among the many natural resources found in Africa are minerals, oil, and natural gas. The economic prosperity of the continent has greatly benefited from these resources, but they have also contributed to conflict and environmental pollution.

The agricultural industry is another element that characterizes the economy. In Africa, the agricultural industry employs more than 60% of the labor force and accounts for a sizeable portion of the GDP. Despite this, the industry frequently exhibits low productivity and a lack of technological innovation.

1.10 Africa's potential for renewable energy sources

Africa has a lot of room for expansion in the area of renewable energy, which might result in a number of positive outcomes. Examples of renewable energy sources that could help improve energy security, promote economic development, and give the availability of electricity in isolated and underdeveloped places include solar, wind, hydropower, and geothermal energy.

The abundance of renewable energy resources in Africa is a major driving force in the sector's growth. For example, the continent of Africa has some of the highest levels of solar irradiation in the world, making it an attractive location for the expansion of solar energy (Asiedu, 2017). Likewise, due to the continent's numerous locations with high winds, Africa offers considerable potential for the development of wind energy (Adesina & Fosu, 2015). Some rivers and other bodies of water in Africa may be utilized to generate electricity through hydroelectricity, and several nations have geothermal resources (Asongu, 2019).

The enormous and rapidly growing population of the continent, which has rising energy demands, is another factor promoting the growth of renewable energy in Africa. There is a huge chance to switch to cleaner and more sustainable energy sources because many African nations still rely on conventional energy sources like wood and charcoal (Asongu, 2017). Therefore, there is great opportunity for the advancement of renewable energy sources in Africa, and several nations on the continent are working hard to do just that. Africa can improve energy security, encourage economic growth, increase access to power, and lower greenhouse gas emissions through increasing renewable energy sources.

1.11 Energy poverty in Nigeria: Research Issues and Research Gaps

Energy poverty is a major issue in Nigeria because so many people do not have access to electricity. This may have a variety of detrimental effects on people's quality of life, such as restricted access to chances for employment, healthcare, and education (United Nations Development Program, 2020).

Energy poverty in Africa and Nigeria in particular is a topic that has a number of open research questions and gaps. Research challenges include a general paucity of data on the scope and causes of energy poverty across Africa's many countries (Hossain et al., 2016). Because of this, it may be challenging to precisely determine the scope of the issue and to provide solutions in the form of policies and initiatives.

Lack of knowledge about the social and economic effects of lack of electricity in Africa is another obstacle to research (Foss et al., 2018). There is little evaluation on the precise ways in which energy poverty affects other parts of people's lives, such as education, healthcare, and economic

possibilities, despite the fact that it is clear that energy poverty has a negative outcome on people's quality of life.

Lack of evidence-based strategies to alleviate energy poverty in Africa is a third research problem (Pachauri et al., 2017). Although there have been several programs and interventions targeted at improving access to energy in Africa, little is known about which strategies work best in specific situations and how to scale them up and reproduce them in other nations.

More study is needed to fully understand the nature and severity of the energy poverty problem in Nigeria and to give feasible solutions, as there are a number of research challenges and gaps in this field.

1.12 An Overview of the Research

The remainder of the thesis is structured in the following manner: The pertinent research on the topic is discussed in Section 2, which follows. The theories of economic growth are examined in chapter 3, while chapter 4 is centered on the economy of Nigeria and energy investment. In Section 5, we go over the model, the data, and the methodology in great depth. Section 6 contains a discussion of the empirical findings as well as the findings themselves. The conclusions and suggestions for future policy decisions are presented in Section 7.

CHAPTER 2
A REVIEW OF RELATED LITERATURE REVIEW

2.1 Introduction

Reviewing previous studies in a field similar to the one being investigated is a crucial element of the research process because it helps to discover areas of current knowledge that are lacking and gives the inquiry a context. This helps researchers to identify what is already known about a topic and what questions remain to be answered. This aids in integrating and synthesizing the body of knowledge already known about a subject, highlighting the most important discoveries and disagreements while giving a thorough overview of the subject. The research works that pertain to the topic of the study can be discovered in common publications, journals, books, published and unpublished investigations, and other sources that are not difficult to get a hold of. This section of the study explains the idea of energy poverty, how it is measured, what causes it, what solutions there are, and some theories around it. In addition, this chapter provides an in-depth analysis of a variety of topics concerning the expansion and development of the economy. The first section of this chapter devotes much of its attention to the theoretical foundations that underpin the discussion on the issues of energy deprivation and economic expansion. In the last part of this chapter, the second section, empirical study on energy poverty as well as expansion in the economy has been covered.

2.2 The Theoretical Review

Different concepts necessary for the understanding of the topic in discus have been elaborated in this part. The following discussion sufficiently covers the definition of energy poverty, its causes, economic theories explaining it, economic growth, and its nexuses.

2.3 Energy Poverty: Definition

How "energy poverty" is defined shifts from place to place. Energy poverty in higher-income and industrialized nations focuses on the inability to afford energy supply, whereas in low-income and developing countries, energy poverty is explained by a lack of access to "modern" energy services (Maxim et al., 2016).

There are a great number of conceptions of energy poverty in published works. However, the most important objective of all these definitions has been to convey how a level of energy use falls short of satisfying some essential demands. With the existence of very few work done by scholars, while conducting research on Britain, Boardman, (1991) was the pioneering researcher to give the concept of energy poverty a definition that was significantly more official and formal. The study defines energy poverty as "the inability of a household to afford a sufficient amount of energy-related amenities, such as warmth, for 10% of its income." Raghutla & Chittedi, (2022a) while buttressing this definition, defines it as spending 10% or more of one's income on energy supplies. This is the income-based 10% threshold measure of energy poverty**.**

While defining energy poverty and its policy implications, Moore, (2012), claimed that definition is crucial for determining the policy mix and resource allocation that is required, and that present official definitions of energy poverty have severe faults. The researcher pointed out that a budget standard method provides more uniform, meaningful, and equitable statistics, whereas presenting fuel expenditures as a proportion of income is a poor predictor of energy poverty. “Unable to afford heating” is the subjective method used by researchers Waddams Price et al., (2012) for measuring energy poverty in the Britain. They compared the results to official figures and investigated the connection between a method that relies on spending and one that relies on respondents' perceptions of energy costs. Only about a sixteenth of low-income households were able to afford

enough energy to keep their homes warm, despite the fact that twenty-eight percent of these households spent more than a tenth of their income on energy in the home. This means that these households are at risk of falling into fuel poverty according to the most common definition of energy poverty. A more comprehensive definition is given by Reddy, (2000). According to the findings of the study, "the lack of sufficient choice in accessing adequate, affordable, reliable, high-quality, safe, and environmentally friendly energy services to support economic and human development" is what determines "energy poverty". This definition is considerably superior to others since it encompasses the essential elements necessary for gaining a grasp of the challenge posed by the lack of energy (González-Eguino, 2015).

2.4 Causes of energy poverty

Millions of people in developing nations around the world are afflicted by energy poverty, a pervasive and complicated problem. Energy poverty can have severe consequences, including limiting educational opportunities, healthcare, and economic opportunities, and contributing to environmental degradation (International Energy Agency, 2019).

Energy poverty in emerging nations is caused by a number of elements, such as issues with infrastructure, policies, and the economy. Energy poverty is a major problem in developing countries, and it is exacerbated by economic inequality and a lack of resources. Many families who live in energy poverty are unable to pay the upfront expenditures of obtaining alternative energy sources or connecting to the grid, such as solar panels (United Nations Development Program, 2016). This is because households are unable to invest in energy infrastructure due to low wages, high poverty rates, and inadequate possessions of finance (World Bank, 2018).

Energy scarcity in developing countries is caused, in part, by a lack limited utilization of energy sources and an inadequate infrastructure. This may be due to geographical or political factors that make it difficult to build and maintain energy infrastructure in certain areas. For example, rural and remote communities may be difficult to reach with energy infrastructure, or political instability may make it difficult to invest in and maintain infrastructure (International Energy Agency, 2019).

Finally, poor legislative and regulatory frameworks and a lack of political will can also contribute to energy poverty in developing nations. In some cases, governments and other decision-makers may prioritize other issues over addressing energy poverty, or the policies and regulations in place may be insufficient to address the issue effectively (World Bank, 2018).

2.5 Several economic models that address energy poverty's root issues

Energy poverty is a severe issue for the entire world and refers to the inability to receive or pay for energy services. It affects millions of individuals worldwide and has a wide range of detrimental implications on health, prosperity and improved living conditions. Multiple factors contribute to and result in energy insecurity, which are explained by a number of theories. Several of the most well-known theories will be examined in this study, along with their implications.

2.5.1 The Social Exclusion Theory

According to the Social Exclusion Theory, exclusionary behaviors combined with structural inequality leads to energy poverty. The inability of some people or groups to fully take use of the economic, social, and cultural opportunities offered by society is what leads to energy poverty. Race, ethnicity, gender, socioeconomic class, and location are just a few examples of the many variables that may contribute to this exclusion (Watts, 2017). Low-income people, for instance, might not be able to afford energy-efficient equipment or cover the upfront costs of setting up

renewable energy systems, which would force them to rely on more expensive and polluting energy sources. Similarly, underprivileged groups might not have the political clout to push for legislation to combat energy poverty and expand access to renewable energy (Watts, 2017). It's possible that people's ability to participate in the political, social, and economic affairs of their communities would be hindered as a result of these practices of exclusion, such as limited availability of energy services. Conclusively, the Social Exclusion Theory suggests that energy poverty is caused by the exclusion of certain individuals or groups from the resources and opportunities necessary to address and overcome it.

2.5.2 The Resource Deprivation Theory

The Material Deprivation Theory, also known as the Resource Deprivation Theory, postulates that a lack of resources, such as money, education, and access to social services, may cause people or households to live in poverty (Bradshaw, 2007). This hypothesis holds that the inability to obtain the resources required to meet fundamental requirements and fully engage in society leads to poverty**.**

According to the Resource Deprivation Theory, insufficient access to energy resources leads to energy poverty. This could be as a result of a lack of funding or of resources, technology, or infrastructure. The cycle of poverty is frequently exacerbated by a lack of resources because people who are experiencing energy poverty frequently lack access to the resources, they need to enhance their quality of life.

2.5.3 The Market Failure Theory

According to the theory of market failure, market inefficiencies are what cause energy poverty. According to the Market Failure Theory, energy poverty can develop when households are not

distributed energy efficiently and resources are not effectively allocated by the market (Kendra, 2021). This may take place for a variety of reasons, one of which is an insufficient availability of reasonably priced sources of energy, a lack of competition in the energy market, and externalities including detrimental environmental effects (Kendra, 2021). For instance, consumers might not have access to reasonable energy options and might be forced to rely on more expensive sources, which could result in energy poverty. Additionally, failing to internalize the negative externalities associated with some energy sources, such as pollution or greenhouse gas emissions, may make it more challenging for low-income households to buy clean energy solutions, which can also lead to energy poverty (Kendra, 2021). According to this argument, energy poverty would be diminished or completely eradicated if energy services were more broadly accessible and reasonably priced. This is because, in accordance with the principle, market-based solutions are more effective and efficient at delivering energy services than solutions that are required by the government.

2.5.4 The Health Disparities Theory

According to the Health Disparities Theory, the high expenses of healthcare are one way that health disparities can cause energy poverty. Financial limitations may make it difficult for people and families in poverty to get high-quality healthcare. They can be more likely to have health problems that call for pricey prescription drugs or medical procedures as a result. People and families may experience energy poverty as a result of these costs because they are unable to pay the financial cost associated with heating and cooling their homes or adopting energy-efficient equipment. Additionally, people and families may be more likely to reside in low-income or disadvantaged communities in areas with high levels of health disparities, which can also contribute to energy

poverty. These communities could not have access to energy-efficient infrastructure and technologies, which would raise residents' energy bills

2.5.5 The Post-Disaster Theory

The Post-Disaster Theory contends that natural disasters frequently make energy poverty worse. This is so that access to energy services might be further restricted if disasters result in the destruction of infrastructure and energy services. Additionally, the economic hardship that is sometimes brought on by natural catastrophes makes it even harder for people affected to receive energy services.

According to the Post-Disaster Theory, there are a number of factors that lead to energy poverty. These factors include the destruction or loss of energy infrastructure as a result of a disaster, the absence of resources or money to rebuild or repair infrastructure, and the lack of access to other forms of energy (Pelling, 2003). Additionally, the Post-Disaster Theory asserts that the long-term effects of catastrophes on social and economic systems, such as the loss of employment and income and the disruption of trade and supply chains, can make energy poverty worse. Long-term energy poverty can result from all of these causes, making it difficult to break the cycle of vulnerability and poverty in the communities affected.

2.6 Measuring energy Poverty

In contrast to other forms of poverty, energy poverty cannot be measured using a single criterion in the same way that other forms of poverty can be measured. This is due to the fact that the criterion of living below the line that defines energy poverty is not one that is widely acknowledged. Due to the fact that a fundamental minimum level of energy services cannot be specified in a manner that is both objective and practical. Many different techniques for assessing

energy poverty have been developed. The researcher went further to review different approaches for measuring energy poverty:

1. The first approach has to do with the Access to Energy. The accessibility of households to two significant elements is included in this technique of calculating energy poverty. The electrification rate, which is also known as the share of the population at large that possesses access to an electricity network, is the first component. This rate is expressed as a percentage. The second is having access to modern cooking appliances like high-efficiency biomass cookstoves, electricity, biogas systems, and liquefied petroleum gas (LPG). This method's benefit is that it is simple to measure, straightforward to express, and convenient for data gathering due to its binary character. This strategy has been criticized for ignoring other crucial elements of economic and social development, such as commercial companies, structures like hospitals, schools, and street lights, and concentrating primarily on home access to energy use. Additionally, the strategy misses out on other energy sources and energy quality.
2. The second technique is energy inputs, assessed as either energy utilized or money spent on energy. Although it is easy to collect the data, there is some disagreement regarding how to define the line that separates those who are considered to be living in energy poverty from those who are not; energy poverty can be measured by either the amount of energy used or the amount of money spent on energy. When administering policies or initiatives to eliminate energy poverty, assessing energy inputs is less significant but relevant for cross-country comparisons.
3. Measuring the outcome of energy poverty is the third method use in assessing energy poverty. The focus of this methodology is on assessing and monitoring whether these

outcomes have improved because it is assumed that without the usage of contemporary energy products, individuals will face negative results. A reduction in the level in which people are energy poor is referred to as an improvement in this outcome. This result has an effect on health; for example, a decrease in respiratory disease cases may be attributed to lower levels of energy poverty. Environmental effect is another result; a rise in the rate of afforestation indicates a decline in energy poverty. Other effects include the opportunity cost of time spent gathering this fuel that could have been spent on a more fruitful endeavor. And finally, while attempting to evaluate energy poverty, the availability of options is also a factor to be measured.

