# EFFECT OF POPULATION GROWTH ON UNEMPLOYMENT IN NIGERIAN ECONOMY

**BY**

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**A RESEARCH THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS & DEVELOPMENT STUDIES, COLLEGE OF ARTS AND SOCIAL SCIENCES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF SCIENCE (M.Sc) DEGREE IN ECONOMICS AND DEVELOPMENT STUDIES, IGBINEDION UNIVERSITY, OKADA, EDO STATE.**

**SEPTEMBER, 2021.**

## DECLARATION

ONELE-OGAH VICTORIA OSINACHI, hereby declare that this Master thesis is a result of research that has been undertaken by me under the guidance of my supervisors and no part of it has been submitted previously, in whole for the award of any other academic degree elsewhere. Except from references to other works which have been duly cited, this thesis is original work.

### Student Name: ONELE-OGAH VICTORIA OSINACHI

Signature………………………. Date…………………………

## CERTIFICATION

We certify that this project, completed by Onele-Ogah Victoria Osinachi with the MatriculationPG/13/016096/ASS is adequate in scope and content and meet the requirement for award of Master for Science (M.Sc) degree in Economics and Development Studies.

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## ABSTRACT

This thesis examines the effect of population growth on unemployment in Nigeria using Autoregressive Distributed Lag Bounds (ARDL) approach on time series data from 1985-2019. It explores the short-run and long-run relationships between population growth and selected macroeconomic variables of economic growth, dependency rate, fertility rate, and unemployment as well as the direction of causality between them. The study showed that population growth does not significantly impact unemployment in the short run; rather, it is the structure of population that does. It was also revealed that population structure has significant negative impact on unemployment in the long run, indicating that rise in population structure tends to reduce unemployment rate in the long run. The study also found that population growth and its components exerts a negative impact on the overall economic conditions in Nigeria. It was recommended that education and training programmers should be reengineered to ensure that more individuals take better advantage of the entrepreneurship training, skills acquisition and financing opportunities in order to boost self-employment. Sectors that are more employment-yielding, such as agriculture and modern services, should be singled out and receive more investments and enabling environment that will create more employment and spur economic growth and development.

## DEDICATION

I dedicate this study to Almighty God, the giver of life who has walked with me to the end of this programme. Also, to my Caring Mother, Mrs. Elizabeth Onele Deniss (JP), to my beloved elder brother, Hon. Comrade Chinedu Ogah (OON) for their wonderful Prayers, Encouragements and Special Support

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# CHAPTER ONE

# Background to the Study

The increase in the level of Nigerian population with high impact on macroeconomic variables is of great concern to economists and researchers. Nigeria has one of the fastest growing population in the world with a population of about 83,562,785 as at 1985, and 200,936,599 million in 2019, with a population growth rate of 2.60% in 2019 (CBN, 2019). The country has been recognized as the most populated country in Africa endowed with wide scope of natural resources, and accounts for one in five of Sub-Sahara Africa’s people. Continuous rise in population will lead to rise in unemployment and other vices for the economy as it affects a wide range of socio- economic variables. This has become a challenge to many economists and policy makers (United Nations, 2019).

The effect of population became an important phenomenon during the 18thcentury. Malthus (1978) in his published work on “An Essay on Principle population”, opines that population is the total number of distinct group of individuals/citizens of people living in a particular city with common characteristics. Nigeria has the largest economy in Africa with the GDP standing at 26,725million and 448.12billion (US Dollar) in the year 1985 and 2019 respectively (ADB, 2020).

The geometric rise in population without the corresponding increase in output depicts some effects on the economy such as shortage in demand, unemployment and other vices. This gives rise to negative consequences through the different aspects of human lives such as education, poverty, social welfare, unemployment, migration and health, especially in developing nations.

Unemployment exists when there is no job for qualified personnel who are willing and ready to work. Globally, unemployment has been a problem especially in the Less Developed Countries (LDCs). It is a hindrance to the attainment of sustainable development goals .This has left the citizens with a lot of worries ranging from the society, government, economists and other analysts in the economy and it has been tagged as a barrier to social and economic development especially in a developing nation including Nigeria. Sequel to this, it is pertinent to look critically into population regulation and control as a result of its escalating growth rate. This happens because the available industries are unable to employ a large number of persons in the labor market. In examining the effect of population, this study focuses on the consequences of population growth which affect socio-economic variables.

### Statement of the Research Problem

Nigeria is richly endowed with natural resources, starting from crude petroleum (oil and gas), to rich water resources, sufficient fertile arable land and rich forest resources. Nigeria has achieved significant growth in its economy with the highest being of about 5.91% in the third quarter of 1985. The Nigerian economy rose to 2.1% in the 4th quarter of 2019 and 2.3% for the full year (NBS, 2021).

Some theories started with the Malthusian Population trap in their statements showing that high population growth exerts pressure on the natural resources available, depresses capital formation and diverts additions to capital resources to maintain rather than increasing the stock of capital per worker thereby restraining economic growth. While other theories believe that high population is tantamount to increase in the labour force, increase in productivity and positive effects such as economies of scale and specializations which lead to economic growth and development. Thus, there is divergence of opinion regarding the desirability of population

growth as some researchers view rapid population growth as a real problem while others assert that it is not a matter of great concern (Afzal, 2012). The Nigerian population has been growing faster than the rate of economic growth. The question is now on how best to exploit the theoretical and empirical relationship between population growth and unemployment. The question should be whether growing population leads to increase on unemployment or whether the unemployment level rises faster than economic growth.

### 1.2 Research questions

1. Is there a relationship between population growth and unemployment?
2. Is there a relationship between population growth and economic growth?

### Objectives of the study

The main objective of this study is to empirically examine the effect of population growth on unemployment in Nigeria. While the following are the specific objectives:

* + 1. Ascertain the effect of population growth on unemployment in Nigeria
    2. Examine the impact of population growth and economic growth

### Research Hypotheses

The following hypotheses are stated in null and alternative forms:

* + 1. H0: population growth does not have any significant impact on unemployment in Nigeria

H1: population growth has significant impact on unemployment in Nigeria

### Significance of the study

This study will provide information on population trends and implications of such trends on the Nigerian economy. The study will also be useful to the employers of labour and to explore the

merits of population as they serve as a very important factor of production in the country. The study will serve as a reference research work, adding to the existing literature on the subject matter.

### Scope of the Study

The basic aim of the study is to determine the impact of population growth on unemployment in the Nigerian economy. The research covers a time series between 1985- 2019, a period of 35 years. The study will emphasize on the effect of population growth on unemployment in Nigeria.

# CHAPTER TWO LITERATURE REVIEW

### Conceptual Review

Population refers to the number of people living in a particular place at a given time. In Nigeria, there has been a phenomenal growth in population in the last few decades with high growth rate of population between 2.8 percent and 3 percent. It is now established that the population of Nigeria is very large, young and is increasing very rapidly. Where as in 1931 the population was

20.06 million, in 1953 the population was estimated at 30.4 million. In 1991 and 2006, it increased to 88.5 million and 140 million respectively. Demographic report showed that the nation’s population rose to 201,214,411 million in 2019, with a population growth rate of 2.60% (CBN 2019). Nigeria is the most densely populated country in Africa and endowed with abundant natural resources.

Unemployment is generally defined as a situation in which persons who are willing and able to work are not employed. Unemployment is the most serious economic danger a worker has to face in any society. Unemployment may not necessarily arise out of lack of vacancies in the economy but essentially that the unemployed may not possess the right skills for the available jobs or that he is unaware that the vacancies exist somewhere for his type of skill. The unemployment rate is simply the percentage of the labour force which is unemployed.

# Theoretical review

### 1 An Overview of Population trend on Unemployment in Nigeria

In 2021, the unemployment rate in Nigeria is estimated to reach 32.5 percent. This figure is projected to increase further in 2022 (NBS, 2021). Available data showed the unemployment rate in Nigeria rose constantly in the past years (NBS, 2021).

Nigeria’s population stood at 140,431,790 by 2012, and further increased to 184 million people by 2018 without commensurate economic development because of poor planning by the nation's

managers (National Population Commission (NPC), 2018). The continued increase in population

has consequently led to the growth in numbers of youths’ population seriously looking for jobs.

Nigeria account for about 47% of West Africa’s population and has one of the largest

populations of youth in the world (ADB, 2020).

* + 1. **Population Trend in Nigeria**

In Nigeria there had been a phenomenal rise in population in the last few decades with high

growth rate of population between 2.8 percent and 3 percent and spatially uneven (NPC, 2009).

It is now recognized that the population of Nigeria is very large, young and is increasing very

rapidly. Whereas in 1931 the population was 20.06 million, in 1953 the population of Nigeria

was estimated at 30.4 million and 1963, it increased to 55.7 million. In 1991 and 2006, it

increased to 88.5 million and 140 million respectively (NPC, 2009).The rising population growth

rate has both positive and negative effects on the economy. On a positive note, Nwosu (2014) asserts that high population increases the size of the market which encourages firms to take the opportunities of economies of scale and better use of resources. Negatively, overpopulation cause environmental degradation. In 1798, Thomas Malthus stated his theory of population

which he mentioned that as population increases geometrically, it will reach a point where the country will reach its carrying capacity. This means that carrying capacity is the number of people that the environment and other elements of the environment can support. Presently Nigeria has reached and exceeded its carrying capacity and if proper measures are not taken, the country has to go back to a subsistence level (Dao, 2012). Nigeria has reached a point where the environments can only render little support to the enormous population of the country.

### Reasons for Nigeria’s Increasing Population

The major factor causing an increased population is the birth rate. Birth rate has influenced the population growth rate in so many ways and it is as a result of good and improved medical facilities and services. Presently, there are improved medical services which reduces child, infant and even mother mortality (Odusina, 2011).

The matter of early marriages precisely in the Northern Part of Nigeria poses a big problem. Due to the fact that women marry at an early stage leads to increased birth rate and prolong their child bearing years, which makes them give birth to too many children (Odusina, 2011). This also accounts for the reason for rise in the Nigeria’s population growth rate.

The reason is based on the increase in material welfare given to citizens. When people are materially well off, they begin giving birth to as many children as they wish without giving any thought to the implication of their actions since they are thriving well. This is also based on the arguments of Thomas Malthus on the poor laws in England, which they suggested that relief materials should be discouraged because an increase in material welfare makes them have more babies. At a point in time, it was observed that an increase in a family’s wealth or income causes

them to have large families given that they have more capacity to cater for them. Old-age security is another factor that contributes to large families given that parents have the mentality that having many children gives them security by guaranteeing that the children will provide for them and give them a better life when they are old and unable to do productive activities. Some parents in the past also believe that having many children is of advantage to them as it enables them have many people to work on their farms (Odusina, 2011).

