THE EFFECT OF POPULATION ON ECONOMIC GROWTH IN NIGERIA

Marvellous Osamudiamen IDUMWONYI
SSC2105568

DEPARTMENT OF ECONOMICS
FACULTY OF SOCIAL SCIENCES
UNIVERSITY OF BENIN
BENIN CITY

OCTOBER, 2025.

THE EFFECT OF POPULATION ON ECONOMIC GROWTH IN NIGERIA

Marvellous Osamudiamen IDUMWONYI
SSC2105568

BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF ECONOMICS, FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF BENIN, IN PARTIAL FUFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE (B.Sc.) DEGREE IN ECONOMICS.

OCTOBER, 2025.

CERTIFICATION

This is to certify that this project titled **"THE EFFECT OF POPULATION ON ECONOMIC GROWTH IN NIGERIA"** was carried out by **Marvellous Osamudiamen IDUMWONYI** with matriculation number **SSC2105568.** It has been read and recommended for acceptance in partial fulfilment of the requirement for the award of Bachelor of Science (B.Sc.) degree in economics.

(Mrs.) E.J. Sowemimo
(Project Supervisor)

Date: _____

Prof. S.O. Igbinedion
(Project Co-ordinator)

Date: _____

Prof Clement A.U. Ighodaro
(Head of Department)

Date: _____

DEDICATION

This project is dedicated to God who in his infinte mercy has kept me alive and brought me this far in life, for by his grace, this project became a reality.

ACKNOWLEDGEMENTS

I give all glory and adoration to God Almighty, who's my source, sustainer, giver of all knowledge and understanding,who spared my life throughout the course of this Work.

I am especially grateful and thankful to my project supervisor Mrs.E.J.Sowemimo for her motherly love, support, priceless suggestions and patience throughout the course of this project. Her priceless suggestions and contributions greatly assisted me and contributed to the completion of this project. May God bless you ma.

I will also like to appreciate my parents Ven&Mrs Fada Osamudiamen .A. Idumwonyi for their love and support all through the course of my study in this institution, thank you very much. To my siblings, in persons of Godsent Osamudiamen Idumwonyi, Ruth Osamudiamen Idumwonyi, Iwinosa Godson Idumwonyi and Osazemen Evidence Idumwonyi, thanks for your support and encouragement. May God bless you all.

I want to also thank my friends Goodness, Odion, Gift, Joshua Michael, thank you all for your lovely support, helping and guiding me throughout this academic journey, may God Almighty bless you. I want to also appreciate Miss Tovia Evbodeghe, thank you for your emotional and psychological support and for always being there for me right from the beginning of this academic journey to the end, words would fail me cause i really can't appreciate you enough for all you've done for me, may God bless you richly.

I will also like to express my gratitude to some special persons who have in one way or the other contributed to my academic journey. In persons of Samuel Fiyinfoluwa Mehinsan, Mr Emeka Elijah, Festus Seigha, Pharm Dr. Onyeka Onwughai, Promise Igbuan, Favour Innih. Thank you all for your academic support and enormous impacts, may God bless you.

Special appreciation goes ton my fellowship, the All Saints' Youth Fellowship (ASYF), where I was nurtured, given the platform to serve, lead and develop myself while on campus, ASYF has left an indelible footprint in my heart and has played a significant role in shaping my character and leadership skills, is is indeed an Oasis of Truth.

Lastly, I acknowledge myself for not giving up and pushing through it all despite all the challenges that came my way.

TABLE OF CONTENT

ABSTRACT

This research study was carried out to determine the impact of population growth on Nigerian Economy. The specific objectives of the study include investigating the relationship and effect of population growth on economic growth in Nigeria. This research study investigated the impact of population growth on the Nigerian economy using annual time series data for the period 1981 to 2024. The data was extracted from CBN statistical publications (2024), National Bureau of Statistics (2024). ADF technique in testing the unit root property of the series was utilized, the ARDL estimation technique was used to analyze the data. The research findings indicate the following: One year lag coefficient of Real Gross Domestic Product has a positive impact on the current value of Real Gross Domestic Product. Population growth has a positive impact on the current value of Real Gross Domestic Product. Poverty Head Count Ratio has a positive relationship with the current value of Real Gross Domestic Product. Unemployment rate has a positive relationship with the current value of Real Gross Domestic Product. Inflation rate has a positive impact on the current value of Real Gross Domestic Product. The prices of goods and services increases the value for goods and services also increase which eventually cause increase in the value of Real Gross Domestic Product. Consumption expenditure has a positive impact on the current value of Real Gross Domestic Product. Haven discovered from the study that a productive population is critical for an economy to attain its slated macro-economic policies, it is therefore necessary for the government to invest in the development of the Nigeria growing population through education and make jobs available for Nigerians who are unemployed or underemployed.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Economic development discourse has long placed a strong emphasis on the connection between population dynamics and economic growth, especially in developing nations like Nigeria. In determining the course of economic performance, population the total number of people living in a nation at any one time plays two roles. On the one hand, population growth can be viewed as an essential source of human capital accumulation, market expansion, and labor supply. However, unchecked population growth can put a great deal of strain on a country's resources, social infrastructure, and job opportunities, which would impede economic development. Nigeria which is known as the "Giant of Africa,"(WHO 2006) is the continent's most populous nation and the sixth most populous globally. With a population of more than 200 million and an annual growth rate of about 2.5 percent, the nation makes a strong case for studying how population affects economic development. Nigeria's population has increased dramatically over time as a result of factors like rising fertility rates, falling death rates, and better healthcare. The question of whether the nation's economic growth has kept up with its population growth has been brought up by this demographic trend.

A key determinant of a country's prosperity and capacity to raise the standard of

living for its people is economic growth, which is typically quantified by an increase in GDP. Economic growth must result in advancements in infrastructure, employment, income, and general welfare in order to be considered significant. But in Nigeria, economic growth has frequently been characterized as unequal and exclusive, prompting worries about how the country's expanding population may affect economic prospects and overall development. Theoretically, classical, neoclassical, and contemporary growth theories have all attempted to explain the connection between economic development and population growth. Unchecked population growth would surpass food production, resulting in widespread poverty and economic stagnation, according to classical economists like Thomas Malthus. On the other hand, according to contemporary growth theories, if properly controlled, a growing population can spur innovation, market expansion, and higher productivity. As a result, the relationship between population and economic growth is not always positive or negative; rather, it depends on how demographic trends interact with institutional capacity, economic structures, and policy frameworks.

Almost every economic sector in Nigeria is impacted by the country's expanding population. Education, health, housing, work, transportation, agriculture, and urban planning are all impacted. For example, the healthcare system is overburdened, and the educational sector frequently finds it difficult to handle the growing number of school-age children. Because there are more job seekers than there are open positions, the labor market is also under stress, which leads to high rates of underemployment

and unemployment. Moreover, urbanization has increased due to rapid population growth, and without adequate planning, this leads to slums, crowded cities, and environmental degradation. Despite these difficulties, there are advantages to having a big population. It offers a sizable domestic market and a sizable labor force that can boost output and consumption. The secret is to control the rate of population growth and match it with Nigeria's economic potential and developmental objectives. Policies that make investments in human capital, such as in healthcare, education, and skill development, can help Nigerians reach their full potential and contribute to economic growth.

Numerous empirical studies have attempted to examine how Nigeria's economic performance is affected by population growth, with varying degrees of success. According to some research, population growth strains social services and raises the dependency ratio, which have a negative impact on economic growth. Others contend that a growing population can be turned into a demographic dividend that drives economic growth with the correct investments and policies.

Considering these divergent opinions, this study looks at the trends, difficulties, and possible ramifications in order to investigate how Nigeria's population affects economic growth. It seeks to improve knowledge of the ways in which demographic shifts impact the nation's economic results and to provide evidence-based suggestions for policy change. Designing successful development strategies that

guarantee inclusive and sustainable economic growth requires an understanding of the relationship between Nigeria's large population and its strategic location in Africa.

1.2 Statement of Problem

With an estimated 200 million people, Nigeria's population is expected to continue to grow at an unprecedented rate over the next several decades. The reality in Nigeria paints a different picture, even though population growth is typically linked to an increase in the labor pool and the possibility of economic growth. Nigeria continues to experience high unemployment, pervasive poverty, low productivity, and sluggish economic transformation despite its sizable and youthful population.

The fact that Nigeria's population is growing faster than its economy is one of the main causes for concern. Because of its reliance on oil revenue and its underdeveloped non-oil sectors, the nation's economic performance has been uneven and susceptible to both internal and external shocks. As a result, the expanding population is placing more strain on infrastructure, public services, and already limited resources, casting doubt on whether economic growth can continue.

Furthermore, due to shortcomings in human capital development, subpar policy implementation, and insufficient investment in vital sectors like industry, education, and health, the potential advantages of a large population such as a thriving labor force,

expanding domestic market, and increased innovation have not been fully realized. Youth restlessness, rural-urban migration, and growing inequality are just a few of the social issues brought on by the imbalance between population size and economic potential.

Despite the important ramifications of these problems, little is known empirically about the precise relationship between population growth and economic growth in Nigeria. Some studies point to the possibility of positive growth if properly managed, while others suggest a negative impact because of overpopulation and resource depletion. This discrepancy emphasizes the necessity of a thorough examination of the precise ways in which population dynamics affect economic performance in Nigeria.

Therefore, the uncertainty surrounding the true impact of population growth on Nigeria's economic development is the main issue this study aims to address. Without a thorough grasp of this connection, policymakers might keep implementing inefficient measures that don't deal with the underlying reasons for economic underperformance. Therefore, in order to offer evidence-based insights into the demographic-economic relationship and to recommend suitable policy interventions that can turn Nigeria's population growth into a catalyst for long-term economic growth, this study is required.

1.3 Objective of the Study

The purpose of this study is to investigate how Nigeria's economic development and growth are impacted by population growth.

1. To examine the relationship between population growth and economic growth in Nigeria

2. TO analyze the effect of population size on per Capita income and living standards

1.4 Research Questions

1. What is the relationship between population growth and economic growth in Nigeria?

2. How does population size affect per Capita income and living standards in Nigeria?

1.5 Hypothesis of the Study

H_0: There is no significant relationship between population growth and economic growth in Nigeria.

H_1: There is a significant relationship between population growth and economic growth in Nigeria.

H_0: Population growth does not significantly affect per capita income in Nigeria.

H_1: Population growth significantly affects per capita income in Nigeria.

1.6 Significance of the Study

Because it seeks to better understand the connection between Nigeria's population and economic growth, this study is pertinent. Policymakers will also need this research to understand the possible environmental effects of a rapidly expanding population and to develop more beneficial demographic policies that address the issue of population growth that encompasses economic growth rate.

1.7 Scope of the Study

The analysis of the relationship between Nigeria's economic growth and population growth is the main goal of this study. It consists Geographic Coverage, rather than focusing on regional or state- level variations, the study considers data at the national level and is restricted to Nigeria as a whole. Using yearly data on population indicators and economic variables, the study will span a time period of 44 years, such as (1981–2024). The population size, GDP growth, dependency ratio, birth rate, and death rate are the main variables. One may also take into account secondary indicators like labor force participation, income per capita, and employment rate. The research's goal is to ascertain whether Nigeria's population growth is a driver or a hindrance to the country's economic progress.

1.8 Limitation of the Study

This study faced some challenges because the data available was not always complete or reliable, as some economic and population records in Nigeria have gaps or errors. It was also hard to clearly show a direct link between population growth and economic growth because other factors can affect the results. Moreover, the findings are focused only on Nigeria and might not work the same way in other countries.

CHAPTER TWO

LITERATURE REVIEW

The large magnitude of Nigeria's population poses both a promise and a challenge (Onwuka, 2020). On one hand, a large labour force can potentially be harnessed to drive economic growth and innovation, as seen in other successful economies. However, the significant challenges that arise from such a demographic landscape cannot be overlooked. With limited resources and infrastructure to support the burgeoning population, there is a growing risk of inadequate access to essential services such as education, healthcare, and employment opportunities (Onwuka, 2020). The strain on natural resources, exacerbated by overpopulation, can also lead to environmental degradation and heightened competition for limited resources, potentially fuelling social and political tensions. Therefore this chapter focused on examining conceptual issues on population and economic growth to lend properly and deeper understanding of the subject matter.

2.1 Conceptual Literature Review

2.1.1 The Concept of Population

Hornby (2020) defined population as the total number of people who live in a particular area, city or country. The population of people in a country is very unique to the development of that country. A country cannot manage itself without the human resources

of the country. Of course, the human resources are obtained from the total population of it. Without the population of people in a country, technological advancement cannot be emerged. Although, the population of people in a country is a natural phenomenon. To the Christians, the Bible has told us that go to the world and multiply. In other words, the population of people is ordained by God Almighty. But the same God Almighty didnot directed men and women to give birth to children they cannot cater for. Meanwhile, population explosion is the continuous or rapid increase in the total number of people living in a particular area, city or country without corresponding increase in the available resources that will sustained the people. Presently, Nigeria is faced with the population explosion of people in all parts of the country (Campbel, 2022).

This high population growth in Nigeria has over stressed all sectors of the economy with high cost of living. According to Fan and Besong (2020), the factors that were responsible to the population explosion in Nigeria were high birth rate, low death rate and immigration. Fan and Besong (2020) further stated that population competes directly for the finite resources that would have been used to generate income. The two authors maintained that the consequences of this high increase in the population were that children will be chronically malnourished and there will be high level of unemployment, hence, low level of income per capital.Nigeria is a country where some married couples and unmarried couples gave birth to children they cannot cater for. The number of children per couple is not controlled by the government of the day. With the Corona Virus disease, popularly called Covid-19, it becomes very cleared to all Nigerians that, indeed, there is

population explosion in Nigeria (Campbell, 2022).

At the moment, the level of poverty in Nigeria is not encouraging. One of the factors that is responsible for the abnormal level of poverty in Nigeria is the imbalance between the available resources and the population of the people (Campbel, 2022). For instance, as at the time of writing this article, the prices of goods in the market have been on the increase on a daily basis. In Economics as a subject in the secondary school level, when demand is in excess over supply, prices of goods will definitely increase. Moreover, the writer of this article strongly believed that population explosion of people is one of the factors responsible for the abnormal increase in the prices of goods in the market. Holistically, many Nigerians are not even aware that, indeed, Nigeria is overpopulated. Let us look at the area of employment of Nigerians into various positions in the different ministries at the Federal and State levels, the huge number of applicants that will apply for such vacancies is very amazing. For instance, if the Federal Government declared 10,000 positions to be fill in the different ministries and agencies, over 100,000 applicants will apply for 10,000 positions. Nigeria as the giant of Africa has the needed human and material resources to regulate its population. Meanwhile, various policies put in place by the Federal Government of Nigeria, if at all such policies exist, to check excessive population of Nigerians are not working. Although, many studies on population explosion in Nigeria have been conducted by researchers, but majority of such studies were not linked to the educational sector. Therefore, this paper will examine the causes of population explosion in Nigeria and its effects on the educational

sector, and also, the ways forward.