4. The fourth indicator used to evaluate energy poverty is called the Multi-Tier Framework (MTF), which was developed by the World Bank and focuses on the quality of energy given. This framework emphasizes key characteristics without which energy services are not regarded as being delivered rather than just acknowledging electricity or any other type of energy connections. Seven factors are taken into account by the MTF when rating the quality of electricity: capacity, duration (including daily supply), quality, reliability, cost, legality, and safety and security. If the energy being delivered possesses these required qualities, then energy services are being rendered. There are five layers of access, with a quantitative or qualitative criterion established for each attribute. The MTF evaluates the efficacy of energy in three various contexts, including domestic, industrial, and communal applications. Cooking, heating, and power use are all included in home needs. The MTF is not without difficulties. Its design is sensitive to arbitrary judgments, complex, and data-intensive.

There are several other composite indicators to measure energy poverty. These methods combine different kinds of data about energy poverty into a single value. These composite measures include the Energy Development Index (EDI) of the International Energy Agency, the Multidimensional Energy Poverty Index (MEPI), and the Energy Poverty Index (EPI).

2.7 The African Economy and Growth

The African economy offers several prospects for expansion and development that may be taken advantage of to promote equitable and sustainable economic growth. Africa's young and quickly expanding population is one such chance. Africa has a huge and youthful population that poses both a challenge and an opportunity, with more than 60% of the population under the age of 25. On the one hand, in order to minimize social unrest and promote sustainable economic growth, it will be required to offer employment and opportunities for this expanding population (Asongu, 2017). On the other side, this young population provides a potential pool of workers and entrepreneurs who might fuel economic expansion and advancement.

The immense and undeveloped natural resource potential of Africa provide another area for development. Oil, minerals, and agricultural goods are just a few of the many natural resources found in Africa. African nations may be able to generate revenue and foreign exchange from these resources, but it will be crucial for them to manage them sustainably in order to maximize the long-term advantages and reduce adverse effects like environmental deterioration (Asongu, 2014).

Another possibility for economic growth and development is Africa's unique placement at the hub of international trade. Africa serves as a hub for trade and a desirable investment location since it is situated between Europe, Asia, and the Americas. This gives a chance for Africa to take use of its advantageous position to promote economic growth and development (Asiedu, 2017).

Finally, by incorporating cutting-edge inventions and technology created in other areas of the world, Africa has the ability to go past particular phases of development. For instance, mobile banking and payments technology have made it possible for many Africans to engage in the formal economy and access financial services even in places where there is a dearth of traditional banking infrastructure (Adesina & Fosu, 2015). Africa has the chance to promote innovation and economic progress by embracing and adapting these technologies.

2.8 The Energy Poverty Nexuses

Nexuses for energy poverty are the different links and linkages between energy scarcity and other economic variables. It highlights the complicated relationships between energy access, poverty, and general human welfare. These factors are fundamental for the wellbeing and productivity of people in all countries most especially in the developing countries. These nexuses cover how energy availability may enhance chances for health, education, poverty and the economy as well as how poverty can restrict access to energy.

When developing strategies to address poverty and energy access, energy poverty nexuses should be taken into account. Policymakers may create more efficient and long-lasting solutions to energy poverty by adopting a holistic perspective on the energy-poverty nexuses. Energy poverty nexuses ultimately offer a framework for comprehending the intricate relationships between well-being, poverty, and access to energy, as well as for creating more efficient and long-lasting solutions to the problem.

The purpose of this portion of the chapter is to investigate the various interconnected factors that contribute to energy poverty. Energy poverty, which may be described as a lack of access to reliable and inexpensive energy services that are necessary for people to satisfy their fundamental

requirements and improve the quality of their lives, has a number of distinct nexuses that are routinely researched. This is because energy poverty prevents people from meeting their basic needs and making their lives better. These nexuses include the following:

2.8.1 The Energy-poverty nexus

This expression is referring to the connection between not having enough money for energy and general poverty. Because individuals may be required to spend a greater portion of their income on energy-related costs, such as the cost of cooking fuel or lights, energy poverty can make poverty worse by increasing the cost of living in a community. Even though there isn't always a one-way relationship between money poverty and not having access to energy, it remains one of the most significant hurdles to having access to energy. This is due to the fact that many people living in poverty do not have access to reliable sources of income. Studies in many geographical contexts have revealed the complex link between families' levels of disposable income and where they fall on the energy ladder, also households' capacity to transition to more expensive, higher-quality fuels and energy depends on their disposable income (El-Katiri, 2014). El-Katiri (2014) also noted in his study that in the Middle East and North Africa (MENA), nations with high percentages of income poverty, notably in North Africa, are where energy poverty is most pervasive and persistent.

The consumption patterns of contemporary energy are indicative of the extreme poverty that exists in sub-Saharan Africa. The World Bank (2017) estimates that Africa countries uses just 712 kg of oil equivalents of modern energy per person year. This is much less than the average annual worldwide production of 2,250 kg of oil equivalent. The World Bank points out that increasing access to contemporary energy sources will help this region's economy grow and reduce poverty.

Tackling energy poverty will help to reduce poverty by increasing access to energy, which may increase people's ability to engage in economic activities and improve their quality of life.

2.8.2 The Energy-health nexus

The connection between energy production, consumption, and health consequences is referred to as the "energy and health nexus." To provide potable water, adequate sanitation, and functional medical facilities, it is necessary to have access to reliable and environmentally friendly sources of electricity. On the other hand, there is a possibility that one's health will suffer as a result of either the production or the use of energy, especially if pollutants and harmful gases are discharged into the atmosphere, which worsen air quality and contribute to climate change (World Health Organization, 2014). Energy poverty may also have a negative impact on a person's health since it may cause them to be exposed to potentially hazardous levels of indoor air pollution caused by the burning of animal waste or wood for the purpose of lighting or cooking, as well as because it can prevent them from having access to power for refrigeration and other health-related requirements.

Furthermore, the allocation of energy resources and access to energy may have an effect on health equality and particularly harm underprivileged people (Gundersen et al., 2016). For instance, low-income neighborhoods may be more likely to reside close to energy production facilities that emit pollutants, which might increase the prevalence of respiratory and cardiovascular illness (Gundersen et al., 2016).

Broadly speaking, the connection between energy and health emphasizes the significance of taking into account the health consequences of energy policy and decision-making, as well as the necessity of an all-encompassing approach to energy production and consumption that prioritizes both economic development and public health. Conversely, expanding access to clean and

dependable energy sources, such electricity or clean-burning fuels, can have a positive impact on health outcomes.

2.8.3 The Energy-education Nexus

The link between access to energy and educational opportunity is known as the "energy and education nexus." Energy poverty may prevent students from having access to the power or other energy sources they need for studying and finishing tasks, which can have a detrimental effect on education. By giving children the tools, they need to study and flourish, expanding access to energy can contribute to bettering educational results. The usage of computers, lights, and other electrical equipment that is necessary for teaching and learning makes it necessary for educational institutions to have access to affordable, dependable energy. The research and implementation of clean energy technologies are also dependent on education since it prepares the next generation of scientists, engineers, and decision-makers for the shift to a more sustainable energy system.

The World Bank (2020) states that having access to electricity is a critical facilitator for education since it makes it possible to use the internet, computers, and other crucial modern teaching and learning tools. Schools could find it difficult to give pupils the tools and assistance they need to achieve academically if they don't have access to electricity. The availability of additional educational materials, such as textbooks, as well as instructors' capacity to interact with students and parents outside of the classroom may also be hampered by a shortage of power.

However, education is equally as essential to the creation and implementation of technology for renewable sources of energy. Education expansion and skill development are crucial for the efficient application of mitigation and adaptation measures, particularly those linked to the deployment of renewable energy technology (IPCC, 2018). By teaching the next generation of

scientists, engineers, and legislators, both the local and global problems of climate change can be addressed simultaneously by accelerating the shift toward a more environmentally friendly energy system.

In conclusion, the link between energy and education is intricate and multidimensional, emphasizing the significance of having access to both for the growth and development of people and civilizations.

2.8.4 The Energy-environment Nexus

The term "energy and environment nexus" describes the connection between energy production and usage and how those two factors affect the environment. The energy industry is a significant contributor to the emissions of greenhouse gases, which are a primary factor in the development of warming temperatures and other environmental problems. On the other hand, a contemporary society cannot function without the usage of energy, and having access to energy that is both inexpensive and reliable is crucial to the growth of the economy as well as the welfare of its inhabitants.

The extraction of petroleum and coal and their subsequent usage are the principal sources of energy that are employed on a worldwide scale, and they are responsible for approximately 78 percent of the total CO2 emissions that are related to energy. These emissions provide a contribution to the phenomenon of global warming, which has repercussions such as an increase in sea level, more frequent and severe heatwaves, and more extreme weather (IPCC, 2018).

The adverse effects of the energy industry on our ecology have also been emphasized by other researches. For instance, Zhang et al (2018) studies discovered that the transportation and extraction of oil and gas can have an adverse effect on ecosystems, biodiversity, and the quality of

the air and water. The growth of hydroelectric dams can have detrimental effects on river ecosystems, including the interruption of fish migration and the loss of habitat for aquatic species, according to research by Chen et al. (2019).

Moreover, access to dependable and inexpensive source of power is crucial for both economic growth and the general well-being of people. Energy usage is necessary for modern civilizations to function. Access to energy, according to the World Bank (2020), "is a fundamental facilitator for economic development, since it permits the creation of industries, the expansion of commerce, and the improvement of living standards." However, there are repercussions on the environment that are related with the development and use of energy that need to be carefully evaluated and managed. These effects need to be addressed. Increasing access to energy sources that are clean and renewable is one way to help alleviate energy poverty while simultaneously lowering the negative effects on the environment. To protect the environment as well as the advancement of the economy, it is essential to strike a balance between the required to preserve the environment and the requirement to have access to energy.

2.8.5 The Energy-gender Nexus

The term "energy and gender nexus" refers to the linkages between energy poverty and gender, specifically how accessibility to and control over energy resources may differ based on a person's gender. This connection is also known as the "energy and gender nexus." It also refers to the effects that the production and consumption of energy have on efforts to achieve a level playing field and the empowerment of women.

Women are frequently disproportionately affected by energy poverty and a lack of access to modern energy sources, according to a review that was conducted by Kishore et al (2017).

Reviewing the existing research, the authors found that women and girls are more likely to be in charge of gathering firewood and other traditional energy sources. This can lead to an uneven workload in terms of time and effort, as well as an increased risk of being exposed to indoor air pollution and other health hazards. In addition, women may have a more difficult time participating in the energy industry, either as producers or consumers, due to the cultural and sociological customs that exist, as well as the financial and legal constraints that exist.

The absence of availability of contemporary sources of energy may be detrimental to both gender equality and the empowerment of women. For instance, study conducted by Singh et al. (2019) found that the absence of power in rural India may hinder women's ability to acquire information, possibilities for training and education, as well as their capacity to participate in economic activities. In a manner analogous to this, the lack of access to affordable electricity may prevent women from participating in decision-making processes at home and in their communities, in addition to contributing to gender-based violence and other forms of discrimination (Tiwari et al 2018).

The connection existing between gender and energy scarcity emphasizes how crucial it is to take into account gender while addressing energy poverty and making sure that energy resources and technology serve both men and women and promote gender equality.

2.9 Empirical Literature

This section of the study tries look into different studies in literature concerning the subject of energy poverty discus. Using a mixed-methods approach, the study gives weight to the various research projects on the subject that have been carried out by various researchers in various locations. The findings of this study will guide sector policy and practice and provide insightful

knowledge on the most effective strategies for eradicating energy poverty in emerging nations, particularly Nigeria and Africa as a whole.

The question of whether or not there is a connection between global warming and a lack of access to affordable energy is one that is being investigated by scholars**.** While researching the connection between the changing climate and energy poverty**,** Ürge & Tirado (2012**)** concluded that the implementation of stringent measures about climate change will significantly raise the degree of energy poverty, particularly in less developed nations. They further assert that solving both problems will require the blending of policy goals. policies targeted at improving energy efficiency and giving access to modern energy facilities will help in dealing with both climate change and energy poverty.

Researchers Dong et al. (2021) employed the nonparametric panel causality-in-quantiles (PCIQ) approach to make their conclusions on the causative link between low-carbon energy transformation and energy poverty. These findings were made using panel data from 30 Chinese provinces from 2004 to 2007. They found a substantial two-way causal link between the reduction in energy poverty and the transition to low-carbon energy sources. They went on to say that switching to a form of energy that produces less carbon dioxide can help in the fight against energy poverty since it makes energy supplies more available, inexpensive, and efficient.

There is a correlation between people's lack of access to affordable energy and their average income level. While investigating the relationship between economic inequality and a lack of access to energy in 51 different nations between the years 2002 and 2014, Nguyen & Nasir (2021) found that there are two different types of causal linkages between income and a lack of access to energy in their research. For starters, rising income disparity in these economies leads to increased

energy poverty. Furthermore, it has been discovered that when energy poverty is eliminated, income disparity decreases dramatically. As a result, enacting policies to reduce income disparity will go a long way toward solving energy poverty, and the fight against energy poverty will also help to close the income gap.

Mendoza et al. (2019) also studied the Philippines between 2011 to 2016, they noted that the Philippines experienced multidimensional energy poverty. Their research implies that when poverty rates rise, households will become more impoverished on multiple levels. In addition, they found that multidimensional energy scarcity, low incomes, and other socio-economic variables are closely associated to the presence of energy poverty in places that are already economically disadvantaged.

People's health and educational levels have a direct impact on productivity, making them crucial determinants in determining economic growth. Evidence demonstrates that various forms of a lack of energy have an enormous impact on health and academic performance at all levels (Banerjee et al. 2021a)**.** Numerous studies have demonstrated a link between countries' declining health conditions and energy poverty. For instance, Phoumin & Kimura (2019) conducted research in Cambodia to determine how energy poverty affects the health, education, and earning potential of households. They found that members of energy-poor households are more likely to spend a significant amount of money on medical expenses because they are more likely to have respiratory health problems. Additionally, they found that members of energy-poor households are less likely to attend school. In addition to this, the rate of school dropouts is significantly greater among homes who are energy poor in comparison to households that are not energy poor. According to the findings of the analysis, measures need to be put into place in order to end energy poverty and supply Cambodia's low-income households with energy that is both clean and affordable.