The matter concerning customs, religions and superstitions has intensely affected population growth. Religions like Islam supports Polygamy (act of marrying more than one wife). This gives access for a man to marry up to four wives and have as many children as he wishes. This practice makes an average man have a least of eight children. The Catholic Church on the other hand discourages the act of family planning as they view it as a sin, based on the teaching that God commanded us to go ahead and multiply without any limitation (Odusina, 2011). This belief tends to encourage couples to give birth without control or limit, thereby increasing the population. Also, some customs in Nigeria believe so much in having male children as they view the male child as a blessing and as the pillar of the family who will carry the family lineage. This in fact makes them strive so hard to get male children regardless of the females they have (Nwosu, 2014).

The factor causing a high population is the fact that there has been a decreased death rate compared with birth rate. This problem is attributed to higher standard of living, higher literacy level, good hygiene and medical services and facilities (Odusina, 2011).

Population growth will continue for decades even after birth rates have declined substantially. This can be attributed to two basic factors. First, high birth rates cannot be altered substantially

overnight. The social, economic, and institutional forces that have influenced fertility rates over the course of centuries do not simply evaporate at the urging of natural leaders. The second factor is the age structure of many developing countries’ population.

### Effect of Population Growth in Nigeria

The effect of population growth on economic growth is more adverse in developing countries because of greater resource-dilution and resource-diversion effects, as well as poorer policy on environments (Headey and Hodge, 2009). Eastwood and Lipton (2011) asserts that in contrast to Asia, there is an alarming implication of continuing high levels of natural increase in sub Saharan African population in the face of low savings rates and low capital productivity.

The effect of population growth on per capita incomes is unfavorable. The growth in population tends to retard per capita income in three ways; it increases the pressure of population on land, it leads to rise in cost of consumption goods because of the scarcity of the cooperate factors to increase their supplies; it leads to a decline in the accumulation of capital because with increase in family members, expenses increase. This is in addition to the adverse effect that population growth has on standard of living, employment, capital formation, environment, social infrastructure, and agricultural development. According to Jhingan (2011) population growth affects economic development in two ways: first, by promoting economic development and second by retarding economic development.

### Unemployment in Nigeria: Causes and Effects

Oyebade (2003) has categorized unemployment into – those who have been in one employment; but lost the jobs as a result of lay off or downsizing, and those youths who have not got any appointment before. Similarly, scholars such as Oluseyi and Elegbede (2012); Adawo,

Essien, and Ekpo, (2012); Adesina (2013); Gbagolo and Eze (2014) in their different studies have identified some key causes of unemployment in Nigeria, among which are: Population Growth – There is rapid growth in Nigeria’s population. The high population growth rate has given rise to the rapid growth of the labour force. Nigeria account for about 47% of West

Africa’s population and has one of the largest populations of youth in the world (ADB, 2020).

Nigeria Educational Curriculum – The types of Nigeria educational curriculum is tailored towards white-collar jobs. Nigeria's type of education has always raised the youths’ expectations that they will easily get government or corporate jobs after their education. Therefore, most of the youths lack skills needed for self-employment but are only pursuing paper certificates that qualify them for office jobs.

Economic Recession – This is a period of general economic decline vis- a-vis drop in the stock market; an increase in unemployment, etc. The economic recession normally bites hard on the citizenry as it generally affects all the areas of the national economy. The question that could be asked in this regard is, what has Nigeria done or how has Nigeria affected the lives of the unemployed youths during the economic boom? What has been Nigeria’s preparation for a time like this?

Corruption – Corruption is one of Nigeria’s major problems, and it plays a critical role in the problem of unemployment that the nation is experiencing. Illegally acquired funds by political office holders could have been used in transforming the economy far better than their European counterparts where Nigerians resort to for green pasture.

Influx of Expatriates – Continued penetration of Nigeria by the expatriates has worsened the situation of unemployment. The unchecked influx of foreigners under the notion that they

possess the skills, which are lacking in Nigeria, has been the excuse for allowing them to take up many jobs the youth could have fit-in the expatriate flood Nigeria competing for jobs with Nigerians in areas such as construction sites, factories, auto sales outlets, communications, companies amongst others.

Rural-urban Migration: massive rural-urban migration by the youths is another cause of unemployment in Nigeria. Over the years, the development pattern in Nigeria has been favorable to urban parts of the nation. This pattern of development has caused mass movement of the youths to a few urban centers of Nigeria to search for jobs, thereby; made urban cities to be congested, hence the shortage of employment. The rural areas which could have been assisted in its little way to provide some jobs had been neglected by the government in terms of provision of infrastructural facilities which could have encouraged the youths to stay.

Insecurity – security is crucial for the nation’s economic development and its absence means that economic growth and development will be hindered. The insecurity of lives and properties/businesses have led to the close down or relocation of many businesses in Nigeria. Many businesses in Nigeria, especially in the Northern part of the nation, had been closed down owing to the activities of dreaded Boko Haram and it has contributed to the high rate of unemployment in Nigeria. Similarly, in southern parts of the nation are cases of armed robbery and kidnapping which has adversely affected the business's development.

Governmental Regulation – government regulation at times does lead to unemployment, for instance, the banning of some products that are considered harmful to human life. Recently there has been a tough regulation regarding the importation of frozen foods such as – turkey, fish, and chickens, the use of preservatives for these foods is considered hazardous to health hence

government regulation against it. Similar to this is the banning of a commercial motorcyclist on some roads considered to be dangerous for these types of labour activities. Although the ban on importation of many of the products is meant to protect the indigenous firms and create, more jobs locally, while the decision to ban commercial motorcyclists on the part of the government is to protect the lives of the citizens. However, the banning should have been a gradual process, as this has brought about an increase in the level of unemployment in the country.”

Other causes of unemployment include includes epileptic electricity supply – poor electricity supply has led to a close down of many businesses, which depend on regular supply of electricity for the productions of goods and services. Some of these businesses resulted in the use of a power generating plant for power supply. However, many of these businesses are running at loss; owing to the high cost of fuel, which brings about high cost of production. Therefore, many of these businesses, which could not continue to run at loss, have to close down.

Non-diversification of the economy – “Nigeria sole dependent on crude oil as the main source of revenue and economy mainstay has been contributing to high rate of unemployment. Instead of the nation to have diversified into different economic activities, Nigeria attached itself to a single economy. The grave mistake that Nigeria continued to commit is the neglect of the agricultural sector. The Agricultural sector that has been the major employer of labour before the discovery of crude oil was completely neglected. It will be recalled that before the discovery of oil in Nigeria, a federating nation as oil was each component region of the nation had its main source of economy. The Northern part of the country was producing the groundnut pyramid; the Western part was producing cocoa, while the Eastern Region (Adegbami, 2013) produced oil palm in economic quantity. Adegbami further states concerning the crude oil discovery in Nigeria that “With the change to the monolithic economy by Nigerian, revenue allocation and

formula for allocating resources become a problematic issue causing resentments and clog in the wheel of the nation's progress and development. Unfortunately, the oil sector where the economic attention of the nation is shifted to could not provide the needed jobs for the teeming youths. The effect is a large number of job seekers who have no place in the oil industry. Even with the expansion of the industry, unemployment has continued to grow at an alarming rate” (Adesina, 2013).

Technological Advancement – Technological advancement whereby the use of technological apparatuses is applied in daily economic activities has made organization jobs to be easier, and as a result, it has continued to reduce the number of workers needed for a particular job. For instance, the use of technological apparatuses such as computers and other cashless electronic transactions vis-a-vis the use of Automated Teller Machine (ATM), Online Baking and the use of Point-of Sales (POS) has led to reduction of the workforce in the banking industries.

Unemployment is a serious disease tormenting Nigerian youths daily, just as the nation’s population continues to increase. The fact that the government is not proactive enough concerning the problem made it persist. The increase in the government’s annual budget and borrowing notwithstanding the case of unemployment continue. The deplorable rate of youths’ unemployment and joblessness do not only lead to low income or no income generation; but also results in low or poor living standard. It is widely believed, that attainment of full employment is an antidote to poverty among the citizenry as well as foster economic growth, while unemployment breed poverty. Besides, unemployment could also be seen as wasting essential resources, that is, human resources. Human resources who could have contributed to the increase in national income and indirectly to the nation’s development are left unutilized (Adawo, Essien, and Ekpo, 2012). Thus, it is not surprising that some of the energetic youths whose energies are

not utilized in their fatherland resulted to find their way out of the country by all means. Many of these youths have even gone extra miles to travel by road in their bid to get to Europe. It is saddening that some of these had met their sudden death in the Sahara desert while embarking on journey to European nations. The socio-economic situation of Nigeria is also affected by unemployment as many Nigerians; especially the youths lack purchasing power. When purchasing power is low, it leads to low consumption of goods, and consequently leads to a reduction in the production of goods. The far reaching effect is that production industries will not grow, which is a minus to the economic growth and development. Some of the unemployed youths have also been involved in crimes and other “unpalatable economic activities”. For instance, unemployed youths do engage in prostituting, thuggery, hooliganism, pickpocketing, drugs addicting and peddling, armed robbery or even hired killers, hence, fit to be used as tools in the hands of politicians to achieve their inordinate goals (Adegbami & Adewole, 2013).

### Theoretical Literature.

* + 1. **Theories of Population Growth**

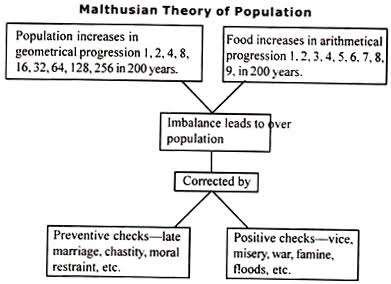
There are theories that show the characteristics of population growth and means by which such population sizes can be controlled. Some of these theories are listed below

1. The Malthusian theory of population.
2. The theory of demographic transition.
3. The Microeconomic Household Theory of Fertility.

### The Malthusian Theory of Population Growth

English clergyman & economist, Thomas Malthus (1766-1834) enunciated his view about population in his famous book, *Essay on the Principle of Population* as it affects the future improvement of society. The Malthusian theory explains the relationship between the growth in food supply & in population. It states that population increases faster than food supply and if unchecked, leads to vice or misery . In his theory, he states that population increases at a geometrical progression while food supply rises at a slow arithmetical progression due to the operation of the law of diminishing returns. This growth would lead to an imbalance which leads to over population.