The future trend of a population is an outcome of the interactive dynamics between its existing age structure and its future trends in fertility, mortality, and migration. An abundance of scientific evidence shows that population growth in a country is connected to socioeconomic growth, environmental protection, health promotion, quality of life, and social stability (Danan Gu, 2021). Understanding the growth dynamics and future trends of populations around the world is crucial to achieving the 2030 Agenda for Sustainable Development Goals (SDGs) and other long-term development goals. This article reviews the main features of recent and future trends in population growth for the world, major regions, and selected countries. We mainly rely on the estimates and projections of the 2019 Revision of the World Population Prospects (WPP 2019) produced by the United Nations Population Division (1) to focus on 201 countries and areas with 90,000 inhabitants or more in mid-2020 (Jagger, 2020).

2.1.2 Causes of Population Growth in Nigeria

The causes of population growth in Nigeria are numerous. Below are some of the causes of rapid growth of population in Nigeria.

1. **Lack of birth control law put in place by the Governments:** Federal, State and Local Governments have failed in this regard as highlighted above. Nigeria is a country where married and unmarried couples gave birth to children the ways they

want. Nigeria is a nation with high number of orphanage homes. Normally, orphanage home is a home for children whose parents are dead (Hornby, 2020). But in Nigeria, there are orphanage homes where children whose parents are alive. This is a sign of population explosion. According to Campbell (2022) quoted the former Chairman of the National Population Commission (NPC), Eze Duruiheoma and said that Nigerians knew that they were by far the most populous country in Africa, and they were proud of it. According to the author, by the year 2050, the author predicted that Nigeria's population will displace the population of the United States as the third most populated country in the world after China and India. The former Chairman of the National Population Commission (NPC) as revealed by Campbell (2022) also noted that Nigeria has no population policy that would limit births, and the people of Nigeria have traditionally valued large families.

However, because of the lack of birth control law put in place by the Federal, State and Local Governments, the population of human beings has outgrowth available resources in Nigeria. It is a very serious challenge to the country's development.

2. Lack of family planning: Since the Federal,State and Local Governments failed in their responsibilities to regulate the number of children per couple, each couple on his part equally failed

in his responsibility to adopt appropriate family planning. According to Umana (2019), most couples failed to use contraceptives in the control of birth. Umana (2019) further added that inability to use contraceptive is a common practice among couples in the Northern part of Nigeria.

3. Early marriages: Couples married at the early ages had a very serious implication on the population growth. Such couples are not matured enough to control the number of children both of them will give birth to. A man and a woman coming together and married is a very serious issue that it should not be taking for granted. In Nigeria, we had cases of couples who got married, few years later, they are not together again, leaving the children to take care of themselves. We equally had cases where new born babies were dumped by couples in the nearby refuge or abandoned houses. This is an indication that such couples are not ready for marriage. Furthermore, Nigeria as a country has experienced this kind of situation, hence, rapid population growth was the result (Campbell, 2022).

4. Male child preference syndrome: In Nigeria, male children were more highly valued than female children (Oramah, 2022). According to Oramah (2022), the reasons for such habit were of carrying on the family name by the male children, greater upper-body strength for physical labour, and among others. Unfortunately, such habit, in most cases, leads to the common practice of continuous child birth in an attempt to have male offspring. Also, in most cases, couples without male child or children will be receiving pressures from the husband's family against the man and his wife. In an attempt to satisfy his family's demand, the man will go ahead and marry another woman. The process may

likely continue until at least a male child will be giving birth to. According to Osam (2019) quoted Ogege (2021), reported that the society placed more value on male children than females because of properties and other traditional benefits attached to the male children.

5. Religion beliefs: There are three major religions in Nigeria, namely, Christianity, Islam and Local tradition. In Islam, men were allowed to marry more than one wife and also the same to the Local traditional religion. According to Oramah (2022), Islamic religion encourages large families and early marriages that associated with polygamous family system. In addition, Osam (2019) reported that such men were polygamist in nature and they believed that they have the capacity to sustain such large families without taking into consideration that they are contributing to the population explosion in Nigeria.

2.1.3 Economic Development: Conceptual Issues

In the work of Stephen (2021) citing Jhingan, economic development refers to the problems of underdeveloped countries. Though the study of economic development has attracted the attention of economists right from Adam Smith down to Marx and Keynes, yet they were mainly interested in the problems which were essentially static in nature and largely related to a Western European framework of social and cultural institutions. It is, however, in the forties of the 20th century and especially after the Second World War that economists started devoting their attention towards analyzing the problems of underdeveloped countries and formulating theories and models of development and

growth. Their interest in the economics of development has been further stimulated by the wave of political resurgence that swept the Asian and African nations as they threw off the colonial yoke after the Second World War. The desire on the part of new leaders in these countries to promote rapid economic development coupled with the realization on the part of the developed nations that 'poverty anywhere is a threat to prosperity everywhere,' has aroused further interest in the subject (Stephen, 2021).

But the interest of the wealthy nations in removing widespread poverty of the underdeveloped countries has not been aroused by any humanitarian motive. The most cogent reason for aiding the underdeveloped countries had been the cold war between Russia and the West before the collapse of the Soviet Union, each trying to enlist the support and loyalty of underdeveloped countries by promoting larger aid than the other. Economic development has also an export value for both the aid-giving and aid-receiving countries. In order to avoid secular stagnation, rich countries need an ever-increasing rate of development which must be accompanied by an outlet for the use of their growing capital stock. Poor countries need an accelerating rate of development to increase their export potential for avoiding deficit in balance of payments. However, a study of the Poverty of Nations and the methods of removing poverty cannot be based on the experience of the rich nations. For 'in the advanced countries there has been a tendency to take economic development for granted as something that takes care of itself and to concentrate on the short-term oscillations of the economy" (Robert, 2024).

2.1.4 Determinants of Economic Development

Citing the work of Jhingan, Chete (2019) stated that the process of economic development is determined by two major factors, economic and non-economic. For an nation to experience economic development the availability of natural resources, human resources, capital, enterprise, technology, etc. These are economic determinants. But economic growth is not possible so long as social institutions, political conditions and moral values in a nation do not encourage development. These are non-economic factors. We study these economic and non-economic determinants of economic growth separately.

Economic Factors

Economists regard factors of production as the main economic forces that determine growth. The growth rate of the economy rises or falls as a consequence of changes in them. Some of the economic factors are; Natural Resources, Capital Accumulation, Organization, Technological Progress, Structural Changes.

1. The principal factor affecting the development of an economy is the natural resources or land. “Land” as used in economics includes natural resources such as the fertility of land, its situation and composition, forest wealth, minerals, climate, water resources, sea resources etc. For economic growth, the existence of natural

resources in abundance is essential. A country which is deficient in natural resources will not be in a position to develop rapidly. As pointed out by Lewis, "Other things being equal, men can make better use of rich resources than they can of poor."

In LDCs, natural resources are either unutilized, underutilized or mis-utilized. This is one of the reasons for their backwardness. The presence of abundant resources is not sufficient for economic growth. What is required is their proper exploitation. If the existing resources are not being properly exploited and utilized, the country cannot develop (Robert, 2024).

2. The second important economic factor in economic development is capital accumulation.

   Capital means the stock of physical reproducible factors of production. When the capital stock increases with the passage of time, this is called capital accumulation (or capital formation). There are various possibilities of increasing the rate of capital accumulation. Since the propensity to save is low in an LDC, voluntary savings will not be forthcoming in sufficient quantities. Therefore, the obvious way is to resort to forced savings. Forced savings reduce

consumption and thereby release resources for capital formation. The various methods of forced savings are taxation, deficit financing and borrowing. Nurkse also suggests mobilization of the disguised unemployed in rural areas for construction works as an important means for capital formation in LDCs. Besides, there are external resources in the form of loans, grants and larger exports that can help in capital formation. Capital formation is the main key to economic growth. On the one hand, it reflects effective demand and, on the other it creates productive efficiency for future production. Capital formation possesses special importance for LDCs. The process of capital formation leads to increase in national output in a number of ways. Capital formation is essential to meet the requirements of an increasing population in such economies. Investment in capital goods not only raises production but also employment opportunities. It is capital formation that leads to technological progress. Technological progress in turn leads to specialization and the economies of large-scale production. Capital formation helps in providing machines, tools and equipment for the rising labour force. The provision for social and economic overheads like transport, power, education, etc., in the country is possible through capital formation. It is also capital formation that leads to the exploitation of natural resources, industrialization and expansion of markets which are essential for economic progress. According to Lewis, the rate of capital formation in LDCs is 5 per cent or less which should be raised to the

level of 12 to 15 per cent. The estimates of Kuznets reveal that during modern economic growth gross capital formation in developed countries was from 11-13 percent to 20 per cent and above while net capital formation was from 6 percent to 12-14 percent (Chete, 2019).

3. Organization is an important part of the development process. It relates to the optimum use of factors of production in economic activities. Organization is complement to capital and labour and helps in increasing their productivities. In modern economic growth, the entrepreneur has been performing the task of an organizer and undertaking risks and uncertainties. The entrepreneur is not a man of ordinary ability. He is an economic leader who possesses the ability to recognize opportunities for successful introduction of new commodities, new techniques, and new sources of supply, and to assemble the necessary plant and equipment, management and labour force and organize them into a running concern. He is the kingpin of any business enterprise for without him the wheels of industry cannot move. So entrepreneurship is an indispensable ingredient in economic development. For instance, the credit for the industrial revolution in England goes to the entrepreneurs, and of the economic growth of the United States in the 19th century and the mid-20th century to the improvement in the quality of management (Gordon, 2020).

4. Technological changes are regarded as the most important factor in the process of economic development. They are related to changes in the methods of production which are the result of some new techniques of research or innovation. Changes in technology lead to increase in the productivity of labour, capital and other factors of

production. Kuznets traces five distinct patterns in the growth of technology in modern economic growth. They are: a scientific discovery or an addition to technical knowledge; an invention; an innovation; an improvement; and the spread of invention usually accompanied by improvements. Like Schumpeter, he regards innovation as the most important technological factor in economic growth. In modern economic growth the five factors, mentioned by Kuznets, have helped in the development of technology. Kuznets points out that LDCs must import modern technology to accelerate their productive capacity in the short run because they cannot wait until they themselves invent or modify the technology of advanced countries. But as they adopt imported technology, they must develop their indigenous technical skills. It is a misnomer that all modern technology is capital-intensive. Advanced countries have also low-cost capital-saving, labor-intensive productivity raising technology which can be transferred to developing countries (Chete, 2019).

5. Structural changes imply the transition from a traditional agricultural society to a modern industrial economy involving a radical transformation of existing institutions, social attitudes, and motivations. Such structural changes lead to increasing employment opportunities, higher labour productivity and the stock of capital, exploitation of new resources and improvement in technology. An LDC is characterized by a large primary sector and a very small secondary sector along with an equally small tertiary sector. Structural changes may begin with the transfer of population from the primary to secondary and then to tertiary

employment. In an overpopulated agriculture-oriented economy, 70-80 per cent of the population is engaged in the agricultural sector. Structural changes involve the expansion of the non-agricultural sector so that the proportion of population in the agricultural sector is progressively reduced. It implies reduction in the size of contribution to net national output by the agricultural sector. But a decline in the share of the agricultural sector in the net national product does not mean a fall in the output of agriculture. Rather agricultural output must increase in absolute terms. In order to increase agricultural output, radical changes will have to be made in the form of land reforms, improved agricultural techniques and inputs, better marketing organization, new credit institutions etc (Abdu et.al, 2018).

The non-economic factors are; social factor, human factor, political and administrative factors.

1. Social attitudes, values and institutions also influence economic, growth. The term "attitude" means the totality of beliefs and values that cause human behavior to be what it is. The term "values" refers to motivations of human behavior towards particular ends. Modern economic growth has been influenced by social and psychological factors. Western culture and education led to reasoning and skepticism. It inculcated the spirit of adventure which led to new discoveries and inventions and consequently to the rise of the new mercantile classes. These forces brought about changes in social attitudes, expectations, and values. People cultivated the habits of

saving and investment, and undertook risks to earn profits. They developed what Lewis calls, “The will to economize,” to maximize output for a given input. As a result, the European countries experienced the Industrial Revolution in the 18th and 19th centuries. Economic and religious freedom brought about further changes in social attitudes and values. Single family unit took the place of joint family system which further helped in modern economic growth (Abdu et.al, 2018).

2. Human resources have been an important factor in modern-economic growth. Economic growth does not depend on the mere size of human resources but on their efficiency. According to Kuznets, the population of Europe increased by 433 per cent between 1750-1950 while the population of the remaining world increased by 200 per cent over the period. Whereas population increased five-fold in European and now developed countries, there was ten-fold increase in their GNP per capita. Such a phenomenal increase in their GNP per capita is attributed to the development of the human factor which is reflected in the increased efficiency or productivity: of their labor force. This is called human capital formation. This “is the process of increasing knowledge, the skills, and the capacities of all people of the country.” It includes expenditure on health, education and generally on social services. Denison’s estimates reveal that expenditure incurred on education in the United States between years 1929-1957 contributed 23 per cent to its gross national output. According to Soloman the increase in national product of the United States through increase in physical capital between years 1889- 1957 equaled the increase through increased labor productivity. But rapidly

increasing population is a great hindrance to the economic development of LDCs. With their low per capita incomes and low rates of capital formation, it becomes difficult for them to support the increase in population. And when output increases due to improved technology and capital formation, it is swallowed up by increase in numbers. As a result, there is no improvement in the real growth rate of the economy (Chete, 2019).

3. Political and administrative factors also helped in modern economic growth. The economic growth of Britain, Germany, the United States, Japan and France has been due to their political stability and strong administration since the 19th century. With the exception of the United States, they were directly involved in the two World Wars and were devastated. Still they have continued to progress on the strength of their political and administrative traditions. On the other hand, Italy has not been able to grow up to their level due to political instability and corrupt and weak administration. Peace, protection and stability have encouraged the development of entrepreneurship in developed countries, along with the adoption of appropriate fiscal and monetary policies by the governments from time to time. The weak administrative and political structure is a big hindrance to the economic development of LDCs. A strong, efficient and incorrupt administration is, therefore, essential for economic development. Prof. Lewis rightly observed: “The government plays crucial roles in stimulating

or discouraging economic activity." Peace, stability and legal protection encourages entrepreneurship. The greater the freedom, the more the entrepreneurship will prosper. Technical progress, factor mobility and large size of market help stimulate enterprise and initiative. But the former can only take place under clean administration and stable political conditions. Similarly, a good government can help in capital formation by adopting the right monetary and fiscal policies, and by providing timely overhead capital facilities. Thus "a government must offer society the services if it desires to stimulate economic development: order, justice, police and defense; rewards commensurate with ability and application in productivity, security in the enjoyment of property which may be of extremely varied character; testamentary rights; the assurance that business covenants and contracts will be kept; the provision of standards of weights and measures and currency and the stability of governmental system itself, to maintain the sense of order and future calculability of expectations and duties." In this way, clean and strong administration, full of justice, stimulates economic development (Gordon, 2020).