Nduka (2021), to find out how rural households in Nigeria might escape energy poverty, conducted a study utilizing the contingent valuation method (CVM). His research showed that households Encourage the use of non-traditional sources of energy. By lowering the financial burden of using electricity, this will result in significant financial savings. He believes that governments should concentrate on luring investors to rural areas by creating a favorable environment. His study also revealed that it is very desirable to invest in sustainable energy businesses**.**

Kahouli (2020) conducted a parallel study in France to evaluate the causal connection between self-reported health and fuel poverty. They found that there was a correlation between the two. According to the results of the study, there is a significant connection between self-reported health condition and fuel poverty**.** He concluded that investing in household energy-efficiency programs will aid in the elimination of energy poverty and, as a result, improve overall health. Improving housing situations to decrease fuel poverty is also a way to cut government healthcare spending.

In places with harsh weather conditions, electricity and heating are essential in making a conducive environment for learning in schools. The provision of energy resources will also contribute to education by providing lighting in schools and ensuring that both teachers and students have access to conducive learning and teaching environments. The running of laboratories and other utilities in the school will be achievable through the provision of such energy resources. In the households, students will have access to light that will enable them to do their studies efficiently. The absents of this will mean that education at all levels is hampered.

Rajesh & Sadath (2019) did this by employing a tool known as the Multidimensional Energy Poverty Index, or MEPI. Their goal was to determine whether or not there was a connection between the shortage of energy and economic growth in India. Even though the overall trend in

India is going in the wrong direction, there is a correlation between a lack of access to power and stagnant economic growth. During the study period, there has been a rise in the strength at which these components have connected. The researchers deployed education and income as tools to measure development because the usage of non-renewable energy sources is as result of non-affordability of the renewable energy resources as well as the level of literacy of the people. According to the findings of this research, education has a greater potential for reducing the amount of energy deprivation than does people's money. This is something that the researchers found when they compared the two. Although energy poverty is more prevalent in rural sections of the country, it is far less prevalent in metropolitan areas. The study also demonstrates a strong link between India's socio-economic underdevelopment and energy poverty. The researchers recommended that policymakers embrace complementary strategies with organizational and technological advancements, including encouraging private investment and utilizing India's potential for renewable energy, as their last recommendation.

John & Deinde (2021) To evaluate both the immediate and long-term impacts of energy shortages and global warming on the growth of the economy in Nigeria from the year 1980 to 2018, the autoregressive distribution Lagged (ARDL) model was used. They discovered that having low access to energy has a detrimental or inverse relationship with the expansion of the gross domestic product. Their study's findings also indicate that non-renewable energy sources are most frequently utilized in Nigerian households. resulting in harm to the environment and public health. In their study's conclusion, the authors recommended that policymakers ensure that awareness-raising programs are developed to highlight the risks that using non-renewable energy poses to the environment, the funding and promotion of low cost and efficient technologies be implemented as

well as policies that will improve the income of the people particularly the low-income earners as thy seems to be affected more by energy poverty.

Garba & Bellingham (2021) conducted research on the scientific proof of the association between the lack of availability to environmentally acceptable cooking fuels and the expanding size of the economy using data from the African continent. African nations from the years 2000 to 2015. the data was collected from the period of 2000 to 2015. During the analysis section of the study, variables such as GDP per head and the percentage of the populace that relies on traditional (solid) fuels were taken into consideration. They used FMOLS and DOLS in their research in order to come to the conclusion that there is a negative causation relationship between GDP per capita and the utilization of traditional fuels (solid) in the study countries that were chosen for the research. They advocated the approval and execution of policies that will increase access to modern fuels for heating and cooking, in addition to reducing obstacles that should be incorporated with current energy accessibility laws.

A number of development outcomes were examined by the researchers Adom et al. (2021) while using DOLS as well ARDL methods to examined the effect of energy poverty and the shift to green energy. They discovered that despite the fact that a lack of access to electricity has a negative effect on earnings, schooling, life lifespan, jobs, and mobile phone subscriptions, it has a favorable influence on poverty, economic inequality, the risk of ingesting contaminated water, and the danger of not having access to sanitation. In addition, the findings of their study demonstrated that transitioning to environmentally friendly forms of energy can buffer the negative effects of energy constraint on a variety of different development outcomes. They discovered that the risk of expensive energy costs associated with the switch to renewable energy is likely to be mitigated with time, with the exception of environmental risk factors and income poor. Further advice from

the researchers was that nations shouldn't solely rely on green energy policies to solve all of their developmental problems. Furthermore, nations adopting renewable energy should consider the hazards that could come with going green and develop strategies to reduce such risks.

Aigheyisi (2020) conducted research to investigate the effect that Nigeria's widespread energy insecurity has had on the country's overall level of technological advancement. The S-estimation method of the resilient least squares estimator was applied in order to analyze yearly time series data spanning from 1990 to 2017 for the purpose of research. According to the report, a country's inability to acquire energy has a detrimental effect on its ability to expand economically, suggesting that increased access to electricity will help in economic development. Additionally identified as critical development variables in the nation are domestic investment and labor force. Further highlighting the country's (inadequate) preparedness for the vagaries of globalization, the analysis reveals that FDI inflows, trade openness, and currency devaluation have all had a negative influence on the development of the economy. In order to mitigate the negative effects of foreign direct investment (FDI) on development, the study recommends a number of measures, including the following: lowering electricity rates; increasing rural and urban electrification; designing and implementing policies and programs to encourage domestic investment; developing the labor force; enforcing import controls; promoting exports; avoiding excessive depreciation of the domestic currency; and implementing appropriate FDI policies.

To empirically evaluate the effect of education on energy poverty Apergis et al. (2022) relied on the GMM estimate approach and the human capital theory. Between 2001 and 2016, they analyzed data from a sample of 30 developing economies. The empirical results demonstrate without a doubt that a lack of education contributes to energy poverty. Important implications for policymakers and government officials, such as educating and assisting households toward energy efficiency

and the use of clean energy sources, remain same across a range of approximations of energy poverty.

The impact that a lack of access to affordable electricity has had on the health and literacy rates of fifty developing nations between 1990 and 2017 is critically examined using Fixed Effect Estimations in a research by Banerjee et al. (2021). According to the empirical findings, better health and educational outcomes are related to lower energy poverty. They arrive to the conclusion that having access to electricity has a more significant and favorable influence on the results of development. According to the findings of the study, there is a correlation between high rates of poverty and low life expectancy rates, and the energy development score appears to have a higher influence on these rates than the poverty headcount ratio does. On the other hand, the influence of the energy indicator of development on infant mortality rates is larger in places where the ratio of poverty-stricken people to population is low or where the per capita income is high.

Oum (2019) used the data from the Lao Economic Consumption Survey (LECSs) for the years 2008-2009 and 2012-2013 in order to carry out research that assessed the severity of energy poverty and its effects on people's well-being, particularly in terms of education and health. The results of this research were published in the journal Energy Policy. According to the statistical study done by the researchers using Ordinary Least Square (OLS), even though more people in the country have obtained access to electricity over the course of time, a bigger percentage of the population still does not have exposure to it and cannot afford to meet both necessity and energy use. This is the case despite the fact that more people have gotten access to it over the course of time. It is generally accepted that those with lower incomes, as well as those who live in more rural locations and have restricted or no connection to basic electrical services and road networks, are more likely to be at risk for a lack of energy. The study also shows that households' average school

years and health status are severely impacted by energy poverty. The author suggested that, while ensuring access to power ought to be the primary objective, it ought to be supplemented with measures encouraging chances to make money and lowering all types of energy poverty.

Kose (2019) conducted research in Turkey to investigate the connection between a lack of energy and health consequences. Using a nationally representative household survey in 2014, researchers were able to find evidence to support the hypothesis that there is a correlation between a health status index and a self-reported energy poverty indicator. In order to carry out this study, the Turkish Statistical Institute (TSI) employed a methodology known as stratified cluster sampling with two stages. A total of 24,554 homes from Turkey's 26 provinces are included in the country's working sample, which has a total of 60,533 observations. The author made estimates using a multi-level empirical analytic approach. The researcher chose this model because of the data's hierarchical organization. The problem of standard error clustering is solved by using multi-level modeling, which also accounts for non-constant variance in a number of different settings. The outcomes of the study point to a negative connection between people's lack of access to affordable electricity and their overall levels of health. Based on the writer, public initiatives to eliminate energy poverty should be specifically devised to address the requirements and living circumstances of diverse population groupings in order to be effective. Energy poverty can be reduced in Turkey and other developing regions of the world by the implementation of policies that aim to improve living conditions. These policies could, for example, address insulation problems and housing faults.

Zhang et al. (2019) conducted research in China to examine how the country's energy crisis affects people's health. They began by applying a multidimensional technique in conjunction with surveys between the years of 2012 and 2016, with the goal of arriving at a measurable measurement of

energy deprivation. This ranking takes into account the ease of access to energy resources as well as their relative cost. Using the OLS econometric model, they moved on to the second step of their investigation, which was to investigate the connection between energy poverty and the health of Chinese people. The findings of their empirical study lend credence to the conclusion that a lack of access to affordable energy has a significant and deleterious impact on one's health. They suggested that policymakers take measures to encourage people to switch from utilizing solid fuels to employing ecologically friendly energy sources, which would enhance people's health. These efforts would also improve the environment.

Between the years 2004 and 2019, Halkos & Gkampoura (2021) conducted research in 28 European nations to investigate the relationship between economic crises and energy poverty. They conducted the empirical research using both the Fixed and Random methods, and the results showed that the Scandinavian countries had the fewest people living in poverty due to a lack of access to affordable sources of energy. On the other hand, throughout the time period covered by the study, the level of energy poverty that was recorded as being the highest was found in Bulgaria and the countries of the Balkans. The price of electricity was found to be the key factor in determining energy poverty, followed by joblessness and the percentage of people who are at risk of falling into poverty, according to the findings of the study. Their research also showed a negative association between the lack of energy and gross domestic product per capita, which lends credence to the notion that the current economic crisis in Europe is having a detrimental impact on the region's overall levels of energy poverty.

With the evidence of works of literature as presented above, it is very clear that further studies need to be done as there seems to need for more research on this subject, particularly concerning developing countries in sub-Saharan African countries.

A Synopsis of the Available Research

Table 1: Summary of Literature Review

AUTHOR	AIM OF THE STUDY	COUNTRY AND DATE	METHOD	RESULT
Dong et al. (2021)	In order to study the connection between low-income energy access and the shift toward low-carbon energy sources	China, 2004-2017	The nonparametric panel causality-in-quantiles (PCIQ) method	They discovered that the shift to low-carbon energy has a strong and bidirectional causal link with the reduction in the number of people living in energy poverty.
Nguyen & Nasir (2021)	Determining connection between economic disparity and energy poverty	51 countries between 2002 and 2014	GMM	rising income disparity in these economies leads to increased energy poverty, Furthermore, it has been discovered that when energy poverty is eliminated, income disparity decreases dramatically
Mendoza et al. (2019)	the development of a composite measure with the purpose of illustrating the extent of multidimensional home energy poverty (MEPI) in the Philippines	Philippines between 2011 to 2016	MEPI	According to the findings of their investigation, individuals and families will be exposed to increasing levels of poverty when the overall rate of poverty increases. Furthermore, energy poverty, along with

				poverty rates and other socio-economic indicators, has a strong correlation
Phoumin & Kimura (2019)	how energy poverty affects households' health, education, and earning potential	Cambodia, 2015 survey	Probit Regression	They made this discovery after finding that people living in homes with low levels of energy efficiency are inclined to have lung health issues, which in turn makes them more prone to have high levels of medical bills.
Nduka (2021)	How to alleviate energy poverty in Nigerian rural homes	Nigeria	contingent valuation method (CVM)	According to the study, households prefer to use renewable energy. It will save a lot of money by bringing down the price of electricity.
Kahouli (2020)	health status as self-reported and fuel poverty	France, 2004-2015	fixed-effect models	According to participants' own reports of their health, living in poverty was significantly associated with poor self-reported health.
Rajesh & Sadath (2019)	to conduct research into how lack of access to affordable electricity affects	India, 2004-05,2011-12.	MEPI	There is a negative correlation between the rate of economic expansion and

	economic expansion			the availability of affordable energy sources.
John & Deinde (2021)	to calculate the short-term and long-term impact on economic growth of factors such as energy poverty and climate change	Nigeria,1980-2018	ARDL	They discovered that a lack of access to affordable energy has a detrimental or inverse connection with the expansion of the gross domestic product. In addition, fossil fuels are the ones that are utilized in Nigerian households at the highest rate. Therefore, having a detrimental effect on both the general population and the environment.
Garba & Bellingham (2021).	Attempting to establish a causal relationship between inadequate availability of safe cooking fuels and slow economic growth	Sub-Sahara African, 2000-2015	FMOLS and DOLS	Within the countries that were chosen for this research, traditional fuels consumption (solid) has been found to be associated with a negative causal link relating to GDP per capita.
Adom et al. (2021)	to investigate the effects on electricity poverty and the transition to	Ghana, 1960-2017	DOLS, ARDL	Energy poverty has a positive effect on poverty, wealth disparity, the

	renewable sources of power			danger of consuming contaminated water, and the risk of not having access to sanitation, but it has a negative effect on income, education, lifespan, jobs, and cell phone subscriptions.
Aigheyisi (2020)	to investigate the effects that a lack of affordable energy has had on the overall development of the nation	Nigeria, 1990 - 2017	robust least squares estimator	According to the findings of the study, a lack of accessibility to energy has a detrimental effect on the rate of economic growth in the country. This finding lends credence to the hypothesis that improved availability of power will contribute to economic growth.
Apergis et al. (2022)	To determine how education affects the availability of affordable electricity	30 emerging economies, 2001-2016.	GMM	The outcomes of the empirical research demonstrate beyond a reasonable doubt that a lack of education has a negative impact on energy poverty.

Banerjee et al. (2021)	The effects of energy poverty on health and academic performance	50 developing nations, 1990 - 2017	Fixed Effect Estimations	There is a correlation between reduced levels of energy poverty and improved health and educational performance. They arrive to the conclusion that having access to energy has a more important and favorable impact on the outcomes of development than does the amount of energy that is used.
Oum (2019)	to determine the extent of people's lack of access to affordable energy and how this impacts their overall well-being, including their education and health.	Lao, 2008–2009 and 2012–2013	OLS	The study shows that households' average school years and health status are severely impacted by energy poverty
Kose (2019)	This study investigates the connections between not having reliable access to energy and adverse health effects.	Turkey, 2014	Multi-level model estimation	The outcomes of the study show that there is a negative association between people's levels of energy poverty and their levels of health.
Zhang et al. (2019)	Examine the impact that not having access to affordable	China, 2012-2016	OLS	The findings of their empirical study lend credence to the conclusion that a

	electricity has on one's health.			lack of access to affordable energy has a significant and deleterious impact on one's health
Halkos & Gkampoura (2021)	Study how economic crisis affects energy poverty	28 EU countries, 2004-2019	Fixed and Random method	Their findings showed that a negative association exists between energy poverty and gross domestic product per capita, lending credence to the idea that the current economic crisis in Europe is having a detrimental influence on the region's levels of energy poverty.