### 2.0 Malthusian Theory of Population



**Fig 2.1Source: Jhingan and Sharama (2011).**

Malthus postulates that to curtail this over population, preventive checks and positive checks should be put in place. Preventive checks that need to be applied are late marriage, celibacy,

moral restraint, etc. If people fail to check growth of population by the adoption of preventive checks, positive checks operate in the form of vice, misery, famine, war, disease, pestilence, flood & other natural calamities which tend to reduce population & thereby bring a balance with food supply. According to Malthus, a nation which has an unchecked population growth is likely to experience an unfavourable economic growth, due mainly to the presence of limited resources with which economies are endowed. His opinion was that diminishing returns will most likely affect food and resources as an increase in the population of a country is expected to decrease available natural resources and in the long run lower the production of goods. Population growth and size also tends to determine the standard of living in an economy that is characterized by low capital accumulation, low technological change as well as being closed or isolated to interactions with the international community.

According to modern day Neo-Malthusians, poor nations will never be able to risk much above their subsistence levels of per capita incomes unless they initiate preventive checks (birth controls) on their population growth. In the absence of such preventive checks, Malthusian positive checks (starvation, diseases, and wars) on population growth will inevitability provide the restraining force.

### 2.3 .3 The Theory of Demographic Transition

In the mid-20th century, Demographic Transition theory of population growth became the dominant theory of population growth. It is the process by which fertility rate eventually declines to replacement levels. Based on observed trends in Western European societies, it argues that population goes through three stages in their transition to a modern pattern.

The First stage which is the pre transition stage is characterized by low & no growth, as a result of high birth& death rate. In this stage people mostly live in rural areas & their main occupation is agriculture which is a state of backwardness. Large family is regarded as a necessity to augment the low family income. More children are regarded as insurance against old age by the parents. Along with high birth rate, the death rate is also high due to non-nutritional food with a low caloric value and lack of medical facilities & cleanliness. The mortality rate is the highest among the children and women of child bearing age.

The Second stage is the transition stage. The economy enters a stage of economic growth, there is better means of transportation, education expands, and better healthcare thus leading to a decline in mortality rate & birth rate is almost stable. People do not make efforts to control the size of family because of the presence of religious dogmas & social taboos towards family planning.

The Third stage is the post transition stage. In this stage, the fertility rate declines & tends to equal the death rate so that the growth rate of population declines. Education expands & permeates the entire society. Popular education leads to popular enlightenment& more knowledge, people discard old customs, dogmas& beliefs & develop individualistic spirit& break with the joint family. Men and women prefer to marry late, the desire to have more children decline. All these tend to reduce the birth rate which along with an already low death rate brings a decline in the growth rate of population. The advanced countries of the world are passing through this stage & population is increasing at slow pace in them.

### .4 The Microeconomic Household Theory of Fertility

In recent years, economists have begun to look more closely at the microeconomic determinants of family fertility in an attempt to provide a better theoretical and empirical explanation for the observed falling birth rates associated with stage 3 of the demographic transition. In doing this, they have drawn on the traditional neoclassical theory of household and consumer behavior for their basic analytical model and have used the principles of economics and optimization to explain family size decisions. The conventional theory of consumer behavior assumes that an individual with a given set of tastes or preferences for a range of goods (a “utility function”) tries to maximize the satisfaction derived from consuming these goods subject to his or her own income constraint and the relative prices of all goods. In the application of this theory to fertility analysis, children are considered as a special kind of consumption (and in developing countries, particularly low-income countries, investment) good so that fertility becomes a rational economic response to the consumer’s (families) demand for children relative to other goods. The usual income and substitution effects are assumed to apply. That is, if other factors are held constant, the desired number of children can be expected to vary directly with household income (this direct relationship may not hold for poor societies; it depends on the strength of demand for children relative to other consumer goods and to the sources of increased income, such as female employment), inversely with the price (cost) of children, and inversely with the strength of tastes for other goods relative to children. Mathematically, these relationships can be expressed as follows:

𝐶𝑑 = 𝑓(𝑌, 𝑃𝑐 , 𝑃𝑥, 𝑡𝑥), 𝑥 = 1, … … , 𝑛 (2.1)

where Cd, the demand for surviving children (an important consideration in low-income societies where infant mortality rates are high), is a function of the given level of household income (Y), the “net” price of children (the difference between anticipated costs, mostly the opportunity cost of a mother’s time, and benefits, potential child income and old-age support, Pc), the prices of all other goods (Px), and the tastes for goods relative to children (tx). Under standard neoclassical conditions, we would expect the following (expressed both mathematically and in words):

𝑑𝐶𝑑 > 0 − The higher the household income, the greater the demand for children.

𝑑𝑌

𝑑𝐶𝑦 < 0 − The higher the net price of children, the lower the quantity demanded.

𝑑𝑃𝑐

𝑑𝑐𝑑 > 0 − The higher the prices of all other goods relative to children, the greater the quantity

𝑑𝑝𝑥

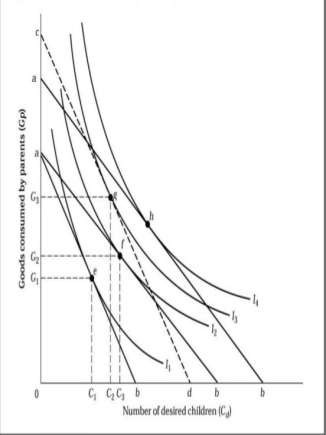
of children demanded.

𝑑𝐶𝑑 < 0 −The greater the strength of tastes for goods relative to children, the fewer children

𝑑𝑡𝑥

demanded.

### Microeconomic Theory of fertility



**Fig 2.5 Source: Todaro&Smith, 2015.**

Figure 2.5 provides a simplified diagrammatic presentation of the microeconomic theory of fertility. The number of desired (surviving) children, Cd, ismeasured along the horizontal axis, and the total quantity of goods consumed by the parents, GP, is measured on the vertical axis. Household desires for children are expressed in terms of an indifference map representing the subjective degree of satisfaction derived by the parents for all possible combinations of commodities and children. Each individual indifference curve portrays a locus of commodity- child combinations that yield the same amount of satisfaction. Any point (or combination of goods and children) on a “higher” indifference curve-that is, on a curve farther out from the origin—represents a higher level of satisfaction than any point on a lower indifference curve. But each indifference curve is a “constant satisfaction” locus. In Figure 2.5, only four indifference

curves, I to 4, are shown; in theory, there is an infinite set of such curves, filling the whole quadrant and covering all possible commodity-child combinations. The household’s ability to “purchase” alternative combinations of goods and children is shown by the budget constraint line, ab. Thus, all combinations on or below line ab (within the triangular area 0ab) are financially attainable by the household on the basis of its perceived income prospects and the relative prices of children and goods, as represented by the slope of the ab budget constraint. The steeper the slope of the budget line, the higher the price of children relative to goods. According to the demand-based theory of fertility, the household chooses from among all attainable combinations the one combination of goods and children that maximizes family satisfaction on the basis of its subjectively determined preferences. Diagrammatically, this optimal combination is represented by point f, the tangency point between the budget constraint, ab, and indifference curve,12. Therefore, C3 children and G2 goods will be demanded. A rise in family income, represented in Figure 2.2 by the parallel outward shift of the budget line from ab to ad’s′, enables the household to attain a higher level of satisfaction (point h on curve I4) by consuming more of both commodities and children—that is, if children, like most commodities, are assumed to be normal goods (demand for them rises with income), an important if in lowincome countries where children are often in demand primarily as a source of future financial security. Note that as income rises, parents may spend more on each child, preferring a smaller number of children, each of higher “quality,” for example, healthier and better educated. Similarly, an increase in the price (opportunity cost) of children relative to other goods will cause households to substitute commodities for children. Other factors (namely, income and tastes) being constant, a rise in the relative price of children causes the household utility-maximizing consumption combination to occur on a lower indifference curve, as shown by the movement of the equilibrium point from f

to e when the budget line rotates around point a to ab″. Note, finally, that if there is a simultaneous increase in household income and net child price as a result of, say, expanding female employment opportunities and a rise in wages, coupled with a tax on children beyond a certain number per family, there will be both an outward shift and downward rotation of the budget constraint line of Figure 2.5 to, say, dashed line cd. The result is a new utility-maximizing combination that includes fewer children per family (point g compared with point f). In other words, higher levels of living for low-income families in combination with a relative increase in the price of children (whether brought about directly by fiscal measures or indirectly by expanded female employment opportunities) will motivate households to have fewer children while still improving their welfare. This is just one example of how the economic theory of fertility can shed light on the relationship between economic development and population growth as well as suggest possible lines of policy.

### Theory of unemployment

**Marxian theory of unemployment (**Marx, Theory of Surplus Value)

It is in the very nature of the capitalist mode of production to overwork some workers while keeping the rest as a reserve army of unemployed paupers. Marxists share the Keynesian viewpoint of the relationship between economic demand and employment, but with the caveat that the market system's propensity to slash wages and reduce labor participation on an enterprise level causes a requisite decrease in aggregate demand in the economy as a whole, causing crises of unemployment and periods of low economic activity before the capital accumulation (investment) phase of economic growth can continue. According to Karl Marx, unemployment is inherent within the unstable capitalist system and periodic crises of mass unemployment are to

be expected. He theorized that unemployment was inevitable and even a necessary part of the capitalist system, with recovery and regrowth also part of the process. The function of the proletariat within the capitalist system is to provide a "reserve army of labour" that creates downward pressure on wages. This is accomplished by dividing the proletariat into surplus labour (employees) and under-employment (unemployed). At first glance, unemployment seems inefficient since unemployed workers do not increase profits, but unemployment is profitable within the global capitalist system because unemployment lowers wages which are costs from the perspective of the owners. From this perspective low wages benefit the system by reducing economic rents. Yet, it does not benefit workers; according to Karl Marx, the workers (proletariat) work to benefit the bourgeoisie through their production of capital. Capitalist systems unfairly manipulate the market for labour by perpetuating unemployment which lowers laborers' demands for fair wages. Workers are pitted against one another at the service of increasing profits for owners. As a result of the capitalist mode of production, Marx argued that workers experienced alienation and estrangement through their economic identity. According to Marx, the only way to permanently eliminate unemployment would be to abolish capitalism and the system of forced competition for wages and then shift to a socialist or communist economic system. For contemporary Marxists, the existence of persistent unemployment is proof of the inability of capitalism to ensure full employment.

### Empirical Literature

Various studies have looked at the nexus between population and growth with mixed results. Some of these are considered as follows: Onwuka (2006) empirically investigated the relationship between population growth and economic development in Nigeria between 1980 and 2003 by employing the OLS technique. His study found out that growth in population

outweighed that of output and that this had negatively affected development in the country because a considerable proportion of the nation’s resources were consumed rather than being accumulated for development purposes.

Stephenson *et al*., (2007) investigated the relationships between demographic and economic variables for Spanish economy for the period 1960-2000. Employing multivariate causality analysis and the Generalized Impulse-Response Function, findings revealed that total fertility varies directly with GDP and infant mortality does not cause total fertility.