2.2 History of Population and Economic Growth in Nigeria

The history of population and economic growth in Nigeria is complex and influenced by various social, political, and economic factors. Here's an overview:

Estimates suggest that Nigeria's population in the pre-colonial era (up to the late 19th century) was around 10-15 million. Various ethnic groups, such as the Hausa, Yoruba, Igbo, and others, had established kingdoms and trade networks. The economy was largely agrarian, with subsistence farming, trading of goods like palm oil, kola nuts, and textiles. The introduction of colonial policies and infrastructure (like railways) enabled migration and led to increased urbanization. By the 1960 census, Nigeria's population was around 45 million. The colonial economy was oriented towards exporting raw materials (such as cocoa, groundnuts, and palm products) to benefit the British economy. This created some economic growth, but it was uneven and largely extractive, benefitting colonial powers more than local populations.

After gaining independence in 1960, Nigeria's population continued to rise rapidly, reaching approximately 65 million by 1972, spurred by improved healthcare and reduced mortality rates. Oil was discovered in the Niger Delta in the late 1950s, leading to increased revenues after the 1970s oil boom. Nigeria experienced significant economic growth, characterized by rapid urbanization and infrastructure development. However, this growth was often mismanaged and led to corruption, with little diversification of the economy.

By the 1991 census, Nigeria's population had grown to about 88 million. Following the 1980s oil price crash, Nigeria faced economic stagnation, high inflation, and structural adjustment programs imposed by the IMF and World Bank. These measures led to

reduced public spending on health and education, worsening social conditions.

The 2006 census estimated the population at around 140 million. Population growth remained high, driven by high fertility rates. Economic reforms under President Olusegun Obasanjo aimed at stabilizing the economy led to modest GDP growth and increased foreign investment, particularly in the oil sector. However, issues like corruption and infrastructure deficits persisted.

By 2021, Nigeria's population was estimated at over 206 million, making it the most populous country in Africa, with high growth rates projected to continue. Efforts to diversify the economy beyond oil have gained momentum, with focus on agriculture, technology, and services. Despite setbacks, including economic recessions in 2016 and 2020, GDP growth has shown resilience,

particularly in agriculture and telecommunications. Nigeria faces challenges related to youth unemployment, urbanization, and the provision of social services. High population growth may strain existing resources. Despite being Africa’s largest economy, Nigeria struggles with high levels of poverty, inequality, and insecurity, impacting overall economic stability and growth prospects.

2.2.1 Population Density

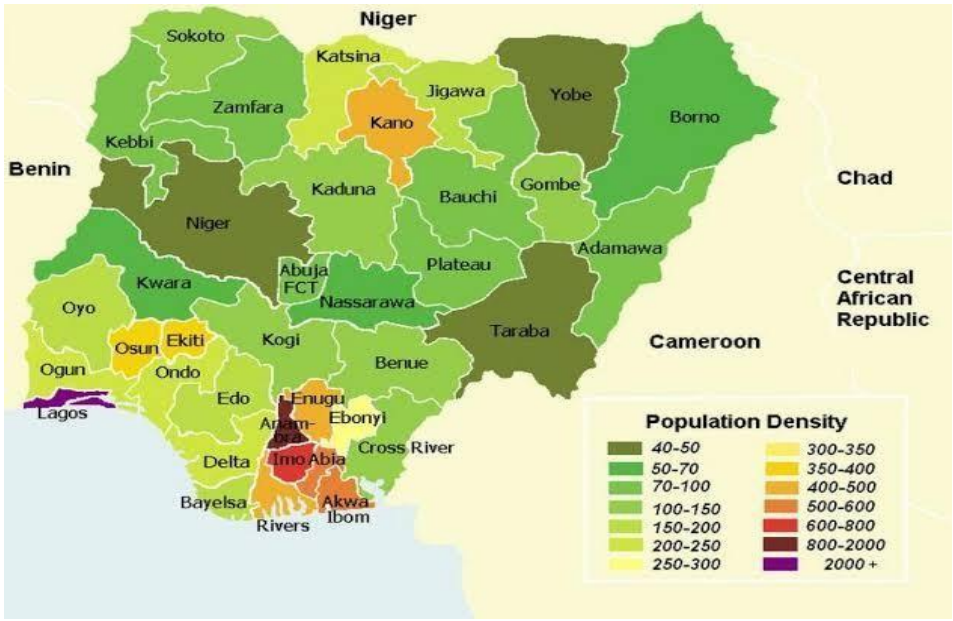


Figure 2.2.1: Map of Nigeria Showing Population Density on State Basis
Source: Wikipedia, 2023

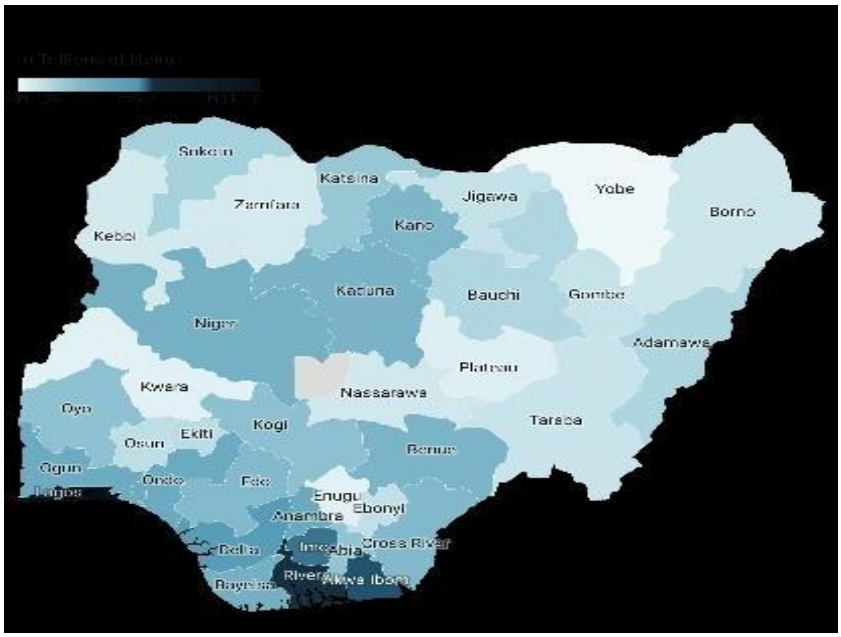
Nigeria is the most populous country in Africa, with a diverse demographic. Its population is characterized by significant variations in density across different states, influenced by factors such as urbanization, economic opportunities, and natural resources.

States and Their Population Densities

Here's a state-by-state breakdown of Nigeria's estimated population density (people per square kilometer) based on available data. Note: population figures are approximations

based on the 2023 census estimates. Lagos State has a population of over 24 million with a square area of 3,577 km² and a Density of 6,700 people/km². Rivers State has a population of 6.9 million of 46,053 km² and a Density of 150 people/km². Kano State has a population of over 14 million people, with an Area of about 20,131 km² and a Density of 700 people/km². Oyo State has a Population of over 7.9 million people and an area of 28,454 km² with a density of over 280 people/km. Abia State has a Population of over 3.7 million people with an area of 6,320 km² and a density**: ~590 people/km². Enugu State has a population of over 3.2 million people and an area of 7,161 km² with a density of 450 people/km². Kaduna State has a population of about 8million people and an area of 46,052 km² with a density of over 170 people/km². Benue State has a population of over 5.7 million people and an area of 34,059 km² and a density of 170 people/km². Ogun State's population is over 4.6 million people with an area of 16,762 km² and a density of 275 people/km². Ekiti State has a population of over 3.3 million people, with an area of over 6,353 km² and a density of over 520 people/km². Delta State has a population of over 5.6 million people, with an area of 17,698 km² and a density of 315 people/km². The Less Densely Populated States are Yobe State with a density of over 200 people/km², Zamfara State with a density of over 140 people/km² and Ekiti State with a density of 520 people/km².

2.2.2 Map of Nigeria Showing the Economic Performance of Various States



Source: BudgIT. Retrieved (2023)

Here's a brief outlook of the economic performance of various states in Nigeria, focusing on key indicators like GDP contribution, major industries, and economic challenges. Due to space limitations, this will cover a selection of states.

1. Lagos State: As the economic hub of Nigeria, Lagos contributes significantly to the country's GDP, accounting for about 30% of Nigeria's total economic output. Major Industries are financial services, trade, manufacturing, and entertainment. The economic challenges are infrastructural deficits, transportation issues, and high cost

of living.

2. Rivers State: A major oil-producing state, contributing significantly to Nigeria's oil revenue.

The major Industries are Oil and gas, shipping, and manufacturing while the economic challenges are Environmental issues, militancy in the Niger Delta, and reliance on oil revenues.

3. Kano State: One of the largest economies in Northern Nigeria, notable for its agricultural output.

The Major Industries are Agriculture (especially textiles), commerce, and manufacturing. The challenges faced by Kano state are among others: Insecurity (Boko Haram), infrastructural deficits, and reliance on subsistence farming.

4. Ogun State: Known for its proximity to Lagos, Ogun contributes significantly to Nigeria’s manufacturing and agricultural sectors. The Major Industries are Agriculture, manufacturing (cement, foods), and trade. The major economic challenges are Land disputes, infrastructure challenges, and dependency on Lagos for market access.

5. Delta State: Another oil-rich state, contributing to the nation's oil and gas sector. Its Major Industries**: Oil and gas, agriculture, and manufacturing. The major economic challenges are Environmental degradation and community unrest over oil revenues.

6. Imo State: Primarily driven by agriculture and trade. Its Major Industries are Agriculture, commerce, and small-scale manufacturing. The Challenges are inadequate infrastructure, unemployment, and internal political instability.

7. Anambra State: Known for commerce and industry, Anambra is one of the more industrious states in Nigeria. Its Major Industries are trade, manufacturing (notably furniture and textiles), and agriculture. The major challenges are infrastructural inadequacies and security issues in some areas.

8. Ekiti State: Primarily agro-based economy with agriculture as the mainstay. The Major Industries in the state are agriculture, tourism, and education. The major economic challenges are High unemployment rates and limited industrial base.

9. Akwa Ibom State: One of Nigeria's leading oil-producing states. The Major Industries: Oil and gas, agriculture, and manufacturing. The major economic challenges are Infrastructural deficits and over-reliance on oil revenues.

10. Abia State: Known as the commercial nerve center of the Southeast. Its Major Industries are textiles, commerce (especially in Aba). The economic challenges are poor infrastructure and security issues, which affect business operations.

11. Borno State: Significantly affected by insecurity due to Boko Haram insurgency. The Major Industries are agriculture (especially livestock), trade. The major challenges are insecurity and displacement of people affecting economic activities.

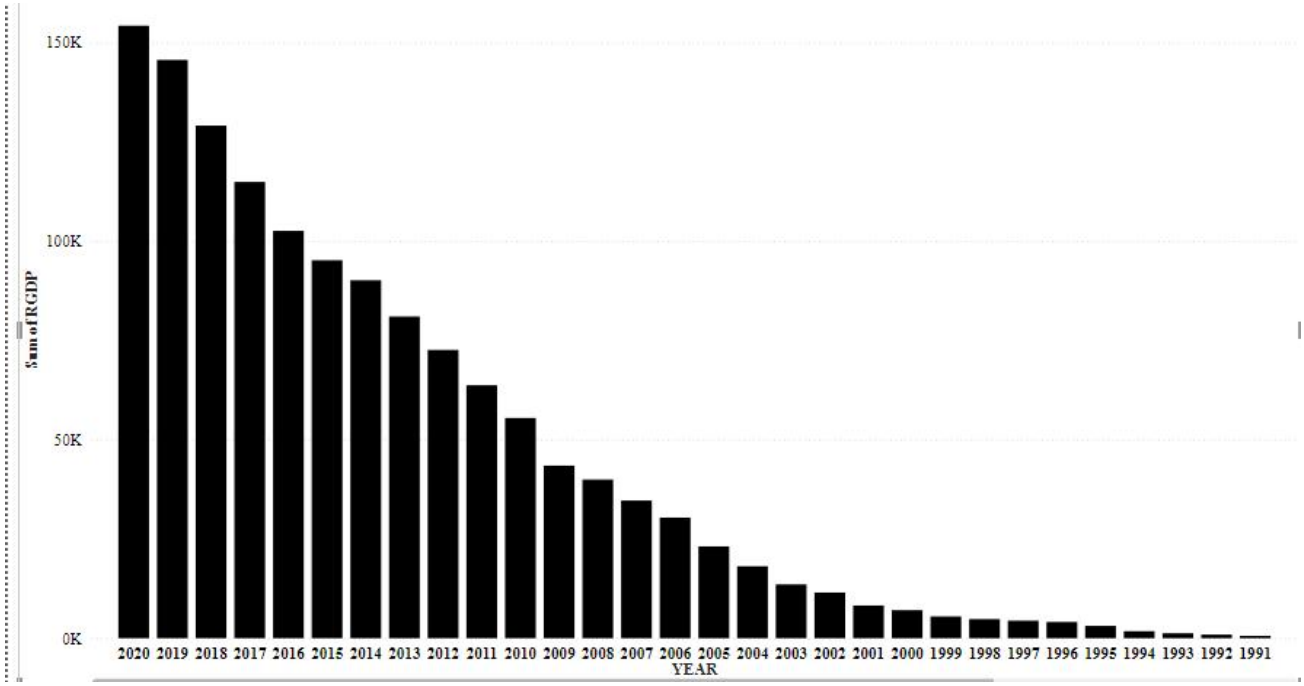
12. Enugu State: Primarily agrarian with significant contributions from mining and trade. The Major Industries are agriculture, coal mining, and commerce. The major challenges infrastructural development and dependency on agriculture.

13. Benue State: Dominantly agricultural, known as the "Food Basket of the Nation. The Major economic activities are farming, livestock rearing, and trade. Challenges faced by Benue state are insecurity (especially farmer-herder conflicts) and dependence on rain-fed agriculture.

14. Niger State: An agrarian economy with a focus on agriculture. Major Industries are agriculture, mining, and trade. Challenges faced by Niger state are insecurity and infrastructural deficits.