CHAPTER 3
THEORIES OF ECONOMIC GROWTH

Introduction

Increasing a country's output of goods and services over a set period of time is what economists refer to as economic growth. This is typically quantified by looking at the country's gross domestic product (GDP) (Mankiw, 2018). Contrarily, the concept of economic development is more expansive and encompasses both economic growth and enhancements to the living conditions of a population (World Bank, 2021).

In the field of economic studies, there are several theories that has been develop over the years in an attempt to give and information about the idea of economic advancement. This study seeks to explain some of these theories in the economic growth discussion. These include:

1. **Linear growth theory:** According to the concept of the linear growth theory, which assumes a constant pace of technological advancement and capital accumulation, stable and gradual increases in output over time characterize economic growth. It is a streamlined model that sheds light on the variables affecting economic growth and can be used to assess long-term trends. Walt Rostow, an American economic historian is one of the proponents of the linear growth theory is the early 1960s (Thaha & Galib, 2022). In order for economies to flourish, Rostow identified a progression over five distinct phases of development. There was a logical progression from one stage to the next, and each stage was dependent on the previous one's completion. The first stage is a Traditional Society where agriculture and barter trade are the main features. In this stage, science and technology is not utilized in the economic activities. In the second phase, known as "Pre-take off," developments in areas such as technological innovation, transportation, rising levels of savings thanks to the formation of entrepreneurs, a relatively simple banking

system, etc. In the third phase, known as "Take-off," customary practices and norms give way to more structured systems of production and reward, leading to increased growth rates in some industries. The fourth stage is called the “Drive to Maturity” stage in which the economy is still enlarging and diversifying in different industries. Characterized by cutting-edge technologies and elevated productivity. The economy continues to grow, salaries and income are increasing, and living conditions are getting better. The fifth stage is the mass consumption stage characterized by a highly industrialized economy that has reached a high level of transformation. The most citizens in this economy works in the service sectors and enjoys high rising consumption per head. The theory is often times criticized for its assumptions of perfect knowledge, stable exchange rates etc. the linear growth theory does not put into account other important factors either than savings.

2. **Structural change theory**: A large shift in an economy's structure, usually brought on by considerable economic breakthroughs, is referred to as a structural change. The structural growth hypothesis states that in order for a country to preserve economic stability, it must move away from agricultural activity, which has a low labor productivity, and towards industrial activity, which has a high labor productivity (Ganti, 2021). This theory explains how an economy can experience a long-term economic progress. The structural growth theory's central idea is that several underlying elements within an economy have an effect on economic progress. The aforementioned elements include the growth of institutional structures, physical infrastructure, human resource development, and technological progress. The structural growth theory contends that for output and productivity to expand over the long run, these structural factors must be strengthened**.** Notable economist such as

Author Lewis, Allen Fisher and Collin Clark hard worked on different models explaining the structural growth theory.

3. **Dependency theory:** When compared to other growth theories, the dependency hypothesis best explains why some nations are more advanced than others. The theory came to be in contrast to the notion that all nations might advance economically by following the same course as developed nations in the 1950s and 1960s. The dependency theory contends that some nations' underdevelopment is mostly a result of historical patterns of dominance and exploitation, as well as external factors. The theory further emphasized that in order to overcome the underlying disparities and dependencies between rich and developing countries, it is necessity for a reconfiguration of the global economic system. Boosting economic expansion calls for an inwardly focused development plan as well as greater government involvement in the form of trade restrictions, challenges to foreign investment, and the nationalization of key economic sectors. The dependency hypothesis has been criticized for its insistence that external factors, such the structure of the international system, are more to blame for the underdevelopment of Third World countries than internal factors (Namkoong, 1999).
4. **New-Classical theory:** The New Classical Theory of Economic Growth stresses the importance of supply-side forces in fostering sustainable economic expansion over the long run, flexible markets, and rational expectations. It advocates for open markets, rational decision-making by economic agents, and investment- and productivity-boosting policies. According to the theory, economies can achieve long-term economic expansion and improve general well-being by focusing on these factors. According to new-classical economists, in order for nations to thrive, they must liberalize their markets, promote risk-

taking among their citizens, privatize state-owned businesses, and reform labor markets by, for example, curtailing trade unions' influence. New-classical economists agree that free trade can promote inward investment, the application of scale and scope economies, an increase in competition, the breakup of domestic monopolies, and the formation of an environment with low inflation.

5. **New growth theory:** The New Growth Theory emphasizes the importance of human capital and knowledge, the reality of positive externalities, and the growth potential of economies of scale. The New Growth Theory also emphasizes the notion that technological advancement is endogenous. It provides a framework for understanding how financial investments in encouraging policy, innovation, and education can lead to increases in productivity and overall economic well-being over the long term. As a result of the emphasis placed on knowledge, economies can no longer rely solely on raw materials for growth; instead, they must diversify their sources of information and provide financial backing for the organizations that facilitate the creation and sharing of new information. The new growth hypothesis is distinguished by the fact that knowledge, unlike land and money, yields increasing rewards.
6. **Property rights:** The study of property rights focuses on the ways in which well-defined and well-secured property rights can stimulate economic development. The "property right" of an individual is the legal entitlement to appropriate an item for one's own consumption or for commercial gain. The ability to do so may also be included, whether through a sale, gift, or bequest. A property right often also confers the ability to enter into agreements with third parties for the purpose of leasing, pledging, or mortgaging goods or property, or for granting access to or use of an asset (Besley & Ghatak, 2010). One of the

main justifications of property rights is that they generate an environment that encourages investment and innovation. The belief that one's property will be protected drives more creation, which boosts the economy. Also, Effective resource allocation in the economy is made possible by well-defined property rights. When people own and are in charge of their possessions, they are more inclined to use them wisely and weigh the advantages and disadvantages of doing so.

CHAPTER 4
THE NIGERIAN ECONOMY AND ENERGY INVESTMENT

4.1 An Overview of the Nigerian Economy

Nigeria, a country on Africa's west coast, has a projected annual growth rate of about 3.2% and a land area of about 923 768 km2. The country's population of approximately 200 million makes it both Africa's most populous and the world's ninth-most populous. It is a country rich in culture because of the contributions of its more than 250 distinct ethnic groups (Monyei et al., 2018).

The main industries in Nigeria's economy include manufacturing, services, oil and gas, and agriculture. This country is categorized as having a mixed economy. Nigeria has historically depended largely on oil exports, which generate a sizable amount of the country's revenue and foreign exchange gains. It is one of Africa's leading oil producers and a member of the Organization of the Petroleum Exporting Countries (OPEC) (Sertoğlu et al., 2017). To lessen its reliance on oil, Nigeria's economy is nevertheless progressively diversifying. With a large section of the population employed and a contribution to food production, the agricultural sector is essential to Nigeria's economy. The nation is abundant in natural resources, including solid minerals like tin, limestone, and coal, which have the potential to be developed further. Tonuchi & Onyebuchi (2019), Nwosa et al. (2019).

4.2 The Strengths of Nigerian Economy

With a nominal GDP projected to reach over $500 billion in 2023, the Nigerian economy is thought to be the biggest in all of Africa. It possesses some key components that are strong and greatly increase the economy's potential. Among such important elements are:

Natural resources: The use of natural resources is an integral part of the manufacturing process. The richness of oil, natural gas, solid minerals, etc., defines Nigeria, a developing economy. The Nigerian government relies heavily on oil exports. Nigeria ranks sixth in terms of oil exports and eighth in terms of global oil production. Additionally, Nigeria possesses the second-largest oil reserves in Africa, behind Libya (Vân, 2021). Oil has historically contributed significantly to the GDP. For example, while the GDP contribution was only 0.9% in 1961, it increased over time, reaching a peak of almost 50% in 2000. The GDP contribution was roughly 37.46% in 1990. Despite a reduction in recent years brought on by economic diversification, oil's overall annual contribution to total GDP in 2022 was 5.67% as opposed to 7.24% in 2021 (Lawal, 2023). But as opposed to oil, the solid minerals sector provides the necessary raw materials to the economy, yet under-developed though with a huge potential contributes less than 1 percent to the GDP.

Large market size: With over 200 million people, another important factor that contribute immensely to an economy is human resource and a viable domestic market for products and services. A big population raises the economy's demand for products and services which creates a domestic market, this encourages investment and production and results in the development of more jobs and higher wages. Over 70% of Nigerians are under the age of 30, and nearly half of all Nigerians are under the age of 15. Its population is projected to double in size during the next 30 years. Because of its large size and young population, Nigeria has the opportunity to become a global economic powerhouse. Due to the positive correlation between urbanization and economic growth, a big and young population may be an asset to a country's economy (Akinyemi & Mobolaji, 2022).

Infrastructure: In the same way that other main production elements like labor and capital contribute to economic expansion, infrastructure also does so. Construction of new infrastructure

is widely believed to have a positive impact on the economy as a whole, the housing market, employment, consumer and government expenditure, and the promotion of productive endeavors (Nugraha et al., 2020). Nigeria has made strides in enhancing its infrastructure, which includes its ports, airports, transportation systems, and power generation. The previous Government under President Mohammadu Buhari has improved the Nigeria's stock of infrastructure to GDP from 20 percent to over 40 percent (Arogbonlo, 2023). Continuous expenditures in infrastructure development, such as building rail networks and power projects, are intended to improve connectivity, lower prices, and increase productivity, and this massive improvement in the economy of Nigeria is a great strength that will ensure the attractiveness of not only local investors, but also Direct foreign investment.

4.3 The weaknesses of Nigerian Economy

The Nigerian economy has difficulties that have hampered its growth and development despite having many resources and strengths. To address these difficulties, the nation has made an effort to advance economic reforms and increase foreign direct investment. The government has put policies into place to strengthen the economy, encourage private sector involvement, and make business operations easier.

However, there exist some significant flaws in the Nigerian economy, one of which is corruption in governance**.** Governmental corruption has had a substantial negative influence on the Nigerian economy. Due to a long history of corruption and poor government, Nigeria has had slow economic growth, discouraged investment, and exacerbated inequality. Governmental corruption has led to the misappropriation of finances and resources intended to provide essential social services including healthcare, education, transportation, and electricity. Corrupt public officials who are charged with creating and enacting laws that will promote economic growth and prosperity plunder

these resources. Numerous tragedies, including a high degree of poverty, inadequate infrastructure and social amenities, violations of rules and regulations, and the prevalence of criminal enterprises amid a booming economy, have been caused by this public official's conduct (Rosemary & Bonmwa 2014). Castro & Nunes (2013) in their study of 73 different countries finds out that countries with the presence of high level of corruption tend to have a negative flow Direct foreign investment which would have boosted the economy of such countries.

Another important weakness seen in the Nigerian Economy is the quality of institutions. Economic development depends heavily on institutions. They offer the framework, regulations, and procedures that direct how people behave in terms of governments, enterprises, and individuals within an economy. Institutions provide the required system, laws, and mechanisms to promote economic progress. They promote the rule of law, strong governance, market efficiency, increased access to financing, infrastructure development, and human capital development.

The standard of institutions in Nigeria has had a significant influence on the expansion of the country's economy (Ubi, 2014). In general, the institutions in emerging countries like Nigeria favor redistribution over production, monopolies over competitive conditions, and restrict growth rather than spur it. Investments in these organizations that might boost productivity are extremely rare (Yıldırım & Gökalp, 2016).

The quality of Nigeria's institutions is vital to fostering an environment conducive to the country's economic development. In particular, the executive, legislative, and judicial institutions must work together for the tax system to generate income, contracts to be enforced, investments in necessary infrastructure, and inclusive governance to be implemented (Abubakar, 2020). Strong and effective institutions foster an atmosphere that supports investment, entrepreneurship, innovation, and

productivity improvements, all of which are necessary for long-term economic growth and prosperity.

Another challenge or weakness faced by the Nigerian economy is security. The protection of lives and property is a fundamental factor in ensuring economic development. The security issues of terrorism, militancy, and kidnapping have interfered with economic operations in Nigeria. The willingness of investors and business owners to increase their investments has been impacted by this. In addition to the lack of investment, the cost of doing business has also increased as a result of businesses resorting to investing in security facilities, which raises cost of doing business and subsequently prices. Consequently, as a developing country, the funding that is meant for infrastructural development to boost the economy is budgeted for fighting terrorism. In 2022 alone about 5.8 billion dollars was expended on the fight against terrorism by the Nigerian government (Babatunde-Lawal, 2022). Agriculture which contributed about 23 percent to the Nigerian GDP in 2022 has been grossly hampered by terrorism. Apart from agriculture, the tourism sector as well as been affected. The perception of insecurity has created a decline in tourist arrivals, impacting revenue from the tourism industry. Addressing security challenges and improving the country's overall security status is crucial for Nigeria's economy to thrive sustainably. By making the country safer, Nigeria can encourage economic development, attract investment, and make it easier for businesses to operate.

4.4 **The Investments on Energy in Nigeria**

The oil and gas sector are particularly prosperous in Nigeria, which is home to numerous energy resources. One of Africa's leading oil producers, Nigeria possesses sizable natural gas reserves, abundant sunlight, Wind power and hydropower potentials but still depends on fossil fuels as a means of energy supply. Despite Nigeria's huge energy potential, the country has the largest

amount of people in the globe (approximately 86 million) who do not have access to power, according to reports from multiple different agencies (Kemp, 2023). This figure is accrued to Governmental mismanagement of public resources.

The previous government under president Muhammadu Buhari has obtained loans from different international instructions to the tune of about 7.5 billion dollars to help in the transmission of electricity, but this investment has not resulted to solving the lingering energy crisis (Kingsley Jeremiah, 2023). Another governmental mismanagement has seen Nigeria spent over $10 billion over a ten-year period on fixing and rehabilitation of inefficient oil refineries (Oluwole, 2023), this fund has not been channel into this purpose as the refineries are still not working, and Nigeria rely largely on oil importation for meeting the energy demands in the country. This failure which is a result of corruption by government officials also result to high cost of importation of fuel. The government again scandalously spent over 400 billion naira (800 million dollars) monthly in subsidizing the fuel (Mary Izuaka, 2023).