Bucci (2008) investigated the existence of a long-run relationship between population (size and growth) and per-capita income focusing on human and physical capital as reproducible inputs. The study revealed that population growth exerts a negative effect on economic growth.

Nwakeze and Omoju (2011) investigated the relationship between economic growth and savings in Nigeria using secondary data for the period 1980 to 2007. The variables employed in the study are saving rate, population, real per capita GDP, interest rate, inflation rate and financial depth. Employing the methodology of vector error correction regression for its analysis, empirical estimation results revealed that savings and rapid growing population have negative and positive influence on economic respectively in Nigeria.

Dao (2012) ascertained the nexus between population and economic growth in Africa using data that covered selected forty-five (45) African economies. Employing panel data regression for the analysis for the variables which include fertility rate, per capita GDP growth, and trade openness, dependency ratio (old and young), the study revealed that the nexus between population growth, fertility rate and old dependency rate are linear and bear a negative influence on economic growth.

Ashraf *et al*., (2012) employed simulation model to assess the quantitative effect of exogenous reduction in fertility on output per capita. The model employs parameters which include schooling, the size and age structure of the population, capital accumulation, parental time input into child-rearing, and crowding of fixed natural resources. The model was then applied to examine the effect of a change in fertility from the UN medium-Variant to the UN low-variant projection using Nigerian vital rates as a base line. The study found out that for a base case set of fixed natural resources such a change will raise output per capita by 5.6 percent at a horizon of 20 years and by 11.9 percent at a horizon of 50 years.

Abdulrahaman (2013) examined population growth and food security in Nigeria from 2010- 2012. The study applied linear regression model and from the analysis using relevant data, the study noted that, Nigeria is witnessing population explosion, where population moves substantially. Some of the factors identified includes; early marriage, poverty and illiteracy, religious beliefs, improved sanitary condition, availability of medical facilities and low mortality rate. The study also learnt that food production within the period of study increased at marginal level, this is why people are vulnerable to hunger as well as hunger related diseases. The study concludes that population explosion due to in efficiencies in agricultural sector out run food supply. Nigeria therefore is in full spank of food insecurity.

Thuku *et al*., (2013) investigated the relationship between population change and economic growth. They employed the Vector Auto regression Estimation technique for an annual time series data between the periods 1963 to 2009.Their study revealed that population growth has a positive impact on economic growth and subsequently promotes development in Kenya.

Eze and Eze (2014) investigated the effects of population growth on economic growth. The study used GDP growth per capita as a proxy for the economic growth. ARDL test to Co- integration was employed for the analysis. The study revealed a long-run sustainable equilibrium between the economic growth and population growth through the use of the ARDL. The study again revealed a unidirectional causality between the population and the economic growth through the use of pairwise Granger Causality test technique.

Bruckner *et al.*, (2014) examined the effects on population growth of shocks to national income that are plausibly exogenous and independent on technological change using a panel of more than 139 countries from 1960 to 2007. Incorporating changes in international oil prices with countries‟ average net oil export shares in GDP and controlling for county and fixed effects, the study revealed that the growth in income induced by oil prices positively impacts on population growth.

Olabiyi (2014) empirically tested the effects of population dynamics on economic growth of Nigeria between 1980 and 2010 using the vector auto regressive (VAR) model. The variables of interest are infant mortality rate, fertility rate, trade openness, government expenditure, real gross domestic product and primary school enrolment. The study was based on annual time series data drawn on variables of interest within the stated period, the researcher found that as fertility rate continued to decline, economic growth was rising; also the researcher established a positive relationship between infant mortality rate and economic growth.

Michael, Usang, Nelson, Etim, Onah and Chukwudi (2014) examined the effect of population explosion on family standard of living in Calabar, Nigeria, and the study applied descriptive statistics and the study is able to discover that the following factors – poor family planning,

illiteracy, poverty, ignorance, culture, religion, migration, and urbanization – causes population explosion and this is influenced by factors like: war, disaster, search for jobs and education, polygamy and early marriage, climate change, and inflation. There is need for mass education on population issues at least annually to serve as a reminder to the public on the effects of large families above the family resources.

Tartiyus, Dauda and Peter (2015) evaluated the impact of population growth on economic growth in Nigeria from 1980 to 2010 given that the impact of population growth on economic growth has always been a subject of disagreement among economists and given Nigeria’s high rate of population growth. The data were analyzed using descriptive statistics as well as regression analysis. The result revealed that there is a positive relationship between economic growth (proxy by GDP growth) and population, fertility and export growth while negative relationships were found between economic growth (proxy by GDP growth) and life expectancy, and crude death rate. It was recommended among others that the average population growth rate of Nigeria should be maintained since it is found to impact positively on economic growth in Nigeria within the period of study and that measures should be adopted to check the crude death rate of Nigeria as it affects economic growth negatively.

Okwori, Ajegi, Ochinyabo, and Abu (2015), empirically examined the Malthusian Population Theory in Nigeria from 1982 -2012. The study applied vector error correction model and the result shows that Population Growth has no significant impact on Economic Development in Nigeria.

Guga, Alikaj and Zeneli (2015) examined Population, Economic Growth and Development in The Emerging Economies from 1994-2010. The study applied OLS regression technique and the

result reveal economic development to be the primary objective of the majority of nations in the world with population growth taken into cognizance as a key factor. Human capital development and economic growth are related to each other. Economic growth provides the conditions for human development and human development provides opportunities for economic growth. Developing countries are unable to afford an increase of such rapid population (as is currently happening and is expected to happen in the coming years). This will negatively affect quality of life and slow economic growth.

Aidi *et al* (2016) recently investigated the connection between population and economic growth in Nigeria. Employing Granger-Causality technique for the period (1970 – 2013), findings revealed that neither population growth Granger-Cause economic growth nor economic growth Granger-Cause population.

Lawanson (2016) examined the effect of rapid population growth on economic development in Nigeria using the ordinary least square technique. The study showed that population has a positive but insignificant effect on economic growth (at first difference) and a negative but significant effect on economic growth (at first difference lagged) in Nigeria}. One of the recommended suggestions is that the focus of the Federal Government of Nigeria should be expanded to include quality empowerment programmes aimed at promoting entrepreneurial development in the country. This would, in turn, boost the production of goods and services locally.

Cist, Mora and Engelman (2017) found a negative impact of population growth rate on economic growth in Sub-Sahara Africa and on food security as well as biodiversity using descriptive statistics in the form of graphs to show the linkage between population and its impact on nature..

However, they found that life expectancy has a positive impact on economic growth on Sub- Sahara Africa.

Makinde and Adegbami (2019) examined the causes and effects of unemployment on youths and national development in Nigeria using descriptive qualitative analysis. The outcome revealed that a high rate of unemployment has led to insecurity and social vices such as prostituting, thuggery, hooliganism, drugs addicting and peddling, armed robbery and hired assassin. The study concluded that unless proactive steps are taken to combat the menace, peace and stability might continue to elude the nation and consequently hamper its progress and development.

### Gaps in Literature

Observing the studies reviewed above, it is evident that researches done to specifically examine the impact of rising population on unemployment in Nigeria are limited, both domestic and international. Also, most of the works were either focused on a country or very large group of countries. Another limitation of previous studies is that their time frames mostly stop at 2013 and 2017. Current events and phenomenal changes are not taken into consideration as well as the current trends in the employed variables were not taken cognizance of, thereby questioning their relevance or their application in today’s world. It is on this premise that this study attempts to cover this identified gap by empirically examining the relationship between rising population and unemployment in Nigeria for the period 1985-2019, specifically looking at its impact of some social- economic indicators and unemployment.

**CHAPTER THREE**

# METHODOLOGY

### Introduction

This chapter presents the sources of data collection and analysis test, model specification and definition of the variables of study.

### Theoretical Framework

In choosing the appropriate economic theory to adopt in the theoretical framework of an empirical study, the researcher must consider the nature and type of the research topic. In this study, the Malthusian Model and the Endogenous growth theory are adopted.

The Malthusian Model: The Malthusian model posits that as population grows indefinitely, it will hamper the ability of the society to provide for itself. He further predicted that in the face of this nemesis there would be growing rates of poverty. According to Mankiw (2010), Thomas Malthus offered what may be history’s most chilling forecast. The vicious cycle that emanates as a result of a high dependency burden which comes with a bulging population leads to low savings, which in turn leads to lower economic growth and as well as lower per capita GDP. Therefore, if population growth is not checked consistently, Malthus made the gloomy prediction that in a short while the nation’s per capita GDP will fall overtime. Falling per capita GDP leads to higher rates of unemployment since the effect of savings and investment which are very critical to boost economic growth has been undermined due to an increasing population. This is what is commonly referred to as the Malthusian trap and this could only be handled if the increasing population is controlled. The implication of Malthus’ model is that the real wages determined by the market would always cling down to the subsistence level. Population would begin to grow if real wages were above that level, including a fall in nominal wages which

occurred because firms now have a larger supply of labour available. This could render some persons unemployed due to the fall in the nominal wage which resorts as a result of the increase or growth in the population.

The Endogenous Growth Model: This study also adopts the endogenous growth model. The rationale for using this model is because it looks deeply into the sources of growth of an economy on the long run based on endogenous technical progress in growth model. It maintains that economic growth is mainly as a result of internal factors rather than external factors. (Romer1994) model is applied which involves human capital along with new technology. In the Roomer’s model, to incorporate endogenous technological change, the function relation is adjusted as:

Yt = F (Kt, Nt, At) (1)

From equation (1) it can be seen that the level of aggregate output depends on the capital (Kt ), and labour (Nt), and technology (At), which appears as an endogenous input. In this model, the output of an individual firm not only depends on its own level of inputs but also on the technology used by other firms whose benefits also accrue to it. The production function of an individual firm denoted by the subscript i is:

Yit= F (Kit, Nit, At) (2)

In the production function above, the technology input subscript t appears long with subscript i because this technology may not be exclusive input of a firm, but may be copied from others. Roomer opined that investment is a source of technological progress. He distinguishes between private returns to capital and social returns to capital. Investment or capital accumulation of a firm enables it to have access to new machines and also new ways to doing things. The model encourages the implementation of policies which advocates for increased investment.