15. Edo State: Known for its diverse economic activities, significant in oil and agriculture. Major Industries are Oil and gas, agriculture (planting of cassava and yams), and trade. The major economic challenges faced by Edo state are; infrastructure needs and improving educational outcomes.

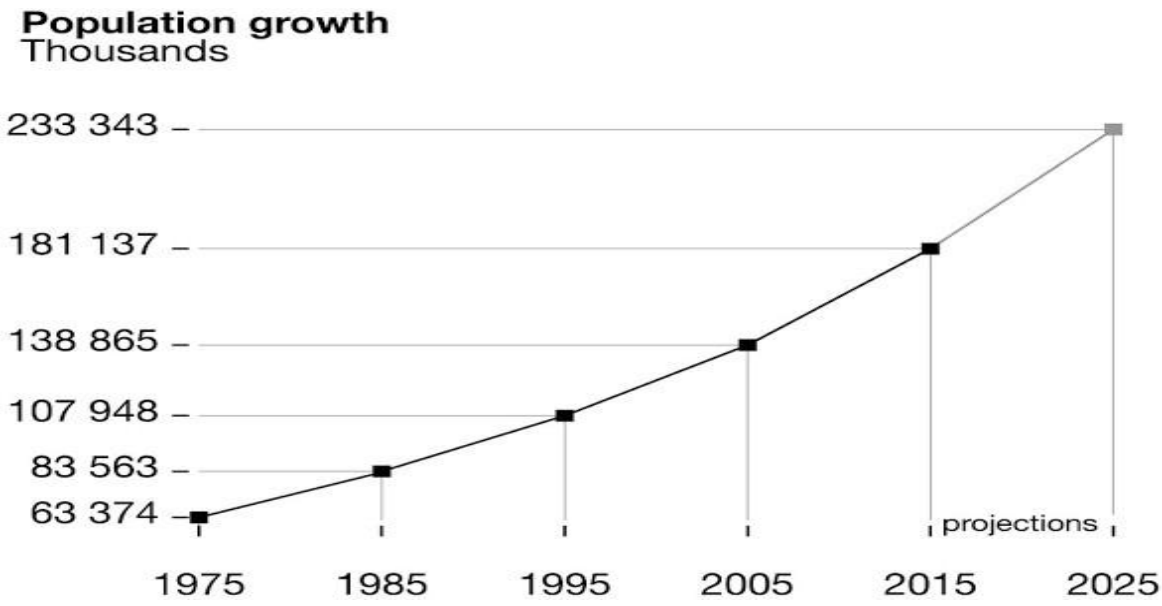
2.2.3: Bar Chart Showing Trend in Real Gross Domestic Product



Source: Author's computation using Power Bi (2023)

The diagram above shows a bar chart of the movement of Real Gross Domestic Product on a yearly basis. From the diagram it can be seen that the level of RGDP in 1980 was significantly low compared to other decades. However the figure shows an upward trend in the level of Real Gross Domestic Product which indicates the significant increase in the level of economic activities and income in Nigeria.

2.2.4 Graph Showing Trend in Population Growth in Nigeria

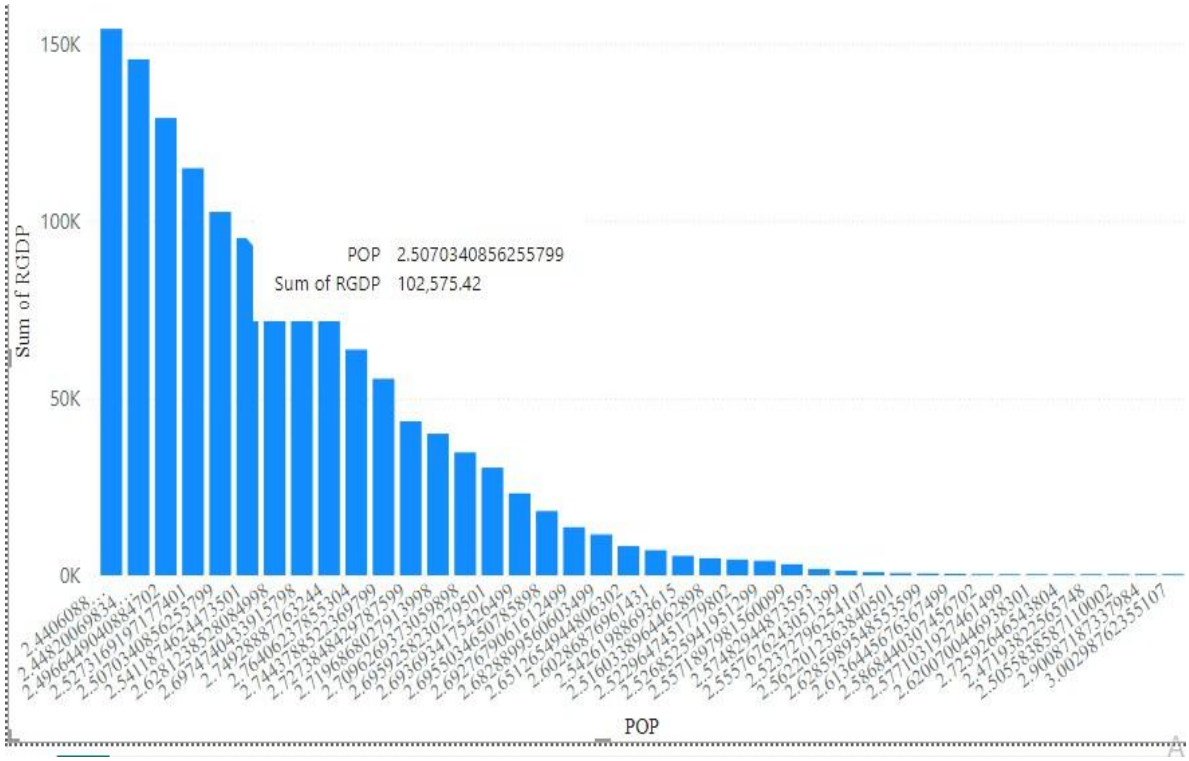


Source: GRID-Arendal (2020)

The above figure shows a continuous upward movement in population growth from 1975 to 2025. From the figure above, the population of Nigeria stood at over 63 million people. This period was just a few years after the civil war which claimed lots of lives and destroyed lots of properties. In 1985 which is the year the Nigerian government adopted the structural adjustment program, the population increased by 24% from 1975. From 2015 to 2025 there has been no organized census program that has been carried out to determine the real figure of Nigeria's population. However projections were made for this entire period. From the projections or

estimated figures, the population of Nigeria stood at over 181 million people and increased to over 233 million people in 2025 (Chete et.al, 2019).

2.2.5 Bar Chart showing the Relationship between Population Growth and Economic



Source: Author's computation using Power Bi (2023)

The diagram above shows the relationship between Real Gross Domestic Product and population growth. From the figure above it can be seen that as the growth rate pf population increases on an annual basis, the level of Real Gross Domestic Product declines.

This shows that there is an inverse relationship between population growth and Real Gross Domestic Product. In conclusion, as the level of population increases there tend to be fall in the level of economic activities which leads to decline in the level of income, savings and investment. The decline in the level of Real Gross Domestic Product can be attributed to increase in the level of poverty, unemployment and social vices (Orji et. al, 2020).

2.3 Theoretical Literature Review

2.3.1 Theories of Population Malthusian Theory of Population

Thomas Robert Malthus (1766-1834) was the key figure to analyse the population statistics. His formulation on population was a landmark in the history of population theories. He generalized the relationship between population factors and social change. In his Essay on the Principle of Population (1798) Malthus argued that because of the strong attraction of the two sexes, the population could increase by multiples, doubling every twenty-five years. He contended that the population would eventually grow so large that food production would be insufficient. Human capacity for reproduction exceeded the rate at which subsistence from the land can be increased. Malthus further wrote 'Population when unchecked increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio.' Malthus contended that the world's population was growing more rapidly than the available food supply. He argued that the food supply increases in an arithmetic progression (1, 2, 3, 4, and so on), whereas the population expands by a

geometric progression (1, 2, 4, 8, and so on).

According to him, the population could increase by multiples, doubling every twenty-five years. He said the gap between the food supply and population will continue to grow over time. Even though food supply will increase, it would be insufficient to meet the needs of expanding population. Moreover, the famine and other natural calamities cause widespread sufferings and increase the death rate, which is nature's check against population.

Theory of Demographic Transition

Demographic transition is a term, first used by Warren S. Thompson (1929), and later on by Frank

W. Notestein (1945), referring to a historical process of change which accounts the trends in births, deaths and population growth that occurred in today's industrialized societies, especially European societies. This process of demographic change began for the most part in the later 18th century. Demographic transition should not be regarded as a 'law of population growth', but as a generalized description of the evolutionary process. In simple terms, it is a theory which attempts to specify general laws by which human populations change in size and structure during industrialization. It is frequently accepted as a useful tool in describing the demographic history of a country. The theory postulates a particular pattern of demographic change from a high fertility and high mortality to a low fertility and low mortality when a society progresses from a largely rural agrarian and illiterate society to a dominant urban, industrial, literate and modern society. It is typically viewed

as a three-stage process:

(i) That the decline in immortality comes before the decline in fertility,

(ii) That the fertility eventually declines to match mortality, and

(iii) That socio-economic transformation of a society takes place simultaneously with its demographic transformation.

i. The transition from high birth and death rates to low rates can be divided into three stages (some scholars like Haggett,1975 have dividedinto four or five stages):

ii. Pre-transition stage: High and fluctuating birth and death rates with little population growth.

iii. Stage I: High birth rates and declining death rates with rapid population growth.

iv. Stage II: Low birth and death rates with slow population growth.

v. Stage III: Birth and death rates both decline appreciably leading to zero population growth.

The theory holds that pre-industrial societies were characterized by stable populations which had both a high death rate and birth rate. It postulates a little and slows population growth. The theory states that the high mortality rates characteristic of undeveloped areas will decline before fertility rates which are also high.

Karl Marx's Theory of Population

The debate about the Malthusian theory has continued down to the present. Economists such as

J.S. Mill and J.M. Keynes supported his theory whereas others, especially, sociologists, have argued against it. According to them, the widespread poverty and misery of the working class people was, not due to an eternal law of nature as propounded by Malthus but to the misconceived organization of society. Karl Marx went one step further and argued that starvation was caused by the unequal distribution of the wealth and its accumulation by capitalists. It has nothing to do with the population. Population is dependent on economic and social organization. The problems of overpopulation and limits to resources, as enunciated by Malthus, are inherent and inevitable features associated with the capitalist system of production. Marx's contention that food production could not increase rapidly was also debated when new technology began to give farmers much greater 5delds. French sociologist E. Dupreel (1977) argued that an increasing.

2.3.2 Theories of Economic Growth

Jorgenson's Neo-Classical Model of a Dual Economy

Jorgenson's Neo-Classical Model of a Dual Economy provides an analytical framework to understand economic growth in countries characterized by both modern and traditional sectors. It emphasizes the role of capital accumulation, technological progress, and labor

dynamics in driving economic development (Campbell, 2022). The economy is divided into two sectors: the modern (capital-intensive) sector and the traditional (labor-intensive) sector. The modern sector typically includes industries like manufacturing and services with higher productivity, while the traditional sector encompasses agriculture and informal activities with lower productivity. Jorgenson's model highlights how capital is allocated between these two sectors. The modern sector is usually more reliant on capital, while the traditional sector employs more labor. The interaction between these sectors influences overall economic growth. The model incorporates the impact of technological advancement predominantly in the modern sector (Oramah, 2022). Technological improvements lead to increased productivity, driving growth and attracting resources (capital and labor) from the traditional sector. Investment is vital for growth in the modern sector. The model posits that as the modern sector grows, it creates a demand for labor, which can lead to migration from the traditional sector. This can eventually raise productivity in both sectors. Jorgenson's analysis includes pricing mechanisms that reflect the productivity differences between the two sectors. Changes in wages and returns on capital can influence the movement of resources across sectors. The model suggests that policies promoting investment in the modern sector and facilitating technological transfer can enhance overall economic growth. It also underscores the importance of education and skill development to bridge the productivity gap between the sectors (Ogege, 2021).

Jorgenson's theory primarily relates to the measurement of productivity and economic growth, particularly through the lens of capital and labor inputs. It is often

discussed in the context of a production function that describes how inputs are transformed into output (Campbell, 2022).

The foundation of Jorgenson's theory can often be represented using a Cobb-Douglas production function, which is a common form in economic modeling. The general form is:

$Y = *K^{\alpha}L^{\beta}$ Where:

Y = Total output (GDP or some measure of economic productivity).

A = Total factor productivity (TFP), which captures the efficiency with which labor and capital are used in the production process.

K = Quantity of capital input.

L = Quantity of labor input.

α and β = Output elasticities of capital and labor, respectively, which indicate the percentage change in output resulting from a percentage change in capital or labor.

The Model:

Total Output: The output produced in the economy.

Factor Inputs: These include capital (K) and labor (L) as primary inputs.

Elasticity Parameters:

α reflects the responsiveness of output t changes in capital.

β reflects the responsiveness of output to changes in labor.

Returns to Scale:

- If $\alpha + \beta = 1$, the production function exhibits constant returns to scale.

- If $\alpha + \beta > 1$, it shows increasing returns to scale.

- If $\alpha + \beta < 1$, it indicates decreasing returns to scale.

To incorporate the concept of technical change or productivity growth over time, we can include a time component in A:

$Y_t = A_t * K_t^{\alpha} * L_t^{\beta}$

A_t captures technological advancements over time.

Jorgenson's approach emphasizes that growth in output can be attributed to changes in the amounts of capital and labor used and improvements in technology (TFP). This refers to an increase in the amount of capital per worker, which generally leads to higher productivity. The model allows for substitution between labor and capital, indicating how firms adjust their inputs in response to relative prices and productivity changes.

Harris-Todaro Theory of Migration and Unemployment

The Harris-Todaro Model, developed by economists John Harris and Michael Todaro in the 1970s, provides a theoretical framework for understanding rural-to-urban migration in developing countries, particularly in relation to unemployment and wage differentials (Campbell, 2022). The model explains why individuals migrate from rural to urban areas despite the presence of urban unemployment. It posits that people base their migration decisions not solely on current job availability but rather on expected utility, considering potential future income (Osam, 2019). Urban wages tend to be higher than rural wages. This differential drives migrants to seek better opportunities in cities, even if it means facing unemployment in the short term. Migrants weigh the expected income from urban jobs against rural income. The expected income in urban areas is calculated by considering the probability of finding a job (given the urban unemployment rate) and the urban wage level. The model introduces the concept that urban unemployment can be a result of high migration rates; as more people migrate to cities hoping for better jobs, the likelihood of unemployment increases, creating a mismatch between job supply and demand (Campbell, 2022). The model reaches equilibrium when the expected income from urban employment equals the income from rural employment. This results in a stable flow of migration until changes in wages or employment rates alter the balance.