In May 2023, the Nigerian President, Bola Tinubu signed the Nigerian electricity bill which replaces the previous law that allow only the federal government to generate and supply electricity. The new law creates an optimal institutional structure for Nigeria's power sector, which includes generation, transmission, distribution, supply, commerce, and overall energy consumption. The law lays the legal and institutional groundwork for Nigeria's privatized, contract-based, rule-based competitive electricity market. Private investors may get permits from states to run mini-grids and power plants, but these permits wouldn't cover long-distance or international transmission of electricity. Using conventional and renewable energy off-grid and mini-grid alternatives, this law, if properly implemented, will expand electrical service to rural, unserved, underserved, peri-urban, and metropolitan areas (Bunmi Aduloju, 2023).

In May of 2023, a massive refinery capable of processing 650,000 barrels of oil per day went live, which was widely hailed as a watershed moment for Nigeria's energy sector. priced at $20 billion The massive refinery being constructed by the Dangote Group, headed by Aliko Dangote, has the capacity to generate up to 53 million litres of petrol, 4 million litres of diesel and 2 million litres of aviation jet fuel each day (Princewill, 2023). This investment is very important for Nigeria because it will triple the nation's capacity for refining, increasing domestic fuel consumption, and producing foreign cash for the nation through exports.

Despite this, Nigeria is still a promising market for energy investments. Individuals and state governments now have more leeway to engage in the energy sector thanks to the implementation of new legislation. Renewable sources of energy are still in their infancy and will require public and private funding to reach their full potential.

4.5 A 10-year review of Nigeria's Economic Progress

A country's economic analysis may tell you a lot about its history, current state, and potential future. Because of its massive population, abundant natural resources, and status as Africa's largest economy, Nigeria's economic performance attracts widespread attention around the world. The economic potential of Nigeria can be better understood by looking at the country's historical growth pattern, which can also reveal problem areas.

Nigeria's economy has undergone a number of shifts during the past decade, with internal as well as external variables contributing. The GDP, inflation, unemployment, and FDI are only few of the economic variables that will be used in this examination. By looking at these metrics, we may get a feel for the state of the country's economy during the past decade, flaws and all.

The average GDP per person has varied throughout the past decade. This could be due to a number of factors, including the covid-19 pandemic's devastating impact on the global economy. The GDP per capita has increased steadily over the past few years, from $2,728 in 2012 to $3,200 in 2014, the highest level in a decade. The election cycle and the subsequent change in government may explain the drop seen in the years after 2015. 2014 saw the lowest on record, at 1941. The swings and unexpected fall in price of crude oil on the worldwide market since 2014 may also have contributed to the GDP decline. As a result, the GDP is not a reliable indicator of the health of the Nigerian economy due to its excessive reliance on crude oil.

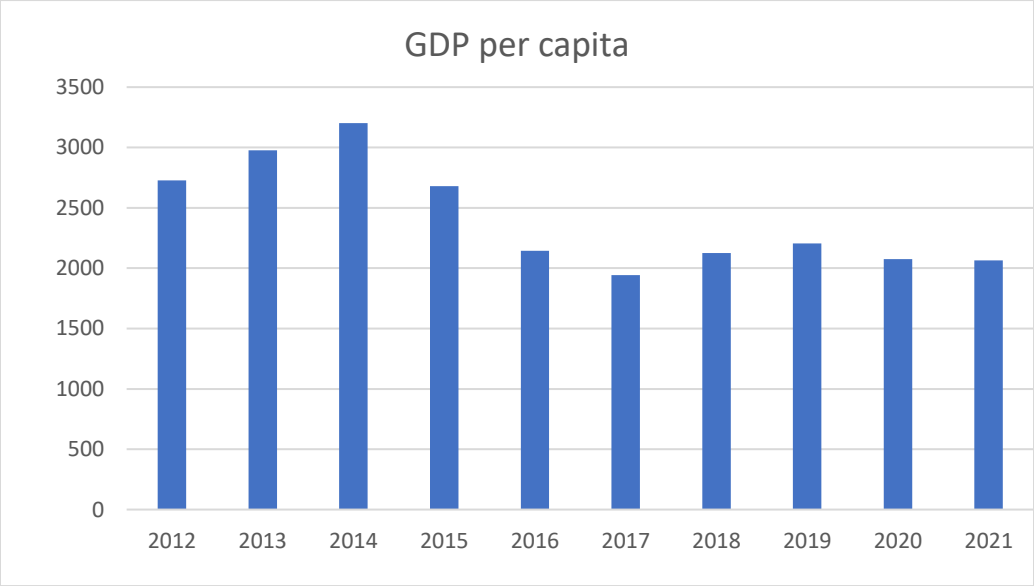

Fig.1: GDP per capita for Nigeria. 2012-2021 (source: world Bank data)

In contrast, inflation is the long-term rise in the cost of living across all products and services in an economy. Inflation is often quantified by looking at the rate of change (in percentage terms) in a price index (commonly the Consumer Price Index (CPI)) over a given time interval. Inflation devalues currency, meaning one unit may buy less goods and services. The money supply, manufacturing prices, government policies, and demand-supply dynamics can all cause inflation.

In recent years, Nigeria has had substantial inflation. Due to internal and foreign factors, inflation has risen nationwide. Nigeria's inflation rate has been slightly unpredictable during the previous decade. Inflation was moderate, hovering around 10%, from 2011 to 2015. However, inflationary pressures heightened in 2016. The inflation rate in Nigeria skyrocketed in 2020, climbing to over 15%, an all-time high. This rise can be attributed in part to supply chain interruptions and the global spread of the COVID-19 virus.

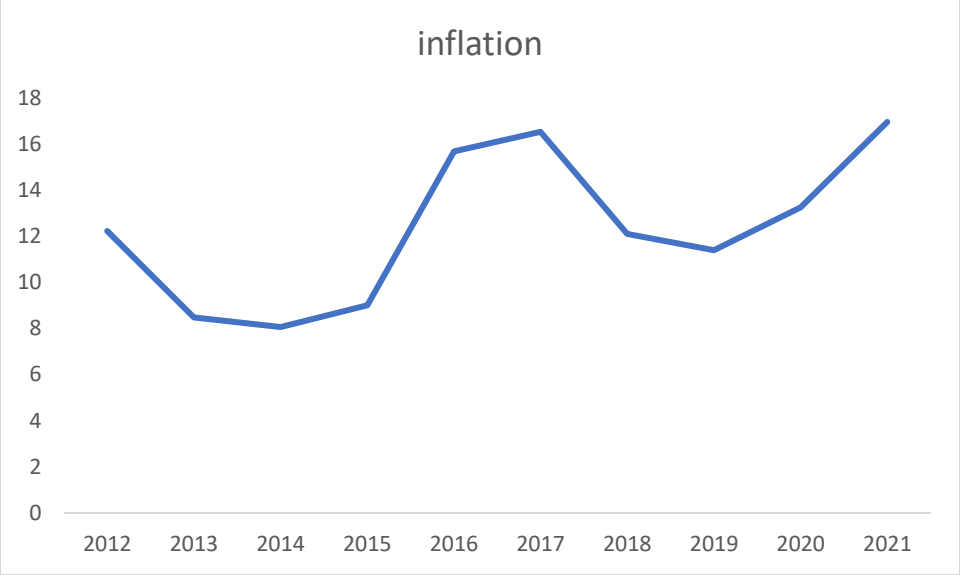

Fig.2: GDP per capita for Nigeria. 2012-2021 (source: world Bank data)

Having a job or being employed is referred to as the state of employment. It is fundamental to any economy, as it directly affects people's standard of living and the rate of economic expansion. The unemployment rate, labor force participation, and new job creation are just few of the measures that can be used to gauge the state of the economy's employment market.

With a rapidly expanding population and few available jobs, Nigeria has struggled to keep its people employed over the past decade. Nigeria has had a difficult time finding and keeping workers for the past decade. Unemployment, defined as the percentage of the labor. force that is actively

looking for work but has been unsuccessful in doing so, has not decreased. The NBS reports that by the year 2020, the jobless rate in Nigeria will have risen from an estimated 14% in 2011 to well over 33%. Among the youthful population, unemployment has been especially severe, with many people under the age of 25 unable to find work. Nevertheless, the diagram below shows the employment to population ration for the past decade.

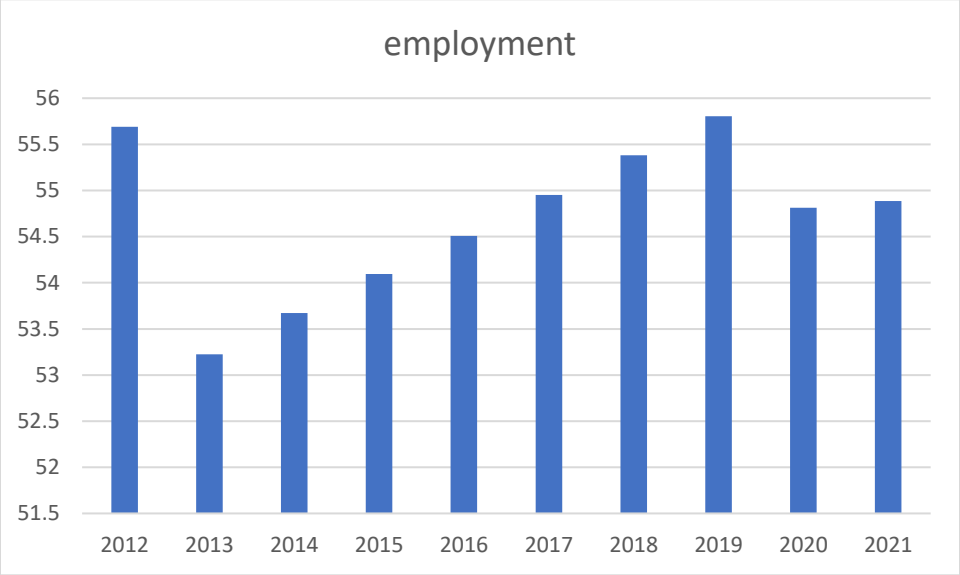

Fig. 3: Employment to population ration for Nigeria. 2012-2021(source: world Bank data)

CHAPTER 5
DATA AND METHODOLOGY

5.1 Introduction

Methods, procedures, and strategies for gathering the necessary data for the study are discussed at length. The many statistical methods employed to examine the information gathered throughout the study are also broken down and discussed here.

5.2 Sources and Data Types

Researchers in the discipline of economics rely heavily on data in order to verify hypotheses and produce conclusions. Economic research can benefit from data gathered from a variety of methods, including surveys, experiments, and observation. Public and commercial institutions, as well as the independent efforts of scholars, are just few examples of the many possible sources for information. To analyze the association between energy poverty and economic expansion in nations that are developing, researchers compiled annual statistics for the Nigerian economy from 1991 to 2019 using the World Bank's World Development Indicators (WDI) database. For this reason, Nigeria was chosen to investigate the connection between economic development and energy poverty in the African continent.

5.3 Variables and the measurements of variables

Using variables to better understand and analyze economic events is an essential part of conducting empirical research in economics. In statistics, a variable is any observable quality that varies over time and space within a population or sample. In order to have a deeper understanding of economic theory, it is required to quantify key aspects through a method known as "the measurement of variables." Multiple factors were considered in this investigation of how energy insecurity affects economic development. The following are examples of such factors:

1. **The Real Gross Domestic Product**: The yearly inflation-adjusted output of a country's products and services is known as its real gross domestic product (GDP). Real GDP helps make comparisons of GDP across years and between countries clearer by displaying comparisons for both the quantity and value of products and services. The GDP is employed as a lagging indicator of economic health in this research. Studies have also employed this factor as a barometer of economic expansion (Dehghan Shabani & Shahnazi (2019), Wang et al. (2020) and Saidi & Hammami (2015).
2. **Access to electricity**: Access to electricity is defined as the fraction of the population that has access to a reliable source of electrical power, and it is compiled from national, business, and well-known worldwide databases (World, 2018). It is widely held that universal access to modern energy sources is crucial to achieving the Sustainable Development Goals of ending extreme poverty and promoting prosperity in the world (Sarkodie & Adams, 2020). This variable is also deployed by different scholars in the energy poverty discussion. (Shyu, (2022), Adhekpukoli, (2018), Ulsrud, (2020).
3. **Gross National Income**: The term "gross national income" (GNI) refers to the sum total of all money produced within a country. It is used to measure and track a nation's wealth from year to year. This figure incorporates not just the GDP but also export earnings for the country. Because it is a proxy for a country's economic prosperity, this variable is crucial when discussing energy poverty. More resources can be allocated towards improving energy infrastructure and increasing access to energy services in countries where the per capita gross national income is higher. Instead, countries with lower GNI may find it difficult to make these investments, leading to a larger prevalence of energy poverty. Moreover, GNI can be used to compare a country's energy poverty rate to that of

others throughout the world and to monitor trends over time. Researchers Ong (2015) and Dong et al. (2022) also highlighted the importance of understanding energy deprivation in terms of income.

4. **Employment to Population Ratio**: The percentage of a country's population that is employed or actively seeking employment is known as the "employment-to-population ratio". People of working age are considered to be employed if they were involved in any activity during a short reference period that produced things or provided services for pay or profit, regardless of whether they were actually working during that time (i.e., at a job for at least one hour) or not. A person's working age is defined as being 15 or older. The ability of an individual or family to afford and gain access to energy services is greatly influenced by employment status, making it an essential factor to consider when considering energy poverty. Energy poverty is less likely to occur when people have steady jobs and incomes that allow them to afford to pay their energy bills and purchase energy-efficient appliances. Energy poverty, on the other hand, might affect those who are unemployed or who work for low wages. Energy poverty is exacerbated when people do not have stable employment opportunities; this is especially true in regions with high unemployment rates, where people may not have the same access to energy-efficient jobs and businesses. Other researchers as well has included this variable in their various studies that includes energy poverty. (Muthalib (2018), Koomson & Churchill (2022), Postuła et al.(2021), Doğanalp et al. (2021b).
5. **Inflation:** The Consumer Price Index tracks the average annual percentage change in a basket of goods and services often purchased by consumers to get an idea of how the cost of living is evolving over time. The most common measure of inflation is changes in

consumer prices. People's inability to afford energy may be related to the general rise in prices of goods and services across an economy over time. Inflation that is too high can hinder the economy, which can lead to people not having enough money for energy. Energy poverty is exacerbated by inflation, which makes it harder for low-income individuals to pay for energy and discourages economic growth and government investment in energy infrastructure**.** This variable is also deployed by different scholars in the energy poverty discussion. (Raghutla & Chittedi (2022b), Husnain et al. (2021).