### Model specification

The model specified in this section is based on theoretical framework of the study that considers growth as a function of labour, capital and other efficiency factors. Moreover, real economic growth in this study is considered as overall economic performance, hence growth is captured by three variables: real GDP growth rate, population growth rate and unemployment. These are the main indicators of economic performance for a developing country (Todaro and Smith, 2006). Taking cognizance of the demographic factors that affect population which in turn affects economic growth, the model of unemployment equation is specified. The functional form of the model that will be used in study this is stated as:

UNEM = f(POPG, ADEPR, FERT, URB, AGRSH, RGDP, SSER, TOPEN) (3)

Where UNEM = Unemployment

POPG= population growth (also proxied by growth in the labour force and the share of male and female in total population)

ADEPR = dependency rate FERT = total fertility rate

SSER = secondary school enrolment rate AGRSH = share of agriculture in total GDP RGDP = real Gross Domestic Product

URB = ratio of population in urban centers to total population The ARDL model is specified below:

∆𝑈𝑁𝐸𝑀𝑡 = 𝛼0 + 𝛿1𝑃𝑂𝑃𝐺𝑡 + 𝛿2𝐴𝐷𝐸𝑃𝑅𝑡 + 𝛿3𝐹𝐸𝑅𝑇𝑡 + 𝛿4𝑈𝑅𝐵𝑡+𝛿5𝑆𝐸𝑅𝑡 + 𝛿6𝑅𝐺𝐷𝑃𝑡

+ 𝛿6𝑇𝑂𝑃𝐸𝑁𝑡

𝑝−1

𝑞1−1

𝑞1−1

+ ∑ 𝜓𝑖ΔUNEM𝑡−𝑖 + ∑ 𝜑1∆𝐴𝐷𝐸𝑃𝑅𝑡−𝑖 + ∑ 𝜑2∆𝐹𝐸𝑅𝑇𝑡−𝑖

𝑖=1

𝑖=1

𝑖=1

𝑞1−1 𝑞1−1

+ ∑ 𝜑3𝛥𝑈𝑅𝐵𝑡−𝑖 + ∑ 𝜑4∆𝑅𝐺𝐷𝑃𝑡−𝑖 + 𝜃𝐸𝐶𝑀𝑡−1𝜉𝑡 … … … … .. (4)

𝑖=1 𝑖=1

Apriori expectation: δ1, δ2, δ3, > 0;: δ4, δ5, δ6< 0; also, φ1, φ2, φ3, > 0 φ4, φ5, φ6, < 0

In order to determine the effect of population growth on economic growth, a second equation is specified as:

RGDPG = f(POPG, FERT, URBR, SSER, TOPEN) (3.5)

Where all variables are as earlier defined. In the ARDL form the model is specified as:

∆𝑅𝐺𝐷𝑃𝐺𝑡 = 𝛼0 + 𝛿1𝑃𝑂𝑃𝐺𝑡 + 𝛿2𝐹𝐸𝑅𝑇𝑡 + 𝛿3𝑆𝑆𝐸𝑅𝑡+𝛿4𝑈𝑅𝐵𝐴𝑁𝑅𝑡 + 𝛿5𝑇𝑂𝑃𝐸𝑁𝑡

𝑝−1

𝑞1−1

𝑞1−1

𝑞1−1

+ ∑ 𝜓𝑖ΔUNEM𝑡−𝑖 + ∑ 𝜑1∆𝑃𝑂𝑃𝐺𝑡−𝑖 + ∑ 𝜑2∆𝐹𝐸𝑅𝑇𝑡−𝑖 + ∑ 𝜑3𝛥𝑈𝑅𝐵𝑡−𝑖

𝑖=1

𝑖=1

𝑖=1

𝑖=1

𝑞1−1 𝑞1−1

+ ∑ 𝜑4∆𝑆𝑆𝐸𝑅𝑡−𝑖 + ∑ 𝜑5∆𝑇𝑂𝑃𝐸𝑁𝑡−𝑖 + 𝜃𝐸𝐶𝑀𝑡−1𝜉𝑡(3.6)

𝑖=1 𝑖=1

### Sources of Data

The secondary data comprising time series observations from 1985 to 2019 (35years) shall be employed in this study. The data on GDP and population growth rate will be collected from the World Bank, data for crude birth rate, poverty rate, unemployment rate, and total fertility rate will be collected from CBN statistical bulletin 2019.

### Preliminary test

This study employed the use of various econometric tools of data analysis**.** The augmented- Dickey Fuller (ADF) unit root test was carried out to test for the stationarity of the data, and co- integration tests was also carried out to test if there are co-integrating equations. The error correction mechanism was also used to correct the short run dynamics of the data.

### Method of data analysis

The study employs the Autoregressive Distributed Lag (ARDL) Bound Testing approach to test the long run and short run relationship irrespective of whether the independent variables are integrated of order zero, I(0), one, I(1) or mutually co-integrated. The dependent variable has to be integrated of the order one (1) and the independent variables should not be integrate of order two (2) or higher before the Autoregressive Distributed Lag (ARDL) Bounds Testing approach can be used.

### Justification of The Autoregressive Distributed Lag (ARDL)

There are numerous methods used for testing the existence of a long run relationship between time series variables. The most used co-integration techniques are the two- steps residual based on procedure by Engle and Granger (1987) and the system based reduced rank regression technique.

* + - * 1 ARDL models generate consistent estimates of long- run coefficients that are asymptotically normal, regardless of whether the variables are purely I(0), purely I(1) or mutually co-integrated (Pesaran et al.,2001)
      * The technique (ARDL) provides unbiased and efficient estimates of the long-run model and valid t-statistics even in situations when the variables are endogenous. This is possible because it avoids the problems of serial correlation and endogeneity (Afzal, 2009).
      * ARDL models are suitable for small sample sizes, unlike other VAR methods like the Johansen co-integration technique which in the same situation would result in considerable loss of degrees of freedom (Banerjee et al., 1993). The ARDL technique uses a single equation, making it easier and simpler to interpret unlike the other VAR approach which involves several equation set-ups.

## CHAPTER FOUR

**PRESENTATION OF RESULTS AND EMPIRICAL ANALYSIS**

### Introduction

In order to effectively perform the analysis in this Chapter, various instruments are adopted to present the relevant aspects of the empirical analysis. In particular, the analysis involves two sets of procedures including statistical analysis and econometric analysis. The statistical analysis involves the use of descriptive statistics of the main variables used in the analysis thereby presenting the background characterization of the data used in the analysis. Considering that macroeconomic data are used in the analysis, the time series properties of the variables are also examined and reported for the sake of effective comparison of the trend behaviour of climatic changes and agricultural production in relation to aggregate economic performance. The econometric analysis is essentially the estimation and analysis of the models specified in the previous Chapter. Essentially, population dynamics could present more than one round of effect in the economy. Thus, as demonstrated in the previous Chapter, the autoregressive distributed lags (ARDL) approach is employed to estimate the dynamic relationships.

### Descriptive Statistics

The descriptive statistics of the time series data for the variables used in the study are reported in Table 4.1. The Table shows the mean and other moment conditions for each of the variables. Average unemployment rate is 9.27 over the period, which is relatively low given that it is below 2 digits. This low unemployment rate however overlooks certain strong challenges in the labour market in Nigeria. As Adegboye (2020) has noted, although unemployment is not a critical issue in the country, the case of productive employment opportunities is critical. This suggests that what the countries is experiencing is an ‘employment problem’ rather than an ‘unemployment problem’. Indeed, the labour force in the country is largely involved in some form of activity or the other, the jobs being performed by the labour force is largely equivalent to under-employment and usually do not guarantee livelihood. For instance, World Bank (2012) expressed the peculiarities of employment challengesin countries like Nigeria to include “the poor aspects of work people do, reallocation of labour to better jobs, and generally creating new jobs”.



**Table 4.1: Descriptive Statistics for the Datasets**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Mean** | **Max.** | **Min.** | **Std. Dev.** | **Skew.** | **Kurt.** | **J-B** | **Prob.** |
| UNEMPL | 9.279 | 23.100 | 1.800 | 5.548 | 0.795 | 3.017 | 4.109 | 0.128 |
| POPG | 2.615 | 2.750 | 2.520 | 0.069 | 0.097 | 1.752 | 2.593 | 0.273 |
| LABF | 52.937 | 53.910 | 51.883 | 0.591 | -0.402 | 1.937 | 2.885 | 0.236 |
| MPOP | 50.436 | 50.672 | 50.253 | 0.142 | 0.253 | 1.608 | 3.564 | 0.168 |
| ADEPR | 88.974 | 92.743 | 86.010 | 2.055 | 0.526 | 1.906 | 3.745 | 0.154 |
| FERT | 6.144 | 6.759 | 5.349 | 0.408 | -0.106 | 2.034 | 1.589 | 0.452 |
| URBANR | 36.147 | 50.040 | 22.671 | 8.301 | 0.159 | 1.858 | 2.283 | 0.319 |
| PCIG | 1.773 | 8.595 | -8.926 | 3.942 | -0.559 | 3.307 | 2.128 | 0.345 |
| RGDPG | 4.233 | 14.604 | -7.577 | 4.348 | -0.079 | 3.306 | 0.188 | 0.910 |
| AGRSH | 21.552 | 26.995 | 15.496 | 3.260 | 0.002 | 1.673 | 2.862 | 0.239 |
| SSER | 39.227 | 56.110 | 23.920 | 10.527 | 0.142 | 1.614 | 3.254 | 0.196 |

TOPEN 29.853 58.920 7.360 12.608 0.029 2.327 0.742 0.690

Source: Author’s computation 2021

Average population growth rate is 2.62 percent, which is very high, especially given the current size of the country’s population. The maximum and minimum values, along with the very low standard deviation value of 0.069 suggest that the high population growth rate in the country has persisted over the period of the study. For the other population and demographic variables, average share of labour force in the population was 52.93 percent, indicating that a larger proportion of the country’s population is in the labour force. This is a critical aspect of the population structure in the country which can either be very beneficial as a form of demographic dividend or quite disastrous when the population structure is not well managed. Given the situation of unemployment and underemployment in the country (note that vulnerable employment rate was over 85 percent in 2020 in Nigeria), then it’s can be said that the negative outcome of a large labour force is at play in the country. As Makinde and Oyegbami (2019) have noted, a large and rising labour force with little skill, matched with lower labour demand often results in unemployment and underemployment.

Average male population is just over 50 percent, while adult dependency ratio is 88.97 percent. This dependency ratio is high and can exert greater constraint on productive employment in the country. From Table 4.1, average fertility rate is quite high at 6.14, indicating that on average a woman has 6 children in Nigeria. Compared to less than 2 in advanced economies, this fertility rate is very high and may portend future challenges as a population problem in the country. The rate of urban population is 36.15 percent on average. Consider that the minimum value of the urban rate was 22.67 percent, and the maximum rate was 50.0 percent. This suggests that the share of urban population has grown drastically between 1981 and 2019

from just over 22 percent to 50 percent. Currently, the Table shows that half of the population in Nigeria lives in urban areas. This has both social and physical implications for the economy.