The Harris-Todaro Model suggests that to manage urban migration effectively,

policymakers should focus on improving rural incomes and creating job opportunities in both rural and urban regions to reduce the incentive for migration. The model provides insight into the challenges faced by rapidly urbanizing countries in managing their labor markets, urban planning, and socioeconomic development (Campbell, 2022).

The model:

Let W_r represent the wage in the rural sector, which is typically constant or follows agricultural productivity.

Let W_u denote the wage in the urban sector, also assumed to be constant for this model. Let Pr be the probability of obtaining a job in the urban sector.

This is defined as:

Pr = ——— +

Where:

Lu is the number of people employed in the urban sector U is the number of unemployed individuals.

The expected income [E(Wu)] from migrating to the urban sector can be

expressed as: E(Wu) = Pr * Wu + (1 - Pr) * 0 = P * Wu

Individuals will choose to migrate if the expected income in the urban sector exceeds the income in the rural sector:

E(Wu) > Wr or equivalently, P * Wu > Wr

Migrants are more likely to move when the expected income of the urban sector (adjusted for unemployment) is greater than the income from remaining in the rural sector. High rates of urban unemployment can discourage migration, as the probability (Pr) will diminish (Osam, 2019).

In equilibrium, migration continues until expected incomes in both sectors equalize or until the costs of migration outweigh potential benefits. The model suggests that promoting rural development and creating jobs in both sectors can alleviate urban migration pressures (Osam, 2019).

In summary, the Harris-Todaro model provides a theoretical framework for understanding the dynamics of migration in developing countries by emphasizing the role of expected incomes and unemployment in decision-making.

2.4 Empirical Literature Review

A study by Nwosu et al. (2019) ventured into the same arena, using annual time series data from 1960 to 2008. Employing a combination of OLS techniques and granger

causality tests, they confirmed a significant impact of population growth on economic growth in Nigeria, while also establishing a sustainable long-run relationship. In a broader context, Hasan (2020) scrutinized China's population and per capita income relationship between 1952 and 1998. Employing Granger-causality tests, they found a co- integrated long-run relationship, suggesting a complex interplay between the variables.

Mahmud's research (2019) delved into India's population growth and economic growth from 1980 to 2013. Utilizing multiple tests including Johansen Co-integration, Vector Error Correction, and Granger Causality, they revealed a unidirectional causality flowing from GDP to population growth.

growth relationship in Indonesia from 1993 to 2005. They employed OLS regression techniques and discovered that net migration significantly affected the relationship between population growth and economic growth, thus highlighting the critical role of migration in the equation.

Thuku et al. (2023) conducted a meticulous study investigating the correlation between population and economic growth in Kenya, utilizing data from 1963 to 2009. Through a robust analytical approach involving Stationarity tests, Exogeneity analysis, Vector Auto Regression (VAR), and Causality tests, the researchers unveiled a significant insight. By examining the interplay between

Gross Domestic Product (GDP) growth rate and population increase, they concluded that population growth holds a positive influence on economic growth in Kenya, thereby

fostering subsequent economic development. While the study focuses on Kenya, its relevance to the Nigerian context is evident. Given that both countries share characteristics as developing nations with similar challenges and demographic trends, the positive impact of population growth on economic growth could potentially extend to Nigeria, offering insights into strategies for sustainable development.

Chang et al. (2021) undertook a cross-country exploration, examining the relationship between Population Growth and Economic Growth across 21 nations from 1870 to 2013. Employing rigorous methods like the Bootstrap Granger Causality Test and the Cross-Sectional Dependence Test, their findings underscore a noteworthy revelation. They demonstrated a bidirectional causality between population dynamics and economic growth, highlighting that population growth can stimulate economic progress, and vice versa. This study holds significant relevance for Nigeria's context, as the country's demographic trends and ambitious developmental goals align with those of the nations studied. Understanding the bidirectional causality can guide Nigerian policymakers in harnessing population dynamics to drive economic advancement and fostering a cycle of sustainable growth.

Similarly, Ukpolo (2022) research into the correlation between population density and economic growth in Ghana, spanning 1980 to 2013, carries implications for Nigeria's trajectory. Using methodologies like unit root tests, Cointegration tests, Diagnostic tests, and Granger Causality tests, the study revealed a positive statistical effect of population

density and labour force on economic growth. While the study pertains to Ghana, the parallels to Nigeria's urbanization and demographic shifts are evident. Nigeria's ongoing urbanization presents an opportunity to analyze how population density affects its economic growth, making Anudjo's findings relevant for policymakers seeking to harness the potential of urbanization for economic development. Contrastingly, Thornton (2021) examination of the long-term relationship between population and economic growth in seven Latin American countries, from 1900 to 1994, offers a valuable lesson in acknowledging context. While his findings diverge from the Nigerian context, they underscore the complexity of this relationship and the significance of considering historical, policy, and cultural factors unique to each country. This study prompts Nigerian researchers and policymakers to recognize the complexity of the relationship and avoid assumptions that one-size-fits-all conclusions apply universally.

Adam (2023) studied the intricate relationship between population growth and economic growth in the Nigerian context, leveraging a comprehensive dataset spanning the years 1961 to 2022 sourced from the World Bank Development Indicators. Guided by the lens of endogenous growth theory, the research employs a multidimensional analytical approach encompassing descriptive statistics, correlation analysis, unit root tests, the Autoregressive Distributed Lag (ARDL) model, and Error Correction Model (ECM) to unravel the complex dynamics between the variables. The findings indicate that Nigeria's expanding population exerts significant implications for sustainable economic development. The population growth is associated with adverse effects on economic

progress, contributing to trade imbalances, hindered economic growth, and intensified poverty levels. Additionally, the strain on the educational system has led to declining literacy rates and reduced productivity among the youthful workforce, subsequently hampering overall economic output. In the long-run impact assessment, the study unveils a robust negative relationship between population growth and economic growth, as well as a significant link between fertility rate and economic growth. The analysis employs the ARDL framework to accommodate the distinct orders of integration among the variables, allowing for a comprehensive exploration of both short-term and long-term relationships. The results affirm the need to address Nigeria's escalating population growth as a pivotal step towards achieving sustained economic growth and development. The research contributes to the existing body of literature by offering empirical insights tailored to the Nigerian context, aligning with theoretical foundations, and providing policy recommendations to harness the potential of population dynamics for enhanced economic progress.

Ali (2023) examined the impact of population growth and economic growth in Pakistan. The study used the Autoregressive Distributed Lagged (ARDL) Model to investigate the long run relationship between population and economic development for the period of 1975–2008. The study found that population growth impacts positively on economic growth. Though the model explained that vast increase in population growth poses a serious problem for the government as it causes the problem of increase unemployment when viewed indirectly, it leads to economic growth when viewed from a direct impact.

This analysis differs from that of Afzal who carried the same research in the same country in 2009. Afzal got an opposite result as he claimed that population growth impacts on economic growth negatively.

Wesley (2017) studied the relationship between population growth and economic growth in Low population growth high-income countries and high population growth low-income countries. The study made use of different variables collected over the past 200 years. It found that low population growth that occurs in high-income economies is likely to create socio-economic problems while high population growth occurring in low-income countries may slow the economic development of such economies. Koduru (2016) in his research on the effect of population growth rate on economic development in India realised that population growth has a positive and significant relationship with economic development such that a rise in population would lead to a rise in economic development. Population growth, economic growth, corruption index, foreign direct investment and natural resource depletion were used as the independent variable while economic development proxied as real gross domestic product stood as the dependent variable.

Also, Abdullah, Shah, Sargani, Ali and Siraj (2022) used ARDL model to study the impact of population growth on economic growth for Bangladesh using data from 1980 to 2005. The study indicates that economic growth and population possess a negative and statistically significant relationship. It concludes that family planning programs to should

be used by the government to overcome the negative consequences of her rapidly increasing population. Again, Thuku, Gachanja, and Almadi (2013) studied the impact of population growth on economic growth in Kenya. The study used the Vector Auto Regression estimation technique to analyse the data that spans between the periods 1963 to 2009. It revealed that population growth and economic growths have a statistically significant and positive relationship. It concludes that the population growth in Kenya promotes economic development.

Akintunde, Philip and Oladeji (2023) examined the effect of population dynamics (mortality and fertility) on economic growth in sub- Saharan Africa using the five-year average between the periods of 1970 to 2005. The study, which involves thirty-five countries in the sub-Saharan Africa, used the pooled ARDL and the dynamic panel data analysis to estimate the model. It revealed a negative relationship between total fertility rate and economic growth, and a positive relationship between life expectancy at birth and economic growth. It concluded that the region in view needs to address the problems and consequences of high population growth in order to enjoy sustainable economic development.

Nwosu, Dike and Okwara (2024) used time series data spanning through 1960 to 2008 to investigate the role of population growth on economic growth in Nigeria and how economic growth is affected through population growth. This study employed a linear model to analyse economic growth fluctuations against population growth and Granger

Causality method to check the causal relationship that existed between the two core variables. The study found the existence of a sustainable long run equilibrium relationship between economic growth and population growth, and also a unidirectional causality relationship between population growth and economic growth.

Orji et. al, (2020) carried out a study on population growth in many developing countries, has become a burning issue in the literature. Furthermore, many divergent views exist on whether increasing population is useful or harmful to growth in the economy. This study therefore, analysed the impact of population increase on economic growth in Nigeria, as an Africa's most populous country. The study employed time series data from 1985–2018 using the framework of the Autoregressive Distributed Lag (ARDL) Model. The findings of this study revealed that the population growth of the economy supports economic growth both in the short and long term. However, it may become explosive in the long run if vital measures are not taken to control it. Since population increase has a huge impact on economic growth, the government should take steps to ensure that the population continues to increase the country's growth trajectory by equipping the workforce with the appropriate skills. Therefore, to enhance sustainable development, the study proposes to formulate an effective government policy in order to ensure the growing labour force with jobs and modern qualification skills in accordance with the requirements of the labor market and increasing the country's GDP. Also, there is need to formulate effective financial policies and support competitive interest rates in order to improve the economy's savings rate. Effective monitoring of the economy's capital-

output ratio should ensure its increase in GDP, and the prohibition of effective state policy should be enacted to maintain stable and non-escalating population growth rate.

2.5 Relationship between Population Growth and Economic Growth

The intricate nexus between population growth and economic progress has been a subject of prolonged discourse, as evidenced by divergent empirical findings across different regions, as noted by Faruk and Abdullahi (2019). The variability in underlying parameters such as resource availability, governmental policies, economic development levels, cultural nuances, and labour force competence accounts for the disparities in this relationship. Historical foundations of this debate trace back to Thomas Malthus' observations in 1798, which projected that unchecked population growth would inevitably outstrip available means of subsistence. Although subsequent economic theorists have refined and expanded upon Malthus' ideas, acknowledging the flaws in his assumptions, his perspective ignited the discourse on population's impact on economic growth. This perspective, as elaborated upon by the likes of Marshal, Pigou, and Keynes, laid the groundwork for subsequent analyses.Nigeria's population has undergone persistent and substantial growth, exemplified by the shift from 16.06 million in 1911 to over 200 million in 2023, as revealed by World Bank data in 2023. The nation's current population, estimated at approximately 184 million according to World Development Indicators statistics in 2017, poses challenges not only to the formulation of coherent development plans but also to the broader panorama of economic growth, underscoring

the contentions of Aidi et al. (2016). This concern is further compounded by persistently high fertility rates in Nigeria, which have oscillated between 6.354 in 1960 and 6.004 in 2022, in stark contrast to the lower rates seen in advanced economies such as the USA, Britain, and Russia (World Bank, 2023; Hasan, 2010). The implications of rapid population growth extend to profound challenges in achieving comprehensive social and economic development, necessitating intensified investments to mitigate disparities and ensure equitable access to essential services.Hence, Nigeria's trajectory towards sustainable economic growth is inextricably intertwined with its response to the escalating population growth. The multifaceted repercussions of this growth on trade, poverty, education, and workforce dynamics necessitate a comprehensive exploration of the intricate relationship between population and economic progress. This study endeavours to shed light on the specific impacts of population growth on Nigeria's economic trajectory, while navigating the nuances of global economic trends and historical perspectives. The ensuing exploration aims to enhance the understanding of the interplay between population dynamics and economic development, offering valuable insights for both policy formulation and academic discourse.

CHAPTER THREE

THEORETICAL FRAMEWORK, RESEARCH METHODOLOGY AND ESTIMATION TECHNIQUE

3.1 Theoretical Framework

Jorgenson's Neo-Classical Model of a Dual Economy

This study is built on the Jorgenson's Neo-Classical Model of a Dual Economy. Jorgenson's Neo- Classical Model of a Dual Economy provides an analytical framework to understand economic growth in countries characterized by both modern and traditional sectors. It emphasizes the role of capital accumulation, technological progress, and labor dynamics in driving economic development (Campbell, 2022) (Oramah, 2022).. (Ogege, 2021). Jorgenson's theory primarily relates to the measurement of productivity and economic growth, particularly through the lens of capital and labor inputs. It is often discussed in the context of a production function that describes how inputs are transformed into output (Campbell, 2022).

The foundation of Jorgenson's theory can often be represented using a Cobb-Douglas production function, which is a common form in economic modeling. The general form is:

$Y = A*K^{\alpha}L^{\beta}U^{\pi}$ Where:

Y = Total output (GDP or some measure of economic productivity).

A = Total factor productivity (TFP), which captures the efficiency with which labor and capital are used in the production process.

K = Quantity of capital input.

L = Quantity of labor input.

U = Other variables such as poverty, unemployment and inflation affecting economic growth

α, β and π = Output elasticities of capital, labor and other variables, respectively, which indicate the percentage change in output resulting from a percentage change in capital or labor.

The Model:

Total Output: The output produced in the economy.

Factor Inputs: These include capital (K) and labor (L) as primary

inputs. Elasticity Parameters:

α reflects the responsiveness of output to changes in capital.

β reflects the responsiveness of output to changes in labor.

π reflects the responsiveness of output to changes in poverty, unemployment

and inflation Returns to Scale:

- If $\alpha + \beta + \pi = 1$, the production function exhibits constant returns to scale.

- If $\alpha + \beta + \pi > 1$, it shows increasing returns to scale.

- If $\alpha + \beta + \pi < 1$, it indicates decreasing returns to scale.

To incorporate the concept of technical change or productivity growth over time, we can include a time component in A:

$Y_t = A_t * K_t^{\alpha} * L_t^{\beta} U_t^{\pi}$

A_t captures technological advancements over time.