Table 2: Summary of variables

Variable	**Measuring unit**	**Source**
GDP per capita	(Current US$)	WDI
Access to electricity (% of population) (**ENE)**	(% of Population)	WDI
Employment **(EMP)**	(Employment to population ratio)	WDI
Gross National Income **(GNI)**	GNI, Atlas method (current US$)	WDI
Inflation **(INFL)**	Inflation, consumer prices (annual %)	WDI

Source: WDI, authors compilation

5.4 Testing for Stationarity

An essential component of economic analysis is the stationarity test, which determines whether or not the data set utilized in the study is stationary. The characteristics of a data set, including its mean, variance, and autocorrelation, must be stable across time for the data to be considered stationary (Enders, 2010). Non-stationary time series data, such as that containing a trend or a unit root, may lead to biased calculations. The main assumptions of an econometric model employed in research must be met, hence testing for stationarity of data is crucial. Performing a test for

stationarity is the only way to learn the order of differencing of our data, which is crucial to understanding the dynamics of our data.

Throughout the course of this thesis, both the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test were utilized in order to ascertain whether or not the data in question are stationary. Researchers can guarantee that the model's assumptions are met and the estimates are unbiased by doing repeated stationary tests and verifying that the time series data is stationary. This can aid in making the findings more solid and reliable, as well as guaranteeing the accuracy of the outcomes.

5.4.1 The Augmented Dickey-Fuller (ADF) test

Dickey and Fuller (1979) developed a computer program to test their theory by finding whether or not a particular variable has a unit root or, alternatively, whether or not the variable follows an a priori random walk. The program was used to test the theory by determining whether or not a given variable follows an a priori random walk. In order to illustrate the flexibility and practicality of the extended Dickey-Fuller test, Hamilton (1994) provides four case studies. In order to determine whether or not a unit root exists in the data, the autoregressive distribution function (ADF) test pits the null hypothesis against the alternative. The test statistic is compared to the pivotal values from the ADF distribution to determine whether to reject or fail to reject the null hypothesis. If the test statistic is bigger than the critical value, the unit root hypothesis is rejected and the data are assumed to be stationary.

The ADF test is robust against serially correlated and trending data. It is important to remember that the ADF test makes the linearity and normality of the errors as assumptions. For the Augmented Dickey-Fuller test, the formula is as follows:

$$\Delta y(t) = \alpha + \beta t + \phi \Delta y(t-1) + \varepsilon(t) \quad (1)$$

Where $\Delta y(t)$ is the first difference of the series at time t, α is the intercept, βt is the linear trend term, ϕ is the lag coefficient, and $\varepsilon(t)$ is the error term.

5.4.2 Phillips-Perron (PP)

Using a modification of the Augmented Dickey-Fuller (ADF) test developed by Phillips and Perron, (1988) one can examine the time series' unit root The PP test can be especially useful when a structural break or change in the series' mean suggests that the time series data is not stationary. To determine whether or not the coefficient on the lagged differences is statistically significant, we first do a backwards regression of the first differences of the time series onto the original time series and a set of lagged differences. The PP test is sometimes used in tandem with the ADF test to address the ADF test's limitations when dealing with non-stationary time series data that has structural discontinuities.

The unit root in the data is the starting point for the Philip-Perron (PP) test's null hypothesis of a stochastic trend in the time series. The alternative, known as the null hypothesis, proposes that the series is neither trend nor unit stationary. If the p-value of the test is less than the significance level, then the non-stationarity of the time series is inferred and the null hypothesis is rejected.

For the PP test statistic, we solve for:

$$PP = ADF - (n-1) * (k-2) / (n+1) * (k-2) * (k-1) * var(u) \quad (2)$$

Where:

ADF is the augmented Dickey-Fuller test statistic

n is the sample size

k is the number of lags in the ADF regression

var(u) is the variance of the residuals from the ADF regression

5.4.3 ARDL Bound Test

The ARDL (Pesaran, 1999, Pesaran et al., 2001) was used as the methodology for this study; It uses partial sum decompositions to uncover asymmetric effects in both the long and short runs, using both positive and negative decompositions. The asymmetric ARDL allows for a constraint-free examination of non-stationarity and nonlinearity in an error-correcting model. For finding cointegrating relationships in limited data sets, the linear ARDL model performs best. Additionally, it allows for statistical conclusions on long-run estimates that are not attainable with other cointegration methodologies, and this is true regardless of the order of integration of the regressors (I (0) or I (1)). However, the linear ARDL cointegration approach fails when there are I (2) variables. In its broadest sense, the ARDL model can be described as follows:

$$\boldsymbol{\varphi(L)Y_t = \alpha_0 + \alpha_1 w_t \beta^1(\mathrm{L})\, X_{it} + U_t} \qquad \textbf{(3)}$$

5.4.4 Breusch-Godfrey Serial Correlation LM Test

In economics, serial correlation (also known as autocorrelation) is typically tested for using the Breusch-Godfrey Serial Correlation LM Test. The premise of independence is broken by serial correlation, which happens when the error factors in a regression model are associated over observations**.** The test presupposes that both the regression model's proper specification and the error terms' stationary process are true.

Statistical significance at a chosen level for the LM test statistic indicates the presence of serial correlation in the model. As a result, it can be inferred that the error components are linked across data and that the standard errors and statistical inference of the model may be skewed.

5.5 Regression analysis

The purpose of this research is to analyze the relationship between economic growth and energy access in Nigeria and other developing nations. Very important variables such as employment, income, and inflation are added as they are determinants of economic growth. To capture the influence of education in our model, we initially included education as one of the independent variables in the study. However, data on education is not complete in the selected period as we discover numerous missing observations of data on education. As a result, this variable was removed from the model, leaving GDP as the dependent variable and employment, inflation, gross national income, and access electricity as independent variables. To carry out this research, the economic model adopted for the study is as follows:

$$\mathbf{GDP} = f\ \mathbf{(ENE, EMP, GNI, INFL)} \qquad \mathbf{(4)}$$

In equation 4, GDP (Gross Domestic Product) as indicated in the model is a representation of economic growth. While ENE is a surrogate for energy poverty and stands for the percentage of the population with access to electricity, EMP on the other end represents the employment to population ratio, GNI (Gross National Income) is a proxy for income and lastly, INFL represents inflation.

To ensure consistency and efficiency in the analysis of our result, the data was transformed their log form and also into an econometric linear form. This model ensured that problems associated with the dataset are avoided (Raghutla & Chittedi, 2022a), in addition to reducing autocorrelation and heteroscedasticity, this modification produced more consistent results (Hassan et al., 2022). The empirical model's linear requirements are represented in the equation 5 below:

$$\mathbf{lnGDP}_{it} = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1 ln\mathbf{ENE}_{it} + \boldsymbol{\beta}_2 lnEMP_{it} + \boldsymbol{\beta}_3 ln\mathbf{GNI}_{it} + \boldsymbol{\beta}_4 ln\mathbf{INFL}_{it} + \boldsymbol{\varepsilon}_{it} \qquad \mathbf{(5)}$$

Subscripts i and t above in Equation 2 denote nation and time, respectively, β_0 stands for the constant term, while the coefficients β_1, β_2, β_3, and β_4, indicate the long-term elasticities of gross domestic product, access to electricity, employment to population ratio, gross national income, and inflation respectively and ε represents the error term.

5.6 Diagnostic and Stability Test

In addition to the previously specified tests, this investigation also employs other diagnostic procedures to validate the credibility of the model used. The Breusch-Pagan-Godfrey (Heteroskedasticity) test is one example; it examines whether the independent variables are associated with the residual variance in a regression model. It provides support for the Jarque-Bera (JB) Test and the homoscedasticity (constant variance of the error terms) assumption. The JB test relies heavily on the skewness and kurtosis of the data. When comparing a distribution to a normal distribution, kurtosis evaluates how much larger than average the tails are, whereas skewness reflects how lopsided the distribution is. The null hypothesis of the JB test is that the data have a normal distribution. If the calculated test statistic (JB statistic) is substantially different from zero at the chosen level of significance, it suggests that the data do not follow a normal distribution.

CHAPTER 6
RESULTS AND DISCUSSIONS

6.1 Introduction

The conclusions of the inquiry are summarized in this chapter's four sections. This discussion chapter is crucial to the thesis as a whole since it is here that the research findings are critically examined, placed in perspective, and given relevance. This is more than just a simple presentation of data because it gives a framework for making sense of the complex web of results in the context of previous research and theory. The discussion part provides researchers with a forum to demonstrate fresh insights, challenge common knowledge, and propose alternative points of view by crafting a narrative that links the empirical data to the broader academic world.

In the first part of this chapter, we complete the descriptive statistics for the data in order to learn how Nigeria's economic growth has been affected by energy poverty. In the second, we look at the stationary test of a data set, and in the third, we look at co-integration. At the end of the day, we discussed not only the regression analysis but also diagnostic tests and data outcome stability checks. All of the E-views software testing were finished, and the presentation was made to match the goals of the study.

6.2 Descriptive Statistics

It is important to include a descriptive statistic in the thesis because it gives the qualitative results a quantitative element. These statistical summaries, which can include measures of central tendency or dispersion, not only give a quick overview of the most important parts of the data, but also give believability to the qualitative interpretations. By putting the data in this way, we were able to show the similarities and differences that helped shape the study's results. This empirical

basis not only makes it easier to trust the interpretations, but it also helps readers understand how the results fit into the bigger picture of the discipline.

EVIEWS was used to generate the descriptive statistics that are included in this study so that they could provide the readers with a head start on the data that would be provided to them. The findings of the tests are presented in the table that follows:

Table 3. Descriptive statistics

	LGDP	**LENE**	**LEMP**	**LGNI**	**LINFL**
Mean	6.987896	3.844696	4.044717	26.27304	2.665378
Median	7.131224	3.863043	4.060133	26.24280	2.530116
Maximum	8.071204	4.082609	4.065310	26.92649	4.288204
Minimum	5.598524	3.562029	3.974528	25.68986	1.684176
Std. Dev.	0.793808	0.152054	0.028797	0.469002	0.662756
Skewness	-0.180274	-0.319524	-1.295923	0.089723	1.086637
Kurtosis	1.468111	1.912084	3.088343	1.410384	3.468905
Jarque-Bera	2.992652	1.923600	8.126613	3.092221	5.972783
Probability	0.223951	0.382204	0.017192	0.213075	0.050469
Sum	202.6490	111.4962	117.2968	761.9180	77.29595
Sum Sq. Dev.	17.64367	0.647374	0.023220	6.158958	12.29887
Observations	29	29	29	29	29

Source: Authors computation

The mean LGDP for the data descriptions that were utilized throughout this time period of study is 6.9, while the highest LGDP for this time period of study is 8.0 and the lowest for this time period of study is 5.5. The standard deviation for this time period is 0.7. LENE, on the other hand, has a mean of 3.8, a standard deviation of 0.2, and extremes of 4.0 and 3.5 for the same time frame. Maximum and minimum employment for the time period is recorded as 4.0 and 3.9 respectively, with a mean of 4.0 and a standard deviation of 0.02. For that time period, we have an LGNI mean

of 26.2, a maximum of 26.9, a minimum of 25.6, and a standard deviation of 0.4. The scores on the LINFL utilized in this analysis range from 2.6 (the mean) to 4.2 (the maximum) with a standard deviation of 0.6 (the minimum).

6.3 Stationary Test

The data stationary was determined using both the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) experiments. The need for clear contrast and precise measurements influenced the selection of these parameters. One requirement for employing an ARDL strategy is that all variables be either I(0), I(1), or a mix of I(0) and I(1), with no variables being I(2).

Table 4 and 5 shows respectively PP Test Result and the ADF tests. Conclusive finding shows that all variables are non-stationary due to the lack of statistical significance at I(0). At the first difference, however, stationarity is suggested because all the variables are statistically significant in the ADF test. Also, the PP test proves that all of the variables are stationary at I(1), not I(0). The test outcomes are listed in the table below:

Table 4: ADF Test Result

Variables	Level	Prob	1st difference	Prob
LGDP	-0.634811	0.8471	-4.127302	0.0036
LENE	-2.861707	0.0649	-5.569387	0.0001
LEMP	-1.928504	0.3150	-3.815016	0.0079
LGNI	0.273455	0.9725	-3.390961	0.0204
LINFL	-2.133705	0.2338	-5.259942	0.0002

Source: Authors computation

Table 5: PP Test Result

Variables	Level	Prob	1st difference	Prob
LGDP	-0.634811	0.8471	-4.127302	0.0036
LENE	-1.797554	0.3739	-15.20264	0.0000

LEMP	-1.096345	0.7029	-2.940485	0.0538
LGNI	0.055554	0.9561	-3.344017	0.0226
LINFL	-2.284107	0.1837	-5.537280	0.0001

Source: Authors computation

6.4 ARDL Bound Test

The Bound Test, developed from the ARDL method, was used to check for the presence of co-integration in the data set. If the F-statistic is less than the minimum required to reject the null hypothesis (the critical values for I (0)), then the null hypothesis remains true. If, however, the statistic is larger than the upper constraint I (1), the null hypothesis of no cointegration is rejected. If the statistic under investigation falls within the test's margin of error, the result cannot be considered definitive.

The F-statistic result (5.349966) indicates that we reject the null hypothesis and that the independent factors are related to the dependent variable over the long run at both the 5% and 10% levels of significance. The results of the Ardl Bound test are shown in Table 6.

Table 6: ARDL Bound Test Result

F-Bounds Test		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.349966	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Authors computation

6.5 ARDL Result and Discussions

According to data in Table 7, the probability of the LGDP responding to a change in LENE in the long term at the 10% level is statistically insignificant (**0.6151)**, with a negative value of **-0.36.** This suggests that an increase in access to electricity will cause a **0.36** percent decrease in the country's overall real gross domestic product. As opposed to this finding, it has been demonstrated practically in economies around the world that expanding access to electricity has a positive effect on economies. This basic concept is essential to the growth and improvement of contemporary economies. Access to electricity does not only boosts economic output and productivity, but it also creates new employment opportunities. Education, healthcare, and communication all require electricity. Schools, hospitals, and computer networks all rely on electricity. People's productivity in the workforce rises as their access to better educational opportunities and medical treatment improves. Human capital is increased and the economy benefits as a result. Contrarily, the result of our research shows that economic growth is affected negatively.