For the GDP variables, the descriptive statistics two indicators are reported – the real GDP growth rate and the GDP per capita growth rate. This is to help identify the place of population in the overall performance of the economy. It is seen from the Table that real GDP growth rate was 4.233 percent on average over the period of the study, while real per capita GDP growth rate was just 1.773 percent on average. Thus, when relatively high growth rate of the economy is calibrated with the patterns of population growth in the country, there is wide disparity between the growth rates. High annual population growth rate is seen to have very strong and debilitating effect on the accounted real income growth. Note that real per capita income growth rate is real GDP growth rate less population growth rate. This is a particular channel through which population is seen as a drag on the economy.

From the Table also, it can be seen that average growth rate of real per capita income (PCIG) in the country is 1.77 over the period, which is quite low for the country. Moreover, the minimum and maximum values of the growth of real income clearly indicate that its growth has fluctuated strongly over the period with values reaching 8.59 percent and -8.92 percent. This instability in real per capita income growth is further underscored by the large standard deviation value (relative to the mean value of 3.94) and the negatively skewed structure of the PCIG series (at -0.587). This suggests that suggesting that most of the data values lies to the right of the mean value. Apparently, there have been large variations in the data series for growth of real income in the country over the years. This strong swings in the growth rate of per real capita income have implications for welfare in the economy as well as the impacts on unemployment.

In terms of the third moments of the variable distributions, we consider the J-B values for each of the series. This indicator shows the level of normality of the probability distribution. The J-B value for all variables fail the significance test at the 5 percent level which indicate that the variables are all normally distributed. This is also the case for all the other variables in the sample for this study.

The initial patterns of relationship among the explanatory variables in the study are examined by considering the correlation coefficients among these variables. The correlation matrix is presented in Table 4.2. There is a strong positive correlation between dependency ratio and fertility rates. This indicates that as fertility is rising, dependency ratio is also rising. This is to be expected, given that high fertility brings about more segment of the population that are not readily in the labour force. However, the share of the labour force in total population is negatively correlated with both fertility rate and dependency ratio, indicating that as more children are born the share of labour force in the population drops. The share of male population is also negatively correlated with ADEPR and FERT, but positively correlated with labour force share. This is an indication that a larger proportion of the labour force in Nigeria may be male. Population growth has the same characteristics in terms of correlation as male population, with a positive correlation with share of agriculture in total GDP and secondary school enrolment. None of the population or demographic factors has any significant correlation with trade openness. This shows the level of disconnect between the macroeconomic factors and the pattern of population growth and dynamics in the country.

**Table 4.2: Correlation Matrix**

**ADEPR FERT LABF MPOP AGRSH POP SSER**

FERT 0.764

(0.000)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| LABF -0.994  (0.000) | -0.784  (0.000) |  |  |  |  | |
| MPOP -0.732 | -0.980 | 0.748 |  |  |
| (0.000) | (0.000) | (0.000) |  |  |
| AGRSH -0.739 | -0.832 | 0.744 | 0.836 |  |
| (0.000) | (0.000) | (0.000) | (0.000) |  |
| POP -0.704 | -0.990 | 0.726 | 0.992 | 0.819 |
| (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |  |  |
| SSER -0.738 | -0.986 | 0.751 | 0.996 | 0.849 | 0.992 |  |
| (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |  |
| TOPEN -0.504 | -0.290 | 0.469 | 0.212 | 0.303 | 0.193 | 0.253 |
| (0.001) | (0.073) | (0.003) | (0.195) | (0.061) | (0.238) | 0.120 |

Source: Author’s computation 2021



### Unit Root and Cointegration Tests

### Unit Root and Cointegration Analysis

Two different tests of stationarity, namely, Augmented Dickey Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests, are utilized in this study to ascertain the time series characteristics of the data on the variables. The results obtained are presented in Table 4.3. From the results of the ADF tests reported in the first panel of the Table, it can be seen that the ADF test statistics for each of the variables in levels are less than the 95 percent critical values. On the other hand, the test statistic values for the series in first differences are greater than the critical values at the 5 percent significance level. Thus, all the variables are non-stationary in levelsbut their first differences were found to be stationary. That is, all variables were integrated of order one or I(1).

**Table 4.3 Unit Root test for Variables**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **ADF Test** | | **KPSS** | | **Order of Integration** |
| *Levels* | *First Difference* | *Levels* | *First Difference* |
| *UNEMPL* | -0.935 | -6.285 | 6.031 | 0.161 | I[1] |
| *RGDPG* | -0.096 | -3.434 | 0.675 | 0.272 | I[1] |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *POPG* | -1.498 | -5.173 | 0.516 | 0.238 | I[1] |
| *LABFG* | 2.335 | 5.923 | 0.516 | 0.207 | I[1] |
| *MPOP* | 1.526 | 9.144 | 0.625 | 0.211 | I[1] |
| *ADER* | 5.103 | 7.081 | 0.501 | 0.159 | I[1] |
| *FERT* | 3.896 | 4.322 | 0.168 | 0.559 | I[0] |
| *URBANR* | -1.742 | -4.009 | 0.728 | 0.212 | I[1] |
| *AGRSH* | -1.755 | -6.769 | 0.661 | 0.193 | I[1] |
| *SSER* | 0.875 | 2.994 | 0.629 | 0.142 | I[1] |
| *TOPEN* | -1.921 | -5.392 | 0.740 | 0.188 | I[1] |

*Note: \* indicates signifies at 5 percent; 95% critical values are reported in parentheses below each test value*



Source: Author’s computation 2021

The KPSS test for stationarity is also employed on each of the variables in order to improve on the robustness of the unit root tests. According to Adegboye (2020), “this test is more relevant in capturing the actual stationarity patterns of the series since the test hypothesis particularly show whether the series are stationary or not and not in reference to the possession of unit roots”. The interpretation of the test outcomes is as follows: a significant KPSS coefficient for a variable indicates non-stationarity. In other words, the null hypothesis for the test is that the data is stationary; while the alternate hypothesis for the test is that the data is not stationary. The result shown in the second panel of Table 4.3 indicates that for each of the series, the null hypotheses of stationarity cannot be rejected for the variables in first differences (the tests statistics fail the test). This indicates that the series are difference-stationary and that all the variables are actually I[1].This implies that a dynamic long run relationship may be estimated based on the ARDL approach to cointegration for the dynamic analysis. Essentially, it is appropriate to use cointegration analysis to estimate the relationships between the variables.

In terms of the overall relationships between population and unemployment, the study proposed the test of long-term autoregressive pattern of relationship. The first analysis therefore is to examine whether a long run relationship exists between dependent variables and

independent variables. Given that the study focuses on error correction processes, the test for a common stochastic trend is conducted in this study for the error correction processes. This involves testing for the existence of a cointegrating relationship between economic growth and tourism sector variables. This test also helps to confirm the application of a dynamic structure for

the model estimation. The evaluation of the Bounds cointegration test results shown in Table 4.4

is based on the critical F-statistic values for the lower and upper bounds as also reported in the

results. Table 4.4 shows the result of the Bounds test of long run effects for the ARDL

specifications for all the two equations in the study.

**Table 4.4: Results of Bounds Approach to Cointegration Test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Equation population F-stat I0 Bound** | | | | **I1 Bound Cointegration** | |
|  | **measure** |  | **(5%)** | **(5%)** |  |
| Unemployment | *POPG* | 4.28 | 2.11 | 3.15 | Yes |
|  | *LABF* | 3.76 | 2.11 | 3.15 | Yes |
|  | *MPOP* | 4.79 | 2.11 | 3.15 | Yes |
| Growth | *POPG* | 7.11 | 2.39 | 3.38 | Yes |
|  | *LABF* | 7.39 | 2.39 | 3.38 | Yes |
|  | *MPOP* | 8.24 | 2.39 | 3.38 | Yes |

Source: Author’s computations

From the Table, the F values for the tests are all greater than both the lower and upper

Bounds values at the 5 percent levels. According to the empirical output of the F-values in both

panels of Table 4.4 therefore, it can be seen that the null hypothesis of no long-run relationship

between population growth and either unemployment is rejected at the 5 percent level. These results reveal that for both of the equations, the determinant variables had strong long run relationships with the dependent variable. Apparently, this result shows that a long run relationship exists among the variables.

### Analysis of ARDL Results

In this section, the results of the estimated ARDL model for the relationships are presented and analysed. It should be noted that the dynamic from of the ARDL estimates suggests that both the long run and short run estimates are presented. The stable estimates are however based on the long run relationships.

### Lag Length Selection

Generally, cointegration-based analyses (such as the ARDL) are susceptible to variations and instability on the basis of their lag structures. This is more serious for autoregressive estimations (Greene, 2011). Hence, given that the collection of variables in the study are assumed to be cointegrated (see the Bounds test in Table 4.4), the lag selection test is also performed to determine the maximum lag that can generate optimum values for the coefficients in the ARDL estimation. In the lag selection, optimality of the model was determined using both the Akaike Information Criterion (AIC) and Schwarz–Bayesian Criterion (SBC). The optimum lag length is determined by considering the least values for the test coefficients. The result is shown in Table 4.5 and indicates that, for each of the equations (based on all the test outcomes), the second lag possesses the minimum value. This implies that two lags are expected to be retained for the ARDL estimation since each of the selection tests indicates the second lag as the optimum lag length. Thus, a lag structure of two periods is selected as representing the structure that will ensure more stable coefficient estimates.

**Table 4.5: Lag Length Selection Criteria**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *No of Lags* | *Unemployment equation* | | | | *Growth equation* | | | |
| **FPE** | **AIC** | **SC** | **HQ** | **FPE** | **AIC** | **SC** | **HQ** |
| 0 | 0.008 | 12.237 | 12.50 | 12.32 | 0.000 | 5.115 | 5.337 | 5.192 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1.01e-09 | -3.720 | -1.85 | -3.08 | 1.00e-10 | -8.851 | -7.518 | -8.39 |
| 2 | 3.53e-10 | -9.961\* | -3.494\* | -3.76 | 1.47e-11 | -12.86\* | -8.41\* | -10.01 |
| 3 | 1.54e-10 | -6.35 | -1.28 | -7.599\* | 1.58e-11 | -11.045 | -7.490 | -10.81\* |
| 4 | 5.05e-11\* | -8.86 | -2.194 | -6.559 | 1.15e-11\* | -11.92 | -7.261 | -10.31 |

Note: \* indicates selected lag. Source: Author, computation. 2021

In the lag selection analysis of the ARDL model, the study proposed a two-lag period for the estimation of the dynamic relationship. In order to further evaluate the appropriateness of the selected lag structure, the inverse root of the lag length selection is also reported in Fig. 4.1. Since the roots from the various dots lie within the circumference of the circle, then it can be said that the selected lag length for the study is acceptable.