Jorgenson's Neo-Classical Model of a Dual Economy interrelates with population growth, poverty, unemployment, and consumption through various mechanisms. Population growth increases the labor supply, particularly in the traditional sector, where employment is generally concentrated. This can exacerbate unemployment if the modern sector does not grow sufficiently to absorb new entrants into the labor market. Rapid population growth may strain resources in both sectors, leading to increased competition for jobs in the urban modern sector and an expansion of the traditional sector. High population growth can drive rural-urban migration, as individuals seek better opportunities in the modern sector, contributing to urbanization trends. The dual economy creates significant income disparities between the modern and traditional sectors. Those in the traditional sector often experience higher levels of poverty due to

lower productivity and wages. If the modern sector fails to grow, the poverty gap can widen, as jobs in the traditional sector may not provide adequate income for subsistence. Thus, economic growth driven by investment in the modern sector can uplift living standards. Economic disparities can limit access to education and healthcare, perpetuating the cycle of poverty, especially in traditional sectors where incomes remain low. Unemployment can arise when the modern sector does not create enough jobs to absorb labor from the traditional sector, leading to a mismatch between labor supply and demand. This is particularly evident during economic downturns or periods of slow modernization. As workers migrate from the traditional sector, they may face unemployment in urban areas due to skill mismatches. The transition process can lead to both short-term and long-term unemployment challenges. Improving educational opportunities and training for those in the traditional sector can help reduce unemployment and enhance labor mobility towards the modern sector. Higher income levels in the modern sector lead to increased consumption of goods and services, driving further economic growth. Conversely, lower incomes in the traditional sector limit consumption options, affecting overall demand in the economy. Economic growth in the modern sector can lead to increased demand for consumer goods and services, influencing production in the traditional sector as well. This interaction can enhance overall consumption and stimulate growth in both sectors.

Jorgenson's Neo-Classical Model of a Dual Economy illustrates the interconnectedness of population growth, poverty, unemployment, and consumption. Understanding these

relationships is crucial for policymakers aiming to drive inclusive economic growth, reduce poverty, and efficiently manage the labor market in economies characterized by dual sectors. By promoting growth in the modern sector and supporting the transition of labor from the traditional sector, economic policies can address unemployment and improve overall standards of living.

3.2 Model Specification

The model for examining the effect of population growth on the Nigerian economy is specified below:

The Model

LNRGDP = f (POP, PHCR, LNUNE, INF, LNCONEX)

$LNRGDP = \alpha 0 + \alpha_1 POP + \alpha_2 PHCR + \alpha_3 LNUNE + \alpha_4 INF + \alpha_5 LNCONEX + U_t$

A priori Expectations

$\alpha_1 > 0$, $\alpha_2 < 0$, $\alpha_3 < 0$, $\alpha_4 < 0$, $\alpha_5 > 0$.

Where:

LNRGDP = Natural log of Real Gross Domestic

Product POP = Population Growth

PHCR = Poverty Head Count

Ratio LNUNE = Natural Log

of Unemployment INF =

inflation rate

LNCONEX = Natural Log of Consumption

α_0 = constant, α_1, α_2, α_3, α_4, and α_5 = parameter estimates, Ut = stochastic error term

3.3 Method of Analysis

This study employed the Autoregressive Distributed Lag (ARDL) model to analyze research data sourced from the statistical bulletin of the Central Bank of Nigeria. In order to examine the short- and long-term relations between recurrent expenditure on internal security and economic growth, Autoregressive Distributed Lag (ARDL) was used. The reason for the use of ARDL estimation technique is because estimates provided by ARDL method avoid problems such as autocorrelation and endogeneity, they are unbiased and efficient. Also the ARDL was employed because some of the chosen variables were not stationary at level however they are stationary at first difference. The ARDL model for this study is presented thus:

$\Delta \mathrm{LN}RGDP_{t,} = C_0 + C_1 \mathrm{LNGDP}_{t-1,} + C_2 \mathrm{POP}_{t-1,} + C_3 \mathrm{PHCR}_{t-1,} + C_4\ \mathrm{LNUNE}_{t-1,} + C_5\ \mathrm{INFL}_{t-1,\ +}\ C_6$

$\mathrm{LNCONEX}_{t-1,j+} \sum a1i,j\Delta\, n1\ i{=}1$

$\mathrm{LN}RGDPt-1, + \sum a2i,\Delta\ n2\ i=0\ LnGRISt-1,j + \sum a3i,j\Delta\ n3\ i=0\ MPRt-1,j + \sum a4i,j\Delta\ n4\ i=0$

$LnEXRt-1,j + \lambda ECMt - 1 + \mu t$

Where Δ is the difference operator while μt is white noise or error term, n is the optimal lag length, α1, α2, α3, α4 represent the short run dynamics of the model and c1, c2, c3, c4 are the long run elasticities and μt is the error term. $ECMt-1$ is the error correction term obtained from the co- integration model. The error coefficients ($\lambda 1$) show the rate at which the co-integration model corrects its previous period's disequilibrium or speed of adjustment to restore the long run equilibrium relationship. The coefficient of ECM is expected to be negative and statistically significant. A negative and significant $ECMt-1$ coefficient implies that any movement in short run between the explained and independent variables will converge back to the long run relationship.

Unit Root Test

The study adopted the Augmented Dickey Fuller unit root test to ascertain the characteristics of the variables employed in the study. This is important so as to avoid the case of spurious data in the estimated coefficients thereby eliminating the possibility of autocorrelation in the error term. At this first stage, we verify the sequence of integration within each series and determine whether or not they are stationary. Researchers have devised a plethora of techniques for ensuring the right order of integration. Dickey (1979) and Fuller (1983) created the Augmented Dickey-Fuller (ADF)

test, which is currently the gold standard (1981). The augmented Dickey-Fuller test is predicated on rejecting the unit root null hypothesis (that the series are not stable) in favor of the alternative hypothesis of no unit root (the series are stationary). Each series is analyzed in both the presence and absence of a deterministic trend (t). To be stated to have a unit root, Y_t must have a non- stationary first difference between Y_t and Y_{t-1}. A series is said to be integrated of order I if it can become stationary with just one shift (1). A stationary I(2) series, which also needs two differences, follows the same pattern. If it's already at 0 (I(0)), there's no use in doing any additional differentiation.

Co-integration and Error Correction Model

There are two stages to the ARDL method. The first stage involves doing a co-integration analysis using the bounds testing method. The long-run relationship as specified by the model above and revealed by co-integration analysis is estimated in the second stage. At this point, an error correction model depicting short-run dynamics is also estimated.

To do the bounds testing the following co-integration equation is used:

$$\Delta LNRGDP_t = \boldsymbol{\beta_0} + \sum^{p}_{i=1} \delta_i \Delta POP_{t-1} + \sum^{p}_{i=1} \gamma_i \Delta PHCR_{t-1} + \sum^{p}_{i=1} \theta_i \Delta LNUNE_{t-1} + \sum^{p}_{i=1} \boldsymbol{\sigma_i} \Delta INT_{t-1} +$$

$$\sum^{p}_{i=1} \pi_i \Delta LNCONEX_{t-1} + \boldsymbol{\mu_1} POP_{t-1} + \boldsymbol{\mu_2} PHCR_{t-1} + \boldsymbol{\mu_3} LNUNE_{t-1} + \boldsymbol{\mu_4} INFL_{t-1} + \boldsymbol{\mu_5} LNCONEX_{t-1} + \boldsymbol{\varepsilon_t}$$

3.4 Diagnostics Test

This test is based on statistical theory used in evaluating the reliability of the parameter estimates of a given model. According to Guajarati (2004), a test of significance is a procedure by which sample result is used to verify the truth or falsity of a null hypothesis. It encompasses the following tests:

1. Standard Error Test: This test is of high relevance arising from the fact that sampling errors tend to characterized parameter estimates of a given model. It is therefore essential to measure the size of the sampling error and subsequently determine the degree of confidence in the validity of the obtained estimates (Koutsoyiannis, 1977). The test helps us to know if our estimates are statistically significant or not, and also whether the sample from which we made estimates might have come from a population whose true parameter value are zero (Koutsoyiannis, 1977 p.80).

2. The T-Test: This test is carried out to ascertain the statistical significance of the individual parameters in an econometric model. It is used in testing the statistical significance of each regression coefficient at a given level of significance (say 1%, 5%, or 10%) with N–K degree of freedom. The table or critical value is given as; $t_{\alpha/2}$ (N – K). Where; t = t –critical, α = level of significance N = Sample size K = total number of estimated parameters.

Decision Rule If the t-cal < $t_{\alpha/2}$ (N –K) at a given level of significance, we accept H_o and reject H_1 but if t-cal > $t_{\alpha/2}$ (N – K) we reject H_o and accept H_1. In the former, we therefore

conclude that the parameter estimate is not statistically significant at a given level of significance while for the latter; we conclude that the parameter estimate is not statistically significant at a given level of significance.

3. F–Test: This test is used to test overall significance of the regression model. Simply put, it is used to test for the statistical significance of the coefficient of determination (R2). The decision is that, if the computed F–test i.e. F-cal > Fα (k-1), (N-K), then we say the overall model is statistically significant at a given significance level. If F-cal < F α (k-1, N-K), then we conclude that the overall model is not statistically significant at a given significance level.

4. R^2 and adjusted R^2 test: the coefficient of determination (R^2) depicts the percentage variations in the dependent variable that is accounted for by the variations in the independent variables in a given single regression model. It is also known as the measure of the Goodness of Fit of a regression line. The adjusted R^2 depicts the variations in the dependent variable that is accounted for by the changes in the explanatory variables of a given model taking account of the degree of freedom associated with the sum of squares. The adjusted R^2 is used in a multiple regression model.

3.5 Data Sources

In order to empirically investigate the impact of population growth on the Nigerian economy, this study uses annual time series data for the period of 1981-2024. The secondary data employed was extracted from the Central Bank of Nigeria statistical publications, National Bureau of Statistics.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Descriptive Statistics

The descriptive statistics are summary statistics that summarize the observation of a data set, which are used as representation of the population parameter. Descriptive statistics are broken down into measures of central tendency, measures of dispersion and measure of normality. These measures help to provide some basic and useful information about the variables under study. The measures employed here includes, the mean, maximum, minimum, standard deviation and skewness. The mean measures the average of a given set of data observations or series. The maximum value is simply the data point that holds the highest value in the series while the minimum value is the lowest value in the data series. The standard deviation is a measure of spread from the mean. Skewness is a measure of symmetry or asymmetry of a given data distribution and it tells whether a given distribution is normally distributed or not.

Table 4.1: Descriptive Statistics

Variables	RGDP	POP	PHCR	UNE	INFL	CONEX
Mean	51003.80	2.620580	91.72886	10.27855	20.75782	33659.29
Median	12529.21	2.608257	91.85000	9.928000	10.75185	8104.494
Maximum	267789.0	3.002988	94.00000	15.87600	219.0028	150045.0
Minimum	139.3105	2.440609	89.50000	8.540000	0.686099	13.60023
Std. Dev.	70334.24	0.115928	1.172233	1.495775	33.57152	45287.74
Skewness	1.496270	0.968818	-0.1799	1.842764	4.931150	1.199263
Kurtosis	4.376202	4.333833	2.398282	6.638906	29.13743	3.106379
Jarque-Bera	19.89026	10.14482	0.901108	49.17872	1430.788	10.56778
Probability	0.000048	0.006267	0.637275	0.000000	0.000000	0.005073
Sum	2244167.	115.3055	4036.070	452.2560	913.3440	1481009.
Sum Sq. Dev.	2.130000	0.577894	59.08764	96.20571	48463.01	8.820000
Observations	44	44	44	44	44	44

Source: Authors Computation Using E-views

From the table above, it can be seen that the average value Real Gross Domestic Product for the period is 51003.80, with a maximum value of 267789.0, a minimum value of 139.3105and a standard deviation of 70334.24. The result also shows that Real Gross Domestic Product is positively skewed.

From the table above, it can be seen that the average value for population growth for the period is 2.6206, with a maximum value of 3.0030, a minimum value of 2.4406and a

standard deviation of 0.1160. The result also shows that population growth is positively skewed.

From the table above, it can be seen that the average value of poverty head count ratio for the period is 94.000, with a maximum value of 76684.94, a minimum value of 89.500 and a standard deviation of 1.1722. The result also shows that poverty head count ratio is negatively skewed.

From the table above, it can be seen that the average value for unemployment rate for the period is 10.2786, with a maximum value of 15.8760, a minimum value of 8.54000 and a standard deviation of 1.4957. The result also shows that unemployment rate is positively skewed.

From the table above, it can be seen that the average value for inflation rate for the period is 20.7578, with a maximum value of 219.0028, a minimum value of 0.686099 and a standard deviation of 33.57152. The result also shows that inflation is positively skewed.

From the table above, it can be seen that the average value for consumption expenditure for the period is 33659.29, with a maximum value of 150045.0, a minimum value of 13.600 and a standard deviation of 45287.74. The result also shows that consumption expenditure is positively skewed.

4.2 Unit root Test

Augmented Dickey-Fuller

Test at Level Table 4.2

Variables	Levels ADF Test Statistic	Probability at 5% level of significance	First Difference ADF Test Statistics	Probability at 5% level of significance	Remarks
LNRGDP	-1.3188	0.6112	-3.3348	0.0201	Stationary
POP	-4.2142	0.0018	-5.8842	0.0001	Stationary
PHCR	-2.4348	0.1385	-7.9078	0.0002	Stationary
LNUNE	1.275339	0.9981	-5.0341	0.0002	Stationary
INFL	-14.473	0.0000	-17.274	0.0001	Stationary
LNCONEX	-3.4499	0.0144	-4.865	0.0003	Stationary

Source: Authors Computation Using E-views

The unit root test result shows that at 5% level of significance and at first difference all the variables are stationary. This implies the absence of unit root in the data.

4.3 Co-integration Test

Table 4.3: Bound Test (Trace Statistic)

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	3.968445	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.50%	2.96	4.18
1%	3.41	4.68

Source: Authors Computation Using E-views

From the table above, the bound test F- statistic shows that there is a co-integrating equation among the chosen variables of the model at 5% level of significance. Given that the bound F-statistic value (3.968, approximately), is greater than both the lower and upper bound value at 5% level of significance, it there shows the existence of a long run co-integrating relationship among the variables.