Although the result is not statistically significant, it may be due to a number of variables. firstly, the United Nations has raised its estimate of Nigeria's population to 211 million. Five million more people are added to the population per year at a pace of 2.4%, compared to the 1.1% global average (Julius Ogunro, 2023). A greater part of this population (about 86 million) is without access to electricity (Kemp, 2023). As a result, a rise in the number of people with access to electricity will have a negligible effect on the economy's real GDP as a whole. Furthermore, crude oil contributed significantly to Nigeria's GDP during the research period because the country is an oil-dependent economy. As noted earlier, Oil has historically contributed significantly to the GDP. For example, while the contribution to GDP was only 0.9% in 1961, The GDP contribution was roughly 37.46% in 1990, and increased over time, reaching a peak of almost 50% in the 2000s. Despite a reduction

in recent years brought on by economic diversification, oil's overall annual contribution to total GDP in 2022 was 5.67% as opposed to 7.24% in 2021 (Lawal, 2023). Since this is the case, it's clear that the availability of energy isn't doing enough to spur economic development. This finding is consistent with that of Akinwale, (2013) who looked at the connection between Nigeria's energy usage and real GDP growth from 1970 to 2005. The researcher concluded that there is no correlation between power consumption and GDP growth, suggesting that there is just a one-way causal relationship between the two variables. This he noted was as a result of low electricity generation, which isn't enough to support economic growth, leading to low levels of electricity consumption. Adegoriola & Agbanuji (2020) also did a similar study on Nigeria for the period 1986-2018 and found out that electricity consumption impacted negatively and insignificantly on economic growth in Nigeria.

In the long run, there is also a good link between employment and economic growth. The analysis shows that when LEMP goes up by 1 unit, LGDP goes up by 2.00 percent, which is a big jump with a 0.00 percent chance of happening. This estimate supports the economic theory of employment as a catalyst for achieving economic growth. Robert Solow expounded that having a large population will result in higher labor thereby inducing economic growth. A similar finding was done by Tkachenko & Mosiychuk (2014) while evaluating how economic development is affected by the availability of the labor force in the post-socialist states, they found out that employment has a positive impact on economic growth.

In the same way, it is thought that when LGNI goes up by one unit, LGDP will also go up by 7.9 percent, which proves that jobs and economic growth go hand in hand in the long run. This is also in line with what Amin et al. (2020) found about countries in south Asia.

On the other hand, LINFL has a bad effect on growth in the economy. It's statistically important at the 10% level, with a chance of 0.07. Estimations show that when LINFL goes up by 1 unit, LGDP goes up by 0.12%. Economics research shows that there is a strong bad link between inflation and economic growth. However, the precise level of inflation that is appropriate for growth is still a point of contention (Akinsola & Odhiambo, 2017). Findings by Wollie (2018), Sumon & Miyan (2017) indicated that at a certain threshold, inflation harms economic growth.

Table 7: ARDL Long-run Result

Dependent variable: LGDP

Variable	**Coefficient**	**t-Statistic**	**Prob.**
LENE	-0.369922	-0.511622	0.6151
LEMP	2.007736	9.244503	0.0000
LGNI	7.974392	3.504971	0.0025
LINFL	-0.122150	-1.902046	0.0733
C	-76.30734	-6.458059	0.0000

Source: Authors computation

Table 8: ARDL Short-run Result

Variable	**Coefficient**	**t-Statistic**	**Prob.**
D(LGDP(-1))	0.267607	2.213118	0.0400
D(LEMP)	2.131224	1.051642	0.3069
D(LEMP(-1))	-7.505484	-3.421881	0.0030
CointEq(-1)*	-0.812927	-6.404405	0.0000

Source: Authors computation

Table 9 provides the short-run ARDL results. The estimates shows that D (LGDP (-1)) increases LGDP by 0.26 percent, with the probability of 0.04 at 5% significance. In the short run, when D(LEMP) increases, LGDP increases by **2.1** percent even though the probability is not significant at **0.30**. But at lag 1, LGDP is affected negatively at **7.5** percent with a significant probability of 0.00**.** However, there is a considerable negative value in the cointegrating equation, proving a reversal to the long-run equilibrium at **0.812**.

6.6 Residual Diagnostic test

Table 9: Residual Diagnostic test Result

Name of the Test	Statistics value	Probability
Breusch-Godfrey LM Test	0.119527	0.8881
Jarque-Bera (JB) Test	3.427077	0.180227
Ramsey reset test	0.791661	0.3860
Heteroskedasticity Test: Breusch-Pagan-Godfrey	1.531103	0.2150

Source: Authors computation

Table 9 displays the outcomes of many diagnostic tests showing that the model is homoskedastic, free of serial correlation, and properly described by both the Ramsey reset test and the Jarque-Bera test. The level of significance for each test is more than 5%. The structural stability of the model was also evaluated using the CUSUM and CUSUMsq tests. Figure 4 and 5 respectively shows that there is no departure from the 5% significance plot, suggesting model stability; this is depicted graphically by the blue lines that run between the top and bottom red lines.

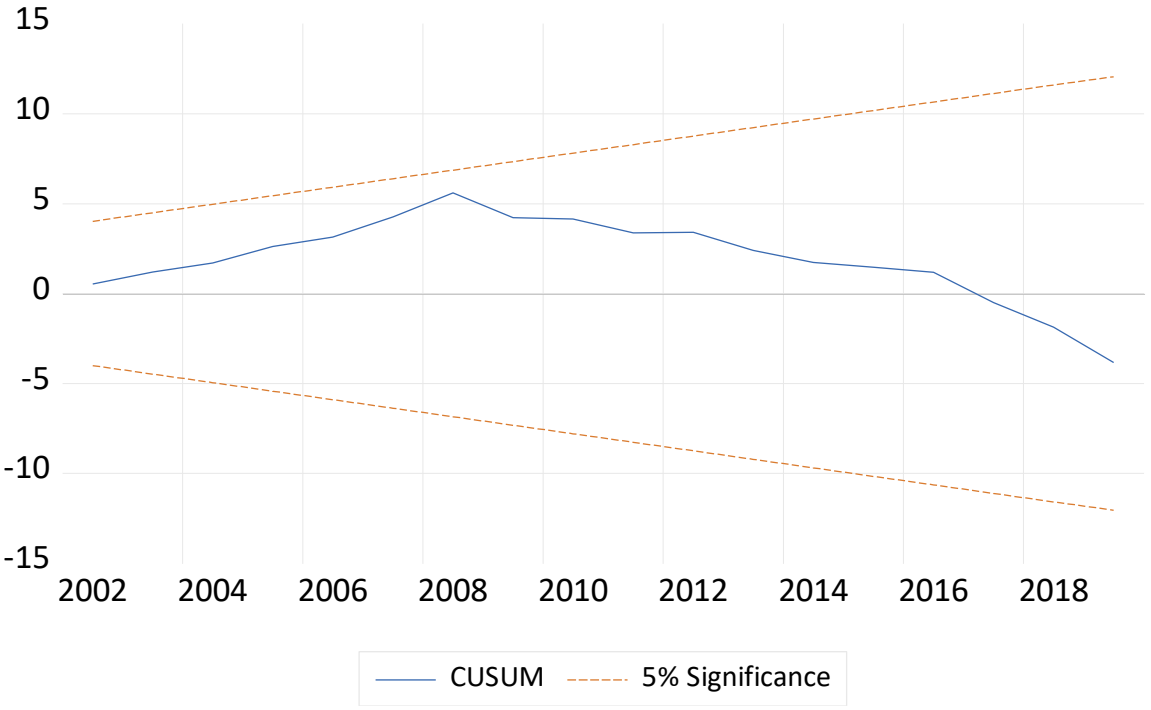

Figure 4: Cusum test

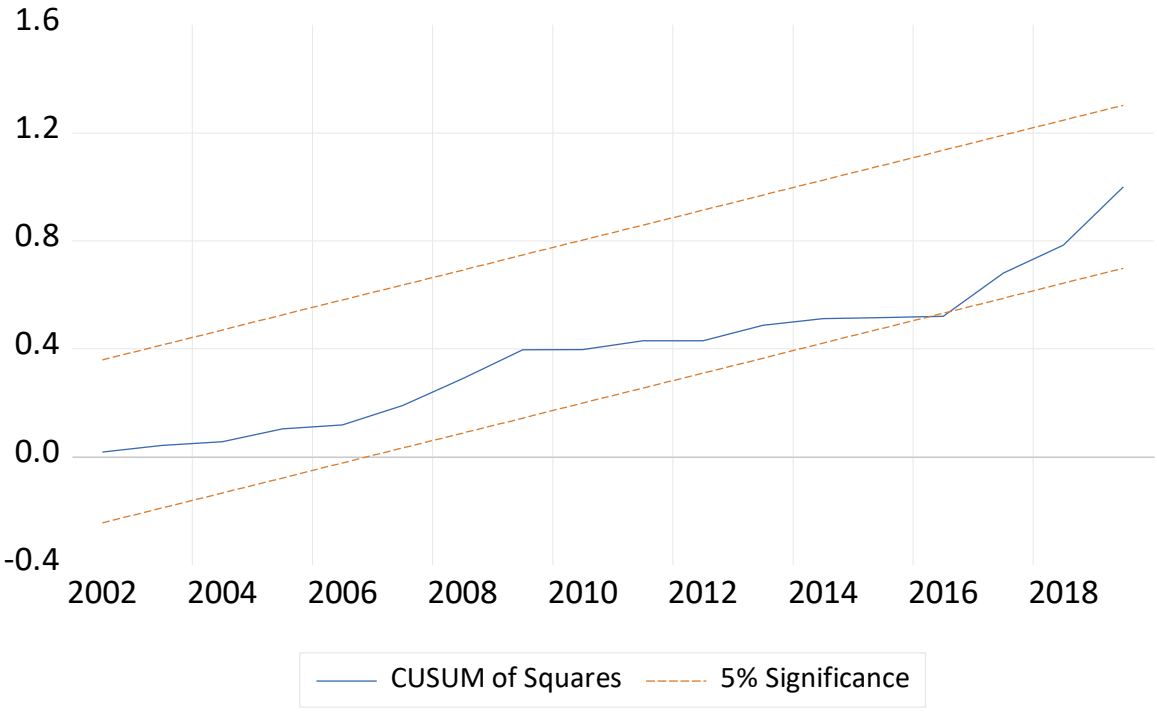

Figure 5: Cusum of Square test

CHAPTER 7
SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.1 Summary and Conclusion

Using the ARDL technique, this study analyses the connection between employment, energy poverty, income, inflation, and economic development in Nigeria. The World Bank's World Development Indicators (WDI) database was used to create annual statistics for the Nigerian economy between 1991 and 2019. In order to establish if the series is stationary, this thesis used the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. For both the ADF and PP tests, all variables were found to be stationary at first difference. The outcome of the bound test indicates that cointegration exists, indicating that the variables are related over the long run. An increase in LENE has a small but statistically insignificant negative effect on LGDP over the long run. On the other side, a rise in LEMP causes a rise in LGDP. When LGNI rises, so does LGDP, but when LINFL rises, the opposite is true. According to ARDL estimations during the short- run, D (LGDP (-1)) boosts LGDP. An increase in D(LEMP) increases LGDP though not significantly. But at lag 1, LGDP is affected negatively. The necessary diagnostics test carried out indicates stability in the model deployed in the study.

According to the findings of this research, the lack of access to affordable sources of energy has a negative effect on the country of Nigeria's overall economic growth. The presence of employment and income has a beneficial effect. The findings of the ARDL regression models have significant repercussions for public policy on issues of energy poverty and development in countries still in the process of industrialization. This result is critical for the long-term development of developing

countries, especially in Sub-Saharan Africa, which suffers from a severe lack of access to clean energy and other essential sources of clean fuel for economic activity.

7.2 Recommendations

The results of this study will help policymakers draw common policy implications that may be applied not only to Nigeria, but also to every developing country in the world, in order to meet the Sustainable Development Goal aim of ending global energy poverty and assuring economic growth by the year 2030. According to the findings of the estimations, the availability of electricity has not really contributed significantly to the expansion of the Nigerian economy in any way that can be directly observed. It is the responsibility of policymakers in Nigeria to ensure that the newly signed law that grants states and private investors licenses to operate mini-grids and power plants is fully implemented in its entirety. If it is carried out as intended, this law will expand access to power in rural areas that are not currently supplied, so expanding access to electricity to the point where it positively contributes to the expansion of the economy.

Electrical power now plays a crucial part in almost every facet of modern life, from transportation to healthcare to education to economic growth. As civilizations progress, access to electricity has gone from being a luxury to a basic necessity. The U.N. Sustainable Development Goal (SDG) 7 states, "by 2030, provide access to modern, affordable, sustainable energy for all." The importance of electricity in creating a more just and wealthy global community is further demonstrated by these findings.

Consequently, in Nigeria, access to power isn't a perk but a human right. Its effects on life-sustaining industries, national income, social progress, and ecological equilibrium are undeniable. Nigeria's full potential can be realized if the country adopts this idea and uses it to eliminate

inequalities, give its people more agency, and create a future in which everyone can prosper and contribute to the country's development. As a result, the Nigerian government needs to prioritize expanding the country's capacity to generate and provide power at a rate that keeps up with the country's booming population. This course of action is not optional but rather mandatory.

Access to clean fuels and technology for cooking will be improved as a result of the promotion of renewable energy technologies such as biogas to replace fuel wood and other non-renewable energy sources and complimenting the access to electricity. This will have a beneficial impact on economic growth in Nigeria. However, this would not come without a price, and the monetary repercussions of this would add to the financial constraints that people in Nigeria already face. Because of this, it is clear that there must be an increase in income in order for this technology to be maintained. To make the installation and use of energy facilities more accessible for all people, the government assistance and subsidies should be focused at lowering those costs. This will help to soften the financial burden for those who are less fortunate. Clean energy that comes from renewable sources would not only stimulate economic expansion, but it will also enhance people's health and well-being by cutting down on the excessive pollution that endangers the citizens of Nigeria's health. This may be accomplished by redirecting energy production towards cleaner sources.

The findings of the study indicate that increased employment levels are beneficial to economic expansion. Giving grants, loans, and tax breaks to small and medium-sized businesses (SMEs) in the major sectors that contribute to GDP is an effective way for the government to encourage the creation of new jobs. This will make it possible for those industries to hire more workers, which will ultimately lead to the creation of additional employment and a general improvement in the economy.