**Fig. 4.1: AR Test for Lag Selection**

1.5

1.5

1.0 1.0

0.5 0.5

0.0 0.0

-0.5 -0.5

-1.0 -1.0

-1.5

-1.5 -1.0 -0.5 0.0 0.5 1.0 1.5

Source: Author, computation 2021

### Regression Analysis

-1.5

-1.5 -1.0 -0.5 0.0 0.5 1.0 1.5

The long run estimates (for demonstrating stable estimates) are analyzed. This provides a consistent structure for the investigation of the dynamic relationship between population growth and unemployment. In Table 4.6, both the short run (in upper panel) the long run (in the lower panel) results for the relationship between population growth and unemployment are presented. It should be noted that, following the strategy shown in Chapter Three, two other measures of

population dynamics (labour force and male population) are used in order to improve the robustness of the estimates. In the short run results for the first panel of the Table, the coefficient of population growth is not represented, suggesting that population growth does not play any role in explaining short run changes on unemployment in Nigeria. Rather, dependency ratio is significant for both the current and lagged variables. This shows that the immediate impact of dependency ratio on unemployment is to reduce it in the short run. However, the delayed effect is positive and the coefficient of the lagged ADEPR variable is much larger than the negative coefficient of the current variable. Thus, it is seen that in the short run, dependency ratio has significant positive impact on unemployment rate in Nigeria.



**Table 4.6: Results for population and unemployment**

Short run results *Measure of population*

**Total population growth Labour force growth Share of male population**

**Variable**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Coeff.** | **t-Stat.** | **Prob.** | **Coeff.** | **t-Stat.** | **Prob.** | **Coeff.** | **t-Stat.** | **Prob.** |
| Δpopulation | -- | -- | -- | -0.077 | -0.045 | 0.965 | 1.683 | 7.924 | 0.000 |
| Δpopulation lag | -- | -- | -- | 6.496 | 2.770 | 0.014 | -1.284 | -6.654 | 0.000 |
| ΔADEPR | -0.533 | -3.52 | 0.002 | -0.412 | -2.253 | 0.039 | -0.988 | -4.642 | 0.000 |
| ΔADEPRt-1 | 1.095 | 5.29 | 0.000 | 1.488 | 5.637 | 0.000 | 0.927 | 4.959 | 0.000 |
| ΔFERT | -- | -- | -- | -- | -- | -- | 0.701 | 2.194 | 0.044 |
| ΔURBANR | -0.283 | -2.28 | 0.034 | 1.991 | 1.729 | 0.103 | 0.362 | 1.057 | 0.307 |
| ΔURBANRt-1 | -- | -- | -- | --- | -- | -- | -0.133 | -3.083 | 0.008 |
| ΔLRGDP | -0.294 | -2.90 | 0.009 | -0.439 | -3.542 | 0.003 | -0.826 | -6.763 | 0.000 |
| ΔLRGDPt-1 | 0.316 | 2.85 | 0.010 | 0.360 | 3.156 | 0.006 | 0.765 | 4.680 | 0.000 |
| ΔSSER | -1.456 | -1.73 | 0.101 | -1.794 | -1.938 | 0.070 | -0.390 | -4.639 | 0.000 |
| ΔTOPEN | -0.180 | -4.37 | 0.000 | -0.134 | -3.391 | 0.004 | -0.088 | -2.449 | 0.027 |
| ΔTOPENt-1 | 0.191 | 4.14 | 0.001 | 0.168 | 3.615 | 0.002 | 0.158 | 3.650 | 0.002 |
| ECMt-1 | -1.006 | -7.94 | 0.000 | -1.039 | -7.672 | 0.000 | -1.134 | -8.755 | 0.000 |
| Adj. R-sq. | 0.656 |  |  | 0.733 |  |  | 0.728 |  |  |
| D-W stat. | 2.514 |  |  | 2.510 |  |  | 2.534 |  |  |
| *Long run results* |  |  |  |  |  |  |  |  |  |
| **Variable** | **Coeff.** | **t-Stat.** | **Prob.** | **Coeff.** | **t-Stat.** | **Prob.** | **Coeff.** | **t-Stat.** | **Prob.** |
| POPG | 0.296 | 1.248 | 0.227 | 0.872 | 0.040 | 0.969 | 0.685 | 2.671 | 0.017 |
| ADEPR | -0.737 | -4.149 | 0.001 | -0.720 | -3.548 | 0.003 | -0.520 | -1.879 | 0.080 |
| FERT | 0.832 | 1.407 | 0.175 | 1.154 | 2.121 | 0.050 | 1.560 | 2.092 | 0.054 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| URBANR | 0.128 | 2.728 | 0.013 | 0.161 | 3.322 | 0.004 | 0.125 | 1.998 | 0.064 |
| AGRSH | -0.896 | -1.768 | 0.093 | -0.859 | -1.540 | 0.143 | -0.188 | -0.338 | 0.740 |
| LRGDP | -0.480 | -2.357 | 0.047 | -0.666 | -2.841 | 0.012 | -0.990 | -2.775 | 0.014 |
| SSER | -0.456 | -3.037 | 0.007 | -0.478 | -2.887 | 0.011 | -0.800 | -3.888 | 0.002 |
| TOPEN | -0.366 | -5.054 | 0.000 | -0.271 | -2.335 | 0.033 | -0.083 | -0.523 | 0.609 |
| Constant | 325.880 | 1.537 | 0.141 | 265.429 | 1.197 | 0.249 | -341.6 | -2.672 | 0.017 |

Source: Author,s computation 2021.

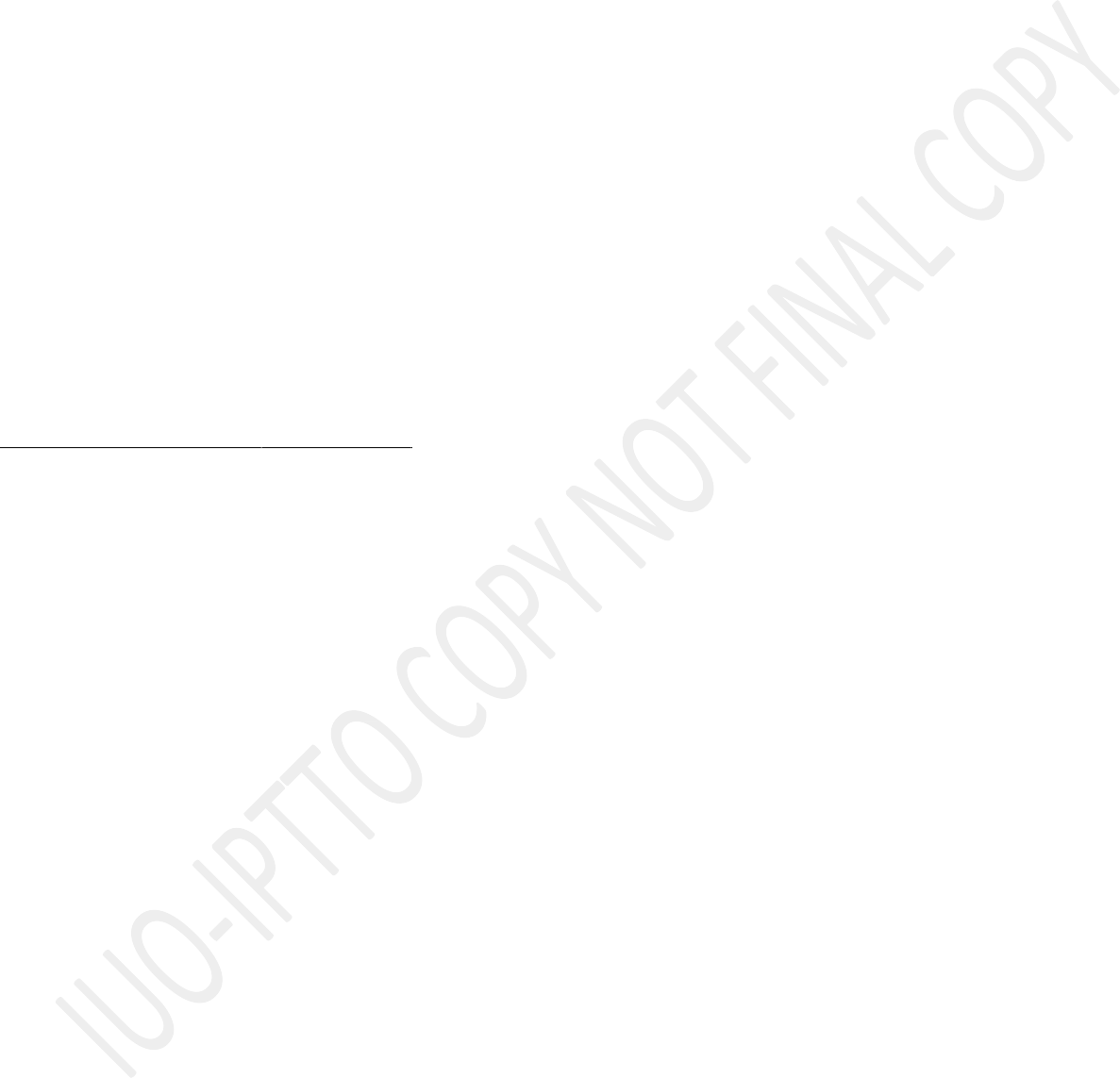
The short run result for urban rate is also significant in the first panel of the result and shows that the share of urban population has significant negative impact on unemployment in Nigeria. In the second panel of the short run results (with labour force share as proxy for population), the coefficient of lagged population is significant and positive. This result shows that labour force growth has a significant positive impact on short term changes in unemployment in Nigeria. Increased labour force tends to force unemployment figures higher in the country. Thus, although population changes on its own did not affect unemployment, consideration of the population structure is what actually matters for explaining the unemployment rate in Nigeria. For the other demographic variables in the equation with labour force, the coefficients of current dependency rate is negative while the lagged coefficient is positive and larger, indicating that the short run impact of an increase in dependency ratio on unemployment is to increase the unemployment rate. In the third panel of the short run estimates, the male population proxy is used. A cursory look at the coefficient of the population variable reveals that an increased share of male population has a significant positive impact on unemployment rate in Nigeria. The coefficient of fertility rate in the male population result is positive and significant at the 5 percent level. This result shows that increased fertility rate leads to decline in unemployment in the short run in Nigeria.

For the other variables in the short run equation, the coefficients of current GDP growth are negative, while the coefficient of lagged GDP growth is positive. For the estimates where

population measures are significant (i.e., using labour force and male share of population), the negative coefficient of current real GDP is larger than the lagged positive coefficients. This means that overall, real GDP growth leads to reduction in unemployment in the short run in Nigeria. School enrolment also has negative impact on unemployment, indicating that educational attainment tends to reduce the rate of unemployment in the short run. Essentially, the result shows that skill development matters for reducing short run unemployment in Nigeria. The overall short run impact of trade openness on unemployment is shown to be positive, suggesting that trade openness tends to exacerbate unemployment rate in the short run in Nigeria.