4.4 Analysis

Table 4.4 Short-run Estimated Model

Dependent Variable: D(LNRGDP)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
D(LNRGDP(-1))	0.87765	0.05592	15.6935	0
D(POP)	0.10656	0.0292	3.64993	0.001
D(PHCR)	0.00023	0.00284	0.0804	0.9365
D(LNUNE)	-0.0725	0.1538	-0.4715	0.6407
D(INFL)	0.00287	0.00019	15.4179	0
D(LNCONEX)	0.09866	0.02793	3.53255	0.0014
ECM(-1)	-0.8245	0.18679	-4.4142	0.0001
C	0.00215	0.00549	0.39211	0.6977

Source: Authors Computation Using E-views

The error correction model, also recognized as the short-run model is imperative. To begin the first difference of the variables are obtained and stationarity condition was met. Subsequently, the error correction terms, derived from the residual series of the long-run equation, are integrated into the model. It is noteworthy that the error correction term is lagged by one period. Form the result above the implication of this is that a shock to consumption expenditure in the current period will be restored at a speed of adjustment of about 82.45% in the next period. This confirms the adequacy

and statistical efficiency of the model. The ECM coefficient is both negative and significant.

4.5 Analysis

Table 4.5 Long-run Estimated Model

Dependent Variable: LNRGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRGDP(-1)	0.86249	0.02609	33.0577	0.0001
POP	0.10768	0.02758	3.90446	0.0005
PHCR	0.00283	0.00255	1.11162	0.2746
LNUNE	0.02377	0.11049	0.21514	0.831
INFL	0.00281	0.00019	14.5875	0.0001
LNCONEX	0.12613	0.02229	5.65912	0.0001
C	-0.4651	0.23492	-1.9798	0.0564
R-squared	0.99984	Mean dependent var		3.82654
Adjusted R-squared	0.99981	S.D. dependent var		1.02496
S.E. of regression	0.01432	Akaike info criterion		-5.4936
Sum squared resid	0.00656	Schwarz criterion		-5.195
Log likelihood	114.124	Hannan-Quinn criter.		-5.3864
F-statistic	32453.3	Durbin-Watson stat		1.95886
Prob(F-statistic)	0.00001			

Source: Authors Computation Using E-views 9

From the table above, it can be seen that the one year lag coefficient of Real Gross Domestic Product has a positive impact on the current value of Real Gross Domestic Product and it is statistically significant at 5% level of significance. A 1% increase in the one year lag Real Gross Domestic Product will lead to 0.862% increase in Real Gross Domestic Product. This is an indication of the continuous upward trend movement in Real Gross Domestic Product year on year.

From the table above, it can be seen that the coefficient of population growth has a positive impact on the current value of Real Gross Domestic Product and it is statistically significant at 5% level of significance. A 1% increase in population growth will lead to 0.1077% increase in Real Gross Domestic Product. The positive impact exerted by growth in population on the Nigerian economy is as a result of the fact that many Nigerians are actively involved in productive activities both home and abroad (Oramah, 2022).

From the table above, it can be seen that the coefficient of Poverty Head Count Ratio has a positive relationship with the current value of Real Gross Domestic Product and it is not statistically significant at 5% level of significance. A 1% increase in Poverty Head Count Ratio will lead to 0.00283% increase in Real Gross Domestic Product. This is a clear indication that despite the fact that the Nigerian economy is recording annual persistent growth year on year, the level of poverty is still on the increase due to the fact that lots of Nigerians are either unemployed or underemployed and thus cannot keep up

with the current cost of living (Osam, 2019).

From the table above, it can be seen that the coefficient of unemployment rate has a positive relationship with the current value of Real Gross Domestic Product and it is not statistically significant at 5% level of significance. A 1% increase in unemployment rate will lead to 0.0237% increase in Real Gross Domestic Product. This is a clear indication that despite the fact that the Nigerian economy is recording annual persistent growth year on year Nigerians are either unemployed or underemployed and living below the average standard of living (Osam, 2019).

From the table above, it can be seen that the coefficient of inflation rate has a positive impact on the current value of Real Gross Domestic Product and it is statistically significant at 5% level of significance. A 1% increase in population growth will lead to 0.00281% increase in Real Gross

Domestic Product. The increase in the price of goods and services causes increase in the cost of production, expenditure and the level income. The prices of goods and services increases the value for goods and services also increase which eventually cause increase in the value of Real Gross Domestic Product (Campbell, 2022).

From the table above, it can be seen that the coefficient of consumption expenditure has a positive impact on the current value of Real Gross Domestic Product and it is statistically significant at 5% level of significance. A 1% increase in consumption expenditure will lead to 0.12613% increase in Real Gross Domestic Product. Consumption is one of the

most critical factor in the Keynesian identity equation besides government sector and the business sector. As the level of individual consumption increases over time, so does the level of income (Real Gross Domestic Product) (Stephen, 2021).

4.6 Policy Implication

From the table above, it can be seen that the one year lag coefficient of Real Gross Domestic Product has a positive impact on the current value of Real Gross Domestic Product and it is statistically significant at 5% level of significance. This is an indication of the continuous upward trend movement in Real Gross Domestic Product year on year. From the table above, it can be seen that the coefficient of population growth has a positive impact on the current value of Real Gross Domestic Product and it is statistically significant at 5% level of significance. The positive impact exerted by growth in population on the Nigerian economy is as a result of the fact that many Nigerians are actively involved in productive activities both home and abroad. From the table above, it can be seen that the coefficient of Poverty Head Count Ratio has a positive relationship with the current value of Real Gross Domestic Product and it is not statistically significant at 5% level of significance. This is a clear indication that despite the fact that the Nigerian economy is recording annual persistent growth year on year, the level of poverty is still on the increase due to the fact that lots of Nigerians cannot keep up with the current cost of living. From the table above, it can be seen that the coefficient of unemployment rate has a positive relationship with the current value

of Real Gross Domestic Product and it is not statistically significant at 5% level of significance. This is a clear indication that despite the fact that the Nigerian economy is recording annual persistent growth, many Nigerians are either unemployed and living below the average standard of living which is one dollar per day. From the table above, it can be seen that the coefficient of inflation rate has a positive impact on the current value of Real Gross Domestic Product and it is statistically significant at 5% level of significance. The prices of goods and services increases the value for goods and services also increase which eventually cause increase in the value of Real Gross Domestic Product. From the table above, it can be seen that the coefficient of consumption expenditure has a positive impact on the current value of Real Gross Domestic Product and it is statistically significant at 5% level of significance. As the level of individual consumption increases over time, so does the level of income (Real Gross Domestic Product).

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the Findings

This research study was carried out to determine the impact of population growth on Nigerian Economy. The specific objectives of the study include investigating the relationship and effect of population growth on economic growth in Nigeria. The research findings indicate the following: One year lag coefficient of Real Gross Domestic Product has a positive impact on the current value of Real Gross Domestic Product. This is an indication of the continuous upward trend movement in Real Gross Domestic Product year on year. Population growth has a positive impact on the current value of Real Gross Domestic Product. The positive impact exerted by growth in population on the Nigerian economy is as a result of the fact that many Nigerians are actively involved in productive activities both home and abroad. Poverty Head Count Ratio has a positive relationship with the current value of Real Gross Domestic Product. This is a clear indication that despite the fact that the Nigerian economy is recording annual persistent growth year on year, the level of poverty is still on the increase due to the fact that lots of Nigerians cannot keep up with the current cost of living. Unemployment rate has a positive relationship with the current value of Real Gross Domestic Product. This is a clear indication that despite the fact that the Nigerian economy is recording annual persistent growth, many Nigerians are either unemployed and living below the average

standard of living which is one dollar per day. Inflation rate has a positive impact on the current value of Real Gross Domestic Product. The prices of goods and services increases the value for goods and services also increase which eventually cause increase in the value of Real Gross Domestic Product. Consumption expenditure has a positive impact on the current value of Real Gross Domestic Product.

5.2 Conclusion

This research study investigated the impact of population growth on the Nigerian economy using annual time series data for the period 1981 to 2024. The data was extracted from CBN statistical publications (2024), National Bureau of Statistics (2024). ADF technique in testing the unit root property of the series was utilized, the ARDL estimation technique was used to analyze the data.

Every economy depends on people to attain economic growth and development. However if the population of an economy is not growing at an exponential rate without being productive or actively employed, the economy will not attain its expected growth and development. It is therefore critical for the Nigerian government to develop the growing population of Nigeria for continued growth of the Nigerian economy.

5.3 Recommendations

Haven discovered from the study that a productive population is critical for an

economy to attain its slated macro-economic policies, it is therefore necessary for the government to:

1. Invest in the development of the Nigeria growing population through education.
2. Make jobs available for Nigerians who are unemployed or underemployed.
3. Make low interest loans or capital available to individuals who wants to invest.
4. Control the rate at which Nigerian population is increasing annually.

REFERENCE

Abdu, M., & Anam, E. B. (2018). Evaluation of the Nigerian Industrial Sector and Economic Growth in the Face of Sustainable Development Goals. International Journal of Advanced Research in Public Policy, Social Development and Enterprise Studies, 3(1), 49-59.

Adams Joseph (2023). Impact of population growth on economic growth in Nigeria. ADSU International Journal of Applied Economics, Finance & Management Vol. 8, Issue 2, 2023

Aidi, H., O., Emecheta, C. and Ngwudiobu, I., M. (2016). Population and economic growth in Nigeria: Is there an empirical evidence of causality? International Journal of Advances in Social Science and Humanities, 4(2), 59-66.

Ali, S., Alam, K., Islam, S., & Hossain, M. (2023). An Empirical Analysis of Population Growth on Economic Development: A Case Study of Bangladesh. International Journal of Economics, Finance and Management Sciences, Vol. 3, No. 3, pp. 252–259. DOI: 10.11648/ j.ijefm.20150303.21.

Ali, S., Ali, A., & Amin, A. (2022). The Impact of Population Growth on Economic Development in Pakistan. Middle-East Journal of Scientific Research, Vol. 18 (4), pp. 483–491. DOI: 10.5829/idosi.mejsr.2013.18.4.12404.

Campbell, J. (2022). Nigeria faces a crippling population boom. Retrieved on 17th June, 2020 from https://www.cfr.org>blogs>nigeria.

Oramah, I. T. (2022). The effects of population growth in Nigeria. Journal of Applied Sciences, 6, 1332-1337.

Osam, E. (2019). Analysis of the social consequences of overpopulation in Nigeria. Multi-Disciplinary Journal of Research and Development Perspective, 8(1), 173-195.

Chang, T., Chu, H., Deale, F. W. and Gupta, R. (2021). The Relationship between Population Growth and Standard-of-Living Growth over 1870-2013: Evidence from a Bootstrapped Panel Granger Causality Test. Empirica, 44 (1), 175–201.

Chete, L.N., Adeoti, F.M. and Ogundele, O. (2019). ―Industrial development and growth in Nigeria: Lessons and challenges‖. Leaning to compete working paper, 8. Available at: https://www.brookings.edu/wp-content/uploads/2016/07/L2C_WP8_Chete-et-al-1.pdf

D. Jorgenson, The Development of a Dual Economy, E.J. 71, 1961 and Surplus Agricultural Labour and the Development of a Dual Economy. O.E.P., 19, 1967

Danan Gu, Kirill Andreev and Matthew E. Dupre (2020). Major Trends in Population Growth Around the World. CCDC Weekly/Vol. 3/No.28

Onwuka, E. C. (2020). Another look at the impact of Nigeria's growing population

on the country's development. African Population Studies, 21 (1), 1-18.

Stephen E.U (2021). Industrial Output and Economic Growth in Emerging Economies: Evidence from Nigeria. Applied Finance and Accounting Vol. 7, No. 1, February 2021. ISSN 2374- 2410 E-ISSN 2374-2429. Published by Redfame Publishing. URL: http://afa.redfame.com

Faruk, B.U., and Abdullahi, A. (2019). Net Population Growth and Economic Growth in Nigeria: An Autoregressive Distributed Lag (ARDL) Model Approach. East African Scholars Journal of Economics, Business and Management, 2(9), 502-512.

Gordon Scott. (2020): Investopedia (2020), https//www.investopedia.com

Hasan, M., (2020). The Long-Run Relationship between Population and per Capita Income

Growth in China' Journal of Policy Modelling, 32(3), 355–372.

J.R. Harris and M.P. Todaro, "Migration, Unemployment and Development: A Two-Sector Analysis," A.E.R. , March, 1970.

Jagger C, Crimmins EM, Saito Y, De Carvalho Yokota RT, van Oyen

H, Robine JM (2020). International handbook of health expectancies. Cham: Springer.

Mahmud, A.M. (2019). Econometric Model on Population Growth and Economic Development in India. Proceedings of the International Symposium on Emerging Trends in Social Science Research.

Kotani S. & Kotani, K. (2021). The effect of net-migration on population-growth relationship in Indonesia. Asian Journal of Empirical Research, 2(2), 62-72.

Nwosu, C., Dike, A. O., and Okwara, K. K. (2019). The effects of population growth on economic growth in Nigeria. International Journal of Engineering and Science, 3(11), 07-18.

Nwosu, C., Dike, O., & Okwara, K. (2024). The Effects of Population Growth on Economic Growth in Nigeria. The International Journal of Engineering and Science (IJES), Vol. 3, No. 11, pp. 7–18.

Ogege, S. O. (2021). Gender role differentiation and social mobility of women in Nigeria.Journal of Social Sciences, 27(1), 67-74.

Okeowo, Gabriel; Fatoba, Iyanuoluwa, eds. (2022-10-13). "State of States 2022 Edition" (PDF). Budgit.org. Budg IT. Retrieved 2023-03-07.

https://en.m.wikipedia.org/wiki/File:Population_density_map_of_Nigerian_states_-_English.png Source: GRID-Arendal: 2020 https://www.grida.no/resources/14106

Orji, A., Ogbuabor, J. E., Iwuagwu, Ch., Anthony-Orji, O. I. (2020). Empirical

analysis of the impact of population increase on the economic growth of Africa's most populous country. Socioeconomic research bulletin, Vìsnik socìal'no-ekonomìčnih doslìdžen' (ISSN 2313- 4569), Odessa National Economic University, Ukraine, No. 2 (73), pp. 27–45.

Osam, E. (2019). Analysis of the social consequences of overpopulation in Nigeria. Multi Disciplinary Journal of Research and Development Perspective, 8(1), 173-195.

Thornton, J. (2021). Population Growth and Economic Growth: Long-Run Evidence from Latin America. Southern Economic Journal,68(2),464-468.

Ukpolo, V. (2022). Population growth and economic growth in Africa. Journal of developing societies, 18(4), 315-329.

Thuku, G., Paul, G., & Almadi, O. (2023). The Impact of Population Change on Economic Growth in Kenya. International Journal of Economics and Management Sciences, Vol. 2, No. 6, pp. 43–60. DOI: 10.4172/2162-6359.1000137.