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APPENDIX

Appendix 1 descriptive statistics

Date: 06/20/23 Time: 16:54
Sample: 1991 2019

	LGDP	LENE	LEMP	LGNI	LINFL
Mean	6.987896	3.844696	4.044717	26.27304	2.665378
Median	7.131224	3.863043	4.060133	26.24280	2.530116
Maximum	8.071204	4.082609	4.065310	26.92649	4.288204
Minimum	5.598524	3.562029	3.974528	25.68986	1.684176
Std. Dev.	0.793808	0.152054	0.028797	0.469002	0.662756
Skewness	-0.180274	-0.319524	-1.295923	0.089723	1.086637
Kurtosis	1.468111	1.912084	3.088343	1.410384	3.468905
Jarque-Bera	2.992652	1.923600	8.126613	3.092221	5.972783
Probability	0.223951	0.382204	0.017192	0.213075	0.050469
Sum	202.6490	111.4962	117.2968	761.9180	77.29595
Sum Sq. Dev.	17.64367	0.647374	0.023220	6.158958	12.29887
Observations	29	29	29	29	29

APPENDIX 2: ARDL BOUND TEST

F-Bounds Test — Null Hypothesis: No levels of relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.349966	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
			Finite Sample: n=35	
Actual Sample Size	27			
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532
			Finite Sample: n=30	
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Appendix 3 short run ARDL result

ARDL Error Correction Regression
Dependent Variable: D(LGDP)
Selected Model: ARDL(2, 0, 0, 2, 0)
Case 2: Restricted Constant and No Trend
Date: 06/13/23 Time: 12:06
Sample: 1991 2019
Included observations: 27

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	0.267607	0.120919	2.213118	0.0400
D(LEMP)	2.131224	2.026568	1.051642	0.3069
D(LEMP(-1))	-7.505484	2.193380	-3.421881	0.0030
CointEq(-1)*	-0.812927	0.126933	-6.404405	0.0000

R-squared	0.640009	Mean dependent var	0.056682
Adjusted R-squared	0.593054	S.D. dependent var	0.180697
S.E. of regression	0.115271	Akaike info criterion	-1.347109
Sum squared resid	0.305610	Schwarz criterion	-1.155133
Log likelihood	22.18597	Hannan-Quinn criter.	-1.290024
Durbin-Watson stat	1.645703		

* p-value incompatible with t-Bounds distribution.

APPENDIX 4 ARDL LONG-RUN RESULT

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LENE	-0.369922	0.723038	-0.511622	0.6151
LGNI	2.007736	0.217182	9.244503	0.0000
LEMP	7.974392	2.275167	3.504971	0.0025
LINFL	-0.122150	0.064221	-1.902046	0.0733
C	-76.30734	11.81583	-6.458059	0.0000

EC = LGDP - (-0.3699*LENE + 2.0077*LGNI + 7.9744*LEMP -0.1222 *LINFL - 76.3073)

APPENDIX 5: LM Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.119527	Prob. F(2,16)	0.8881
Obs*R-squared	0.397465	Prob. Chi-Square(2)	0.8198

APPENDIX 6: Homoskedasticity test

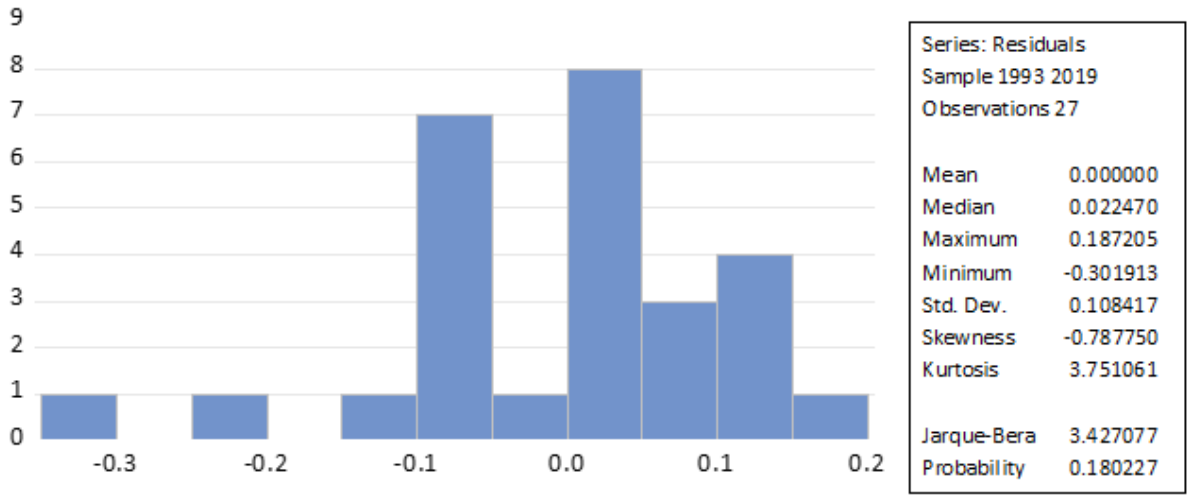
Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.531103	Prob. F(8,18)	0.2150
Obs*R-squared	10.93326	Prob. Chi-Square(8)	0.2055
Scaled explained SS	6.684015	Prob. Chi-Square(8)	0.5711

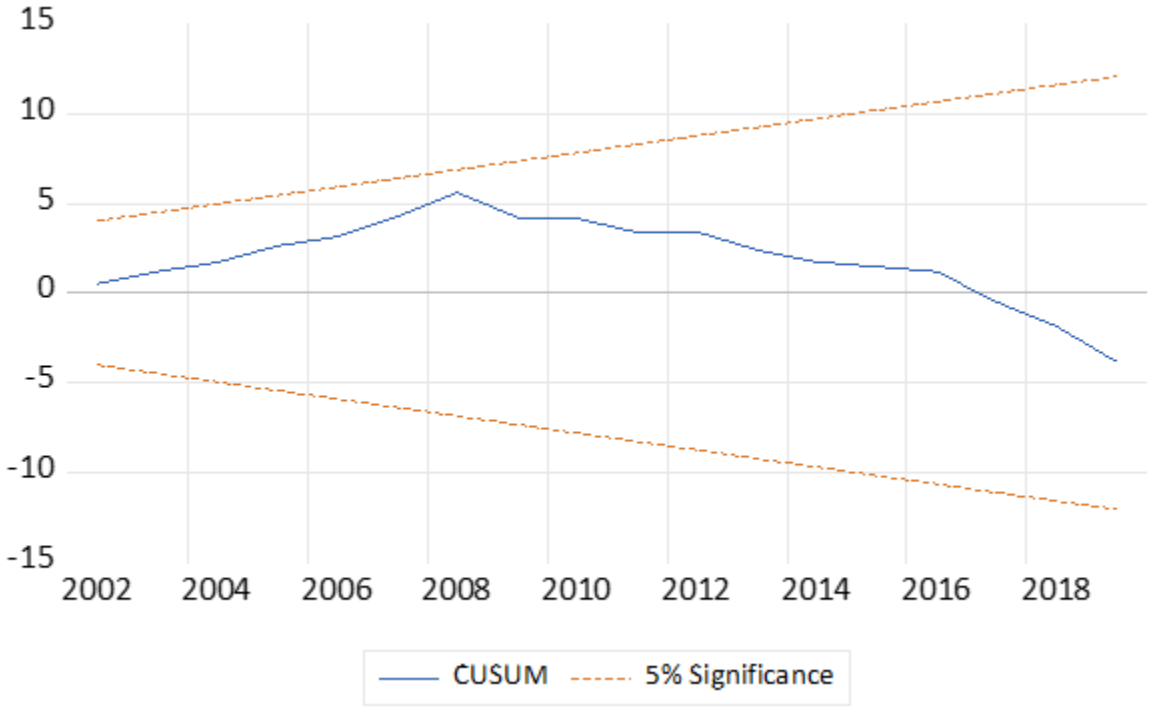
APPENDIX 7: Ramsey Reset Test

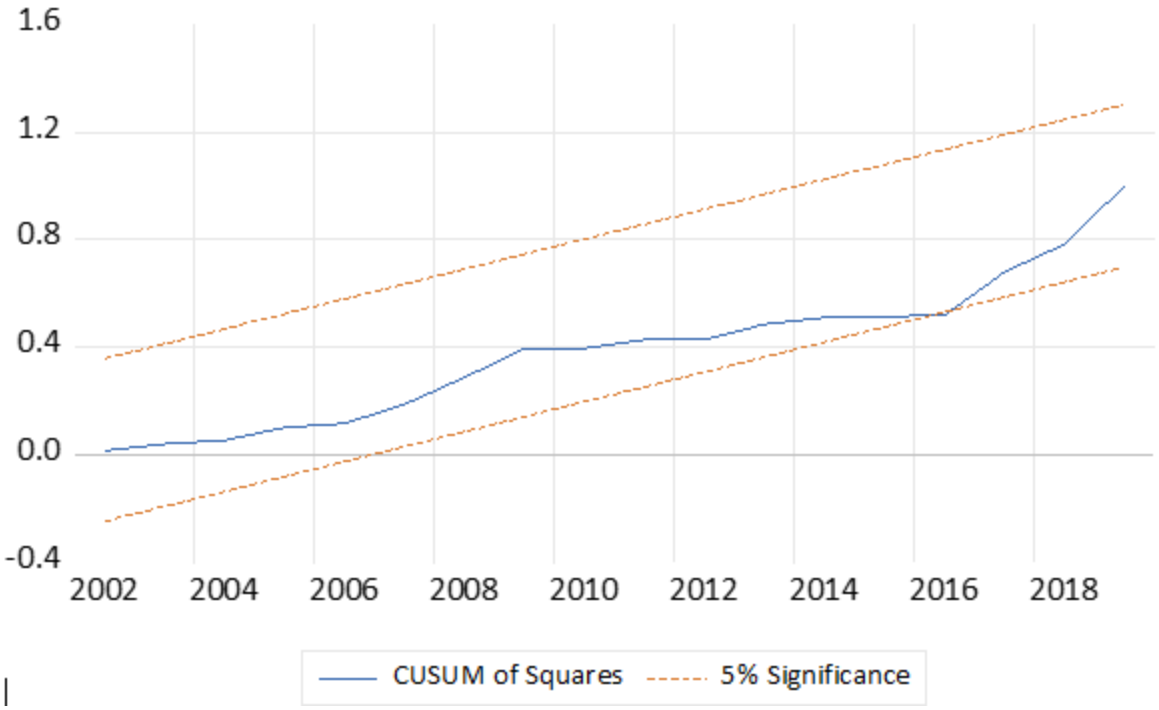
	Value	Df	Probability
t-statistic	0.889753	17	0.3860
F-statistic	0.791661	(1, 17)	0.3860
Likelihood ratio	1.228946	1	0.2676

APPENDIX 8: Normality Test



APPENDIX 9: CUSUM AND CUSUMSQ




1.6
1.2
0.8
0.4
0.0
-0.4
2002
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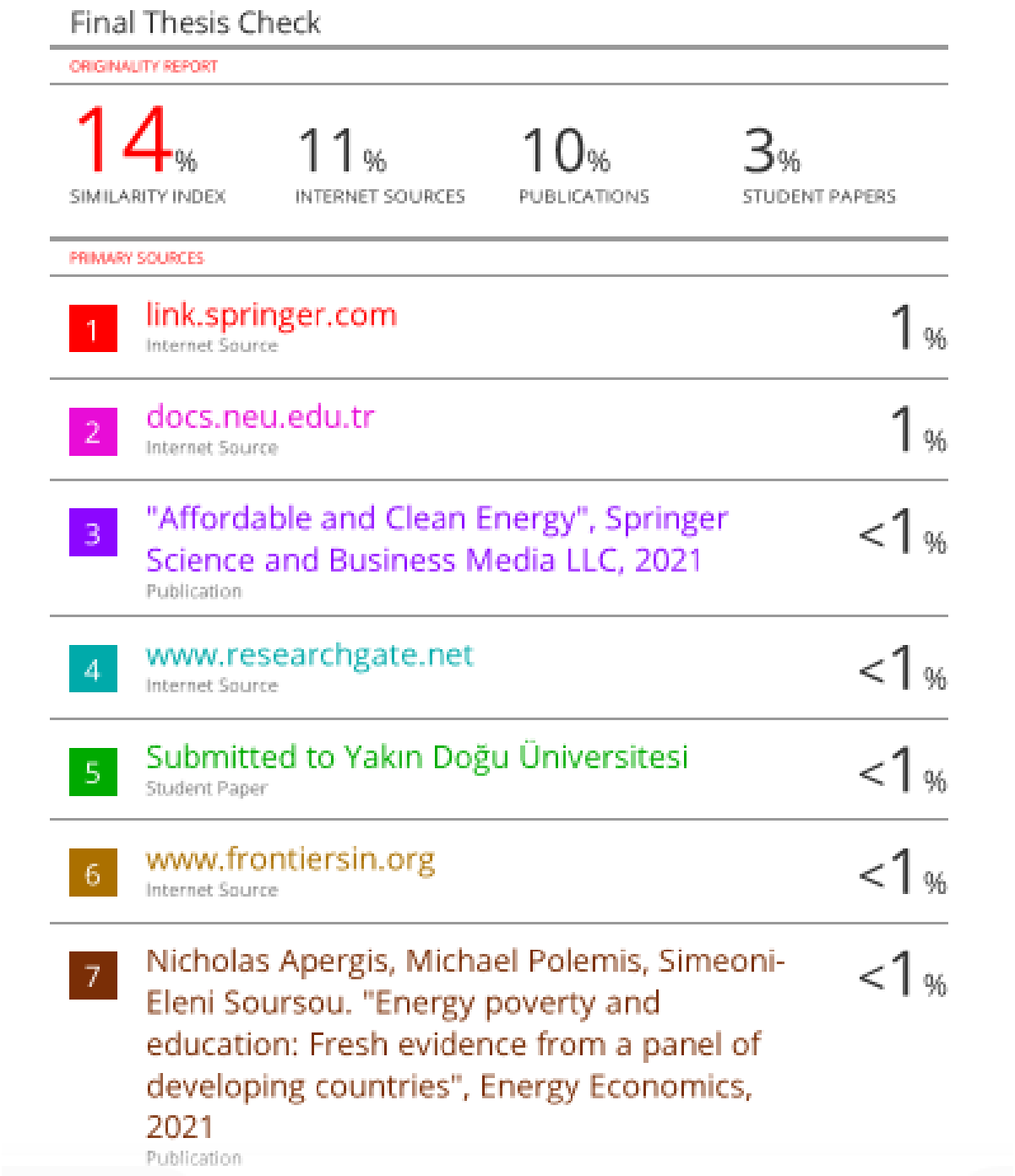
2018
CUSUM of Squares
5% Significance

SIMILARITY REPORT



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21.11.2022

Dear Freiderick Yohanna Letong

Your project **"Energy Poverty and Economic Growth in Developing Countries- A panel Analysis of some selected African Countries"** has been evaluated. Since only secondary data will be used the project does not need to go through the ethics committee. You can start your research on the condition that you will use only secondary data.

Prof. Dr. Aşkın KİRAZ

The Coordinator of the Scientific Research Ethics Committee