Wesley, E., & Peterson, F. (2017). The Role of Population in Economic Growth. SAGE Open, Vol. 7, Issue 4, pp. 1–15. DOI: https://doi.org/10.1177/2158244017736094

World Bank (2023). World bank development indicator. Washington Dc, World Bank, USA

Appendix

Descriptive Statistics

	RGDP	POP	PHCR	UNE	INFL	CONEX
Mean	51003.80	2.620580	91.72886	10.27855	20.75782	33659.29
Median	12529.21	2.608257	91.85000	9.928000	10.75185	8104.494
Maximum	267789.0	3.002988	94.00000	15.87600	219.0028	150045.0
Minimum	139.3105	2.440609	89.50000	8.540000	0.686099	13.60023
Std. Dev.	70334.24	0.115928	1.172233	1.495775	33.57152	45287.74
Skewness	1.496270	0.968818	-0.179895	1.842764	4.931150	1.199263
Kurtosis	4.376202	4.333833	2.398282	6.638906	29.13743	3.106379
Jarque-Bera	19.89026	10.14482	0.901108	49.17872	1430.788	10.56778
Probability	0.000048	0.006267	0.637275	0.000000	0.000000	0.005073
Sum	2244167.	115.3055	4036.070	452.2560	913.3440	1481009.
Sum Sq. Dev.	2.13E+11	0.577894	59.08764	96.20571	48463.01	8.82E+10
Observations	44	44	44	44	44	44

Unit Root Test at Level

Null Hypothesis: LNRGDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.318810	0.6112
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNRGDP) Method: Least Squares
Date: 09/06/25 Time: 23:50 Sample (adjusted): 1982 2020
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNRGDP(-1)	-0.010263	0.007782	-1.318810	0.1953
C	0.116527	0.030233	3.854325	0.0004

R-squared	0.044897	Mean dependent var	0.078058
Adjusted R-squared	0.019083	S.D. dependent var	0.050101
S.E. of regression	0.049621	Akaike info criterion	-3.118884
Sum squared resid	0.091103	Schwarz criterion	-3.033573
Log likelihood	62.81824	Hannan-Quinn criter.	-3.088275
F-statistic	1.739259	Durbin-Watson stat	0.958916
Prob(F-statistic)	0.195338		

Null Hypothesis: POP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.214232	0.0018
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-
Fuller Test Equation
Dependent Variable:
D(POP)
Method:
Least
Squares
Date:
09/06/25
Time: 23:51
Sample (adjusted): 1982 2024
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
POP(-1)	-0.437604	0.103840	-4.214232	0.0001

C	1.136399	0.272654	4.167914	0.0002

R-squared	0.302243	Mean dependent var	-0.011534
Adjusted R-squared	0.285225	S.D. dependent var	0.092297
S.E. of regression	0.078032	Akaike info criterion	-2.218000
Sum squared resid	0.249649	Schwarz criterion	-2.136084
Log likelihood	49.68700	Hannan-Quinn criter.	-2.187792
F-statistic	17.75975	Durbin-Watson stat	1.719946
Prob(F-statistic)	0.000134		

Null Hypothesis: PHCR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.434770	0.1385
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-
Fuller Test Equation
Dependent Variable:
D(PHCR)
Method:
Least
Squares
Date:
09/06/25
Time: 23:51
Sample (adjusted): 1982 2024
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PHCR(-1)	-0.286484	0.117664	-2.434770	0.0193
C	26.24589	10.79954	2.430279	0.0196

R-squared	0.126323	Mean dependent var	-0.046512
Adjusted R-squared	0.105014	S.D. dependent var	0.921350
S.E. of regression	0.871631	Akaike info criterion	2.608494
Sum squared resid	31.14935	Schwarz criterion	2.690410
Log likelihood	-54.08262	Hannan-Quinn criter.	2.638702
F-statistic	5.928107	Durbin-Watson stat	2.079681
Prob(F-statistic)	0.019340		

Null Hypothesis: LNUNE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.275339	0.9981
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNUNE) Method: Least Squares
Date: 09/06/25 Time: 23:52 Sample (adjusted): 1982 2024
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNUNE(-1)	0.077246	0.060569	1.275339	0.2094
C	-0.071256	0.060855	-1.170917	0.2484

R-squared	0.038157	Mean dependent var	0.006262
Adjusted R-squared	0.014697	S.D. dependent var	0.019582
S.E. of regression	0.019438	Akaike info criterion	-4.997802
Sum squared resid	0.015491	Schwarz criterion	-4.915886
Log likelihood	109.4527	Hannan-Quinn criter.	-4.967594
F-statistic	1.626489	Durbin-Watson stat	1.794623
Prob(F-statistic)	0.209369		

Null Hypothesis: INFL has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.47269	0.0000
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-
Fuller Test Equation
Dependent Variable:
D(INFL)
Method:
Least
Squares
Date:
09/06/25
Time: 23:53
Sample (adjusted): 1982 2024
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFL(-1)	-0.910732	0.062928	-14.47269	0.0000
C	14.28183	2.487793	5.740763	0.0000

R-squared	0.836300	Mean dependent var	-4.751956
Adjusted R-squared	0.832308	S.D. dependent var	33.81584
S.E. of regression	13.84767	Akaike info criterion	8.139506
Sum squared resid	7862.078	Schwarz criterion	8.221423
Log likelihood	-172.9994	Hannan-Quinn criter.	8.169715
F-statistic	209.4587	Durbin-Watson stat	1.038244
Prob(F-statistic)	0.000000		

Null Hypothesis: LNCONEX has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.449942	0.0144
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-
Fuller Test Equation

Dependent Variable:
D(LNCONEX)

Method:
Least
Squares
Date:
09/06/25
Time: 23:54
Sample (adjusted): 1982 2024
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCONEX(-1)	-0.033225	0.009630	-3.449942	0.0013
C	0.213477	0.036568	5.837802	0.0000

R-squared	0.224983	Mean dependent var	0.094016
Adjusted R-squared	0.206081	S.D. dependent var	0.086514
S.E. of regression	0.077086	Akaike info criterion	-2.242390
Sum squared resid	0.243633	Schwarz criterion	-2.160474
Log likelihood	50.21139	Hannan-Quinn criter.	-2.212182
F-statistic	11.90210	Durbin-Watson stat	1.857128
Prob(F-statistic)	0.001312		

Second difference

Null Hypothesis: D(LNRGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.334832	0.0201
Test critical values:	1% level	-3.615588	
	5% level	-2.941145	
	10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-
Fuller Test Equation
Dependent Variable:
D(LNRGDP,2) Method:
Least Squares
Date: 09/06/25
Time: 23:55 Sample
(adjusted): 1983
2020

Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNRGDP(-1))	-0.474494	0.142284	-3.334832	0.0020
C	0.037585	0.013307	2.824415	0.0077

R-squared	0.236011	Mean dependent var	-0.000116
Adjusted R-squared	0.214789	S.D. dependent var	0.048833
S.E. of regression	0.043272	Akaike info criterion	-3.391426
Sum squared resid	0.067409	Schwarz criterion	-3.305238
Log likelihood	66.43710	Hannan-Quinn criter.	-3.360761
F-statistic	11.12110	Durbin-Watson stat	2.132788
Prob(F-statistic)	0.001988		

Null Hypothesis: D(POP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.884235	0.0001
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-
Fuller Test Equation
Dependent Variable:
D(POP,2)
Method:
Least
Squares
Date:
09/06/25
Time: 23:56
Sample (adjusted): 1983 2024
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POP(-1))	-0.916804	0.155807	-5.884235	0.0000
C	-0.008462	0.014472	-0.584748	0.5620

R-squared	0.463981	Mean dependent var	0.001618
Adjusted R-squared	0.450581	S.D. dependent var	0.125640
S.E. of regression	0.093128	Akaike info criterion	-1.863231
Sum squared resid	0.346915	Schwarz criterion	-1.780485

Log likelihood	41.12785	Hannan-Quinn criter.	-1.832901
F-statistic	34.62423	Durbin-Watson stat	1.722944
Prob(F-statistic)	0.000001		

Null Hypothesis: D(PHCR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.907773	0.0002
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PHCR,2) Method: Least Squares
Date: 09/06/25 Time: 23:56 Sample (adjusted): 1983 2024
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PHCR(-1))	-1.218909	0.154141	-7.907773	0.0000
C	-0.066229	0.142123	-0.465995	0.6437

R-squared	0.609881	Mean dependent var	-0.002381
Adjusted R-squared	0.600128	S.D. dependent var	1.454208
S.E. of regression	0.919574	Akaike info criterion	2.716637
Sum squared resid	33.82469	Schwarz criterion	2.799383
Log likelihood	-55.04937	Hannan-Quinn criter.	2.746966
F-statistic	62.53287	Durbin-Watson stat	2.084532
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNUNE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-5.034076	0.0002
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNUNE,2) Method: Least Squares
Date: 09/09/25 Time: 21:34 Sample (adjusted): 1983 2024
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNUNE(-1))	-0.865030	0.171835	-5.034076	0.0000
C	0.005658	0.003191	1.772977	0.0838

R-squared	0.387836	Mean dependent var	0.001296
Adjusted R-squared	0.372531	S.D. dependent var	0.025130
S.E. of regression	0.019906	Akaike info criterion	-4.949119
Sum squared resid	0.015850	Schwarz criterion	-4.866373
Log likelihood	105.9315	Hannan-Quinn criter.	-4.918790
F-statistic	25.34192	Durbin-Watson stat	1.825706
Prob(F-statistic)	0.000011		

Null Hypothesis: D(INFL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.27410	0.0001
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-
Fuller Test Equation
Dependent Variable:
D(INFL,2)
Method:
Least
Squares
Date:
09/09/25
Time: 21:36
Sample (adjusted): 1983 2024
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFL(-1))	-1.055126	0.061081	-17.27410	0.0000
C	-0.277001	2.085902	-0.132797	0.8950

R-squared	0.881795	Mean dependent var	4.963909
Adjusted R-squared	0.878840	S.D. dependent var	38.42333
S.E. of regression	13.37443	Akaike info criterion	8.071014
Sum squared resid	7155.013	Schwarz criterion	8.153760
Log likelihood	-167.4913	Hannan-Quinn criter.	8.101344
F-statistic	298.3946	Durbin-Watson stat	2.318639
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNCONEX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-4.864987	0.0003
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNCONEX,2) Method: Least Squares
Date: 09/09/25
Time: 21:36 Sample (adjusted): 1983 2024

Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNCONEX(-1))	-0.749393	0.154038	-4.864987	0.0000
C	0.069224	0.019798	3.496470	0.0012

R-squared	0.371742	Mean dependent var	-0.002465
Adjusted R-squared	0.356035	S.D. dependent var	0.106783
S.E. of regression	0.085690	Akaike info criterion	-2.029702
Sum squared resid	0.293714	Schwarz criterion	-1.946956
Log likelihood	44.62374	Hannan-Quinn criter.	-1.999372
F-statistic	23.66809	Durbin-Watson stat	1.966389
Prob(F-statistic)	0.000018		

Dependent Variable: LNRGDP Method: ARDL
Date: 09/09/25
Time: 21:47 Sample (adjusted): 1982 2020
Included observations: 39 after adjustments Maximum dependent lags: 1 (Automatic selection) Model selection method: Akaike info criterion (AIC)

Dynamic regressors (0 lag, automatic): POP PHCR
LNUNE INFL LNCONEX
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRGDP(-1)	0.862490	0.026090	33.05767	0.0001
POP	0.107682	0.027579	3.904464	0.0005
PHCR	0.002829	0.002545	1.111619	0.2746
LNUNE	0.023772	0.110493	0.215140	0.8310
INFL	0.002805	0.000192	14.58753	0.0001
LNCONEX	0.126132	0.022288	5.659117	0.0001
C	-0.465084	0.234915	-1.979798	0.0564

R-squared	0.999836	Mean dependent var	3.826543
Adjusted R-squared	0.999805	S.D. dependent var	1.024963
S.E. of regression	0.014317	Akaike info criterion	-5.493556
Sum squared resid	0.006559	Schwarz criterion	-5.194968
Log likelihood	114.1243	Hannan-Quinn criter.	-5.386425
F-statistic	32453.28	Durbin-Watson stat	1.958856
Prob(F-statistic)	0.000001		

*Note: p-values and any subsequent tests do not account for
model selection.

Dependent Variable:
D(LNRGDP) Method:
ARDL
Date: 09/09/25
Time: 21:49 Sample
(adjusted): 1983
2020
Included observations: 38 after
adjustments Maximum dependent
lags: 1 (Automatic selection) Model
selection method: Akaike info
criterion (AIC)
Dynamic regressors (0 lag, automatic): D(POP) D(PHCR)
D(LNUNE) D(INFL) D(LNCONEX) ECM(-1)
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(LNRGDP(-1))	0.877647	0.055924	15.69347	0.0000
D(POP)	0.106559	0.029195	3.649930	0.0010
D(PHCR)	0.000228	0.002841	0.080396	0.9365
D(LNUNE)	-0.072513	0.153804	-0.471464	0.6407
D(INFL)	0.002866	0.000186	15.41793	0.0000
D(LNCONEX)	0.098661	0.027929	3.532546	0.0014

ECM(-1)	-0.824508	0.186787	-4.414159	0.0001
C	0.002154	0.005492	0.392109	0.6977

R-squared	0.937078	Mean dependent var	0.079339
Adjusted R-squared	0.922396	S.D. dependent var	0.050122
S.E. of regression	0.013963	Akaike info criterion	-5.520200
Sum squared resid	0.005849	Schwarz criterion	-5.175445
Log likelihood	112.8838	Hannan-Quinn criter.	-5.397539
F-statistic	63.82582	Durbin-Watson stat	2.183711
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Bounds Test
Date: 09/09/25
Time: 22:05 Sample:
1982 2020
Included observations: 39

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	3.968445	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Test Equation:
Dependent Variable:
D(LNRGDP) Method:
Least Squares
Date: 09/09/25
Time: 22:05 Sample:

1982 2020
Included observations: 39

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.164822	0.741868	-1.570120	0.1262
POP(-1)	0.078589	0.085877	0.915138	0.3670
PHCR(-1)	0.007459	0.007630	0.977554	0.3356
LNUNE(-1)	0.607615	0.408105	1.488870	0.1463
INFL(-1)	0.000373	0.000265	1.403790	0.1700
LNCONEX(-1)	0.225358	0.079746	2.825962	0.0081
LNRGDP(-1)	-0.276347	0.091173	-3.031030	0.0048

R-squared	0.357567	Mean dependent var	0.078058
Adjusted R-squared	0.237111	S.D. dependent var	0.050101
S.E. of regression	0.043760	Akaike info criterion	-3.259031
Sum squared resid	0.061279	Schwarz criterion	-2.960443
Log likelihood	70.55111	Hannan-Quinn criter.	-3.151901
F-statistic	2.968445	Durbin-Watson stat	1.339824
Prob(F-statistic)	0.020297		