In all the three short run estimates, the coefficients of the error correction terms have the expected negative sign and they are all significant at the 1 percent level. The negative sign shows thatany deviation of unemployment rate from its long run trend or equilibrium will be restored in the long run. This demonstrates the presence of long run stability in the economy based on movements in population and other related variables. The coefficient of the ECM terms are all greater than 1.0 (in absolute terms) suggesting that the adjustment to long run equilibrium for unemploymentis not direct.

The lower panel of the results in Table 4.6 shows the long run results. From the results, only the coefficient of male share of population is significant and negative. However, it is seen that all the coefficients that represent population in the long run model are negative, indicating that long run unemployment is generally negatively influenced by population. Rising population tends to also lead to lesser unemployment after all short term adjustments have been made. Thus, the results demonstrate that though population growth may stimulate unemployment in the short run, the long run effect is to reduce unemployment. Also, the outcome of the result indicates that it is not population growth in general that affects unemployment, but the structure of population.

The short run result for the effects of population growth on economic growth is shown in the upper panel of Table 4.7. Population growth does not feature in the short run, indicating that population growth does not have short run effects on economic growth in Nigeria. Fertility rate also does not feature. Essentially, most of the population and demographic factors are not relevant for economic growth in Nigeria, especially in the short run. The coefficient of urban rate is however significant at the 1 percent level and shows that the size of the urban population has significant positive impact on short run growth in the economy in Nigeria. A one percent rise in urban population rate leads to an overall 0.154 percent rise in economic growth in the short run. The coefficient of the error correction term is also negative and significant, which shows long run stability of the estimated results.

**Table 4.7: Results for population growth on economic growth**

Short run *Measure of population*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Total population growth** | | | **Labour force growth** | | |
| **Coeff.** | **t-Stat.** | **Prob.** | **Coeff.** | **t-Stat.** | **Prob.** |
| ΔURBANR | 0.038 | 1.140 | 0.265 | 0.027 | 0.807 | 0.427 |
| ΔURBANRt-1 | 0.104 | 2.750 | 0.011 | 0.115 | 3.025 | 0.006 |
| ΔSSER | 0.043 | 4.762 | 0.000 | 0.039 | 4.483 | 0.000 |
| ΔSSERt-1 | 0.035 | 3.643 | 0.001 | 0.038 | 3.985 | 0.001 |
| CointEq(-1)\* | -0.561 | -7.828 | 0.000 | -0.575 | -7.980 | 0.000 |
| Adj. R-sq. | 0.723 |  |  | 0.730 |  |  |
| D-W stat | 1.893 |  |  | 2.033 |  |  |
| *Long run* | **Coeff.** | **t-Stat.** | **Prob.** | **Coeff.** | **t-Stat.** | **Prob.** |
| **Variable** |
| POPG | -0.175 | -0.482 | 0.634 | -0.044 | -0.987 | 0.333 |
| FERT | 1.024 | 2.289 | 0.030 | 0.785 | 2.955 | 0.007 |
| URBANR | 0.102 | 4.612 | 0.000 | 0.100 | 5.731 | 0.000 |
| SSER | 0.015 | 0.993 | 0.330 | 0.006 | 0.412 | 0.684 |
| TOPEN | -0.001 | -0.576 | 0.570 | 0.000 | -0.454 | 0.654 |
| C | 0.018 | 0.007 | 0.995 | 1.420 | 0.714 | 0.482 |

Source: Author’s computation 2021

In the long run result, the coefficient of population growth and labour force growth fail the significance test at the 5 percent level. This result shows that though population growth can reduce the rate of economic growth in the long run, this negative impact is actually not significant. Essentially, the result indicates that the size of the population and its growth does not matter for long run growth in Nigeria. The coefficient of fertility rate is however positive and significant, suggesting that higher fertility may improve economic growth in the long run. The urban population rate is also significant and positive and shows that growing urban centers significantly boosts long run economic growth in Nigeria. This result therefore shows that it is the management of the population growth, rather than population growth itself that matters for economic growth in the long run in Nigeria.

### 4.4.3 Robustness Tests for Regression Results

The estimated coefficients in the study are further examined using basic robustness checks. The normality and serial correlation tests (using the J-B and LM statistics respectively) reported in Table 4.8 are used to show the stability of the cointegration parameters for the variables used in the equations. From the results, none of the J-B and LM statistics passed the significance test even at the 5 percent level, the respective J-B and LM tests for the normality and serial correlation show that the residuals are normally distributed and are devoid of serial correlation. Thus, each of the estimated equations can be adjudged to be stable and effective for long term prediction and analysis.

**Table 4.8: Post estimation test results**

|  |  |  |
| --- | --- | --- |
| ***Test*** | ***Unemployment eq.*** | ***Growth eq.*** |
| *Lcvalue (Bootstrap p value)* | 1.033 (0.539) | 0.951 (0.628) |
| *Normality test (J-B)* | 0.542 (p = 0.762) | 0.159 (0.924) |
| *Serial Correlation LM Test* | 2.433 (p = 0.0.113) | 0.850 (0.422) |

Source: Author’s computations 2021

In order to test the stability of cointegration parameters, the *Lc*test is employed based. According to Balcilar et al. (2013, p.12), the “Nyblom-Hansen statistic tests for parameter constancy against the alternative hypothesis that the parameters follow a random walk process”. From the results in Table 4.8, there is clear indication of parameter stability in each of the equations. This is demonstrated by the insignificant values for the Hansen Lc coefficients in the estimation. Thus, a stable long run relationship is shown to exist between economic growth and tourism sector development in Nigeria. Also, the respective J-B and LM tests for the normality and serial correlation show that the residuals are normally distributed and are devoid of serial correlation.

In addition to the *Lc* test, robustness checks are provided by testing the stability of the estimated data set across the cross sections in the sample. This helps to eliminate doubt about possible outlier regression for any of the groups in the sample. The chart in Figure 2 shows the result of the CUSUM of squares test. It can be seen that the CUSUM of squares line for the result lies entirely within the dotted 5 percent significance bound line throughout the chart. This reveals that the estimation is stable within the analysis.

**Fig 4.2: Parameter Stability Charts for Unemployment and Growth equations**

1.4

1.2

1.0

1.6

1.2

0.8

0.6

0.8

0.4

0.2

0.0

-0.2

0.4

0.0

-0.4

98 00 02 04 06 08 10 12 14 16 18

-0.4

2002 2004 2006 2008 2010 2012 2014 2016 2018

CUSUM of Squares 5% Significance

CUSUM of Squares 5% Significance

Source: Author’s computation 2021

The test of normality for the probability functions of the error for estimated modelsare reported in Figure 4.3. From the Charts, a bell-shaped probability density structure is observed which clearly show that the distributions are non-normal for both the unemployment and economic growth equations. This is also seen in the J-B statistic values of 5.64 and 1.28 for the respective equations which both fail the significance test at the 5 percent level. This result shows that the estimated errors from the regressions are normally distributed and thus, the coefficients are reliable for policy analysis.

**Fig. 4.2a: Histogram for Unemployment Equation**

14

Series: Residuals Sample 1983 2019

Observations 37

Mean Median Maximum Minimum Std. Dev. Skewness Kurtosis

1.97e-12

-0.299945

6.444931

-6.385515

2.195363

0.068665

4.908702

Jarque-Bera 5.645585

Probability 0.059440

12

10

8

6

4

2

0

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

**Fig. 4.2a: Histogram for Growth Equation**

12

Series: Residuals Sample 1983 2019

Observations 37

Mean -1.50e-15

Median 0.000451

Maximum 0.027542

Minimum -0.033818

Std. Dev. 0.012254

Skewness -0.329600

Kurtosis 3.626669

Jarque-Bera 1.275357

Probability 0.528518

10

8

6

4

2

0

-0.03 -0.02 -0.01 0.00 0.01 0.02 0.03

Source: Author’s computation 2021

### Analysis of Causality

Finally, we show the causality tests for the reverse causality and effects that may be present among the main variables of the study, especially between population factors and unemployment or economic growth. The results are shown in Table 4.9 where the tests are based on the F-statistic test outcomes for each of the null hypotheses.From the results, the F-statistics

for the null hypothesis that causality does not run in either direction between population growth and unemployment fail the significance tests at the 5 percent level. This shows that population growth on its own may not actually explain unemployment levels in the country. In the same vein, unemployment does not explain population growth dynamics. However, when the labour force share is considered, the F-test for the null hypothesis of no Granger causality running from labour force to unemployment is significant, although the reverse is not significant. This means that labour force actually Granger causes unemployment but unemployment does not Granger cause labour force. The result therefore highlights that it is not total population growth that relates to unemployment in Nigeria, rather it is the structure of population growth that relates to unemployment. Another significant result is the causality running from labour force share to

|  |  |  |  |
| --- | --- | --- | --- |
| agricultural output. |  | | |
| ***Table 4.9: Results of the dynamic Granger Causality Test*** |
| **Null Hypothesis:** | **Obs** | **F-Statistic** | **Prob.** |
| POPG does not Granger Cause UNEMPL | 38 | 0.065 | 0.801 |
| UNEMPL does not Granger Cause POPG |  | 3.443 | 0.072 |
| LABF does not Granger Cause UNEMPL | 38 | 5.098 | 0.030 |
| UNEMPL does not Granger Cause LABF |  | 0.001 | 0.971 |
| RGDPG does not Granger Cause UNEMPL | 37 | 0.835 | 0.367 |
| UNEMPL does not Granger Cause RGDPG |  | 2.890 | 0.098 |
| AGRSH does not Granger Cause UNEMPL | 38 | 2.672 | 0.111 |
| UNEMPL does not Granger Cause AGRSH |  | 3.000 | 0.092 |
| RGDPG does not Granger Cause LABF | 37 | 1.285 | 0.265 |
| LABF does not Granger Cause RGDPG |  | 0.946 | 0.338 |
| AGRSH does not Granger Cause LABF | 38 | 0.934 | 0.340 |
| LABF does not Granger Cause AGRSH |  | 6.251 | 0.017 |
| *Employment types* |  |  |  |
| POPG does not Granger Cause EMPLYER | 27 | 2.144 | 0.141 |
| EMPLYER does not Granger Cause POPG |  | 1.559 | 0.233 |
| RGDPG does not Granger Cause EMPLYER | 27 | 1.482 | 0.249 |
| EMPLYER does not Granger Cause RGDPG |  | 0.253 | 0.779 |
| POPG does not Granger Cause WEMPL | 27 | 0.463 | 0.635 |
| WEMPL does not Granger Cause POPG |  | 0.724 | 0.496 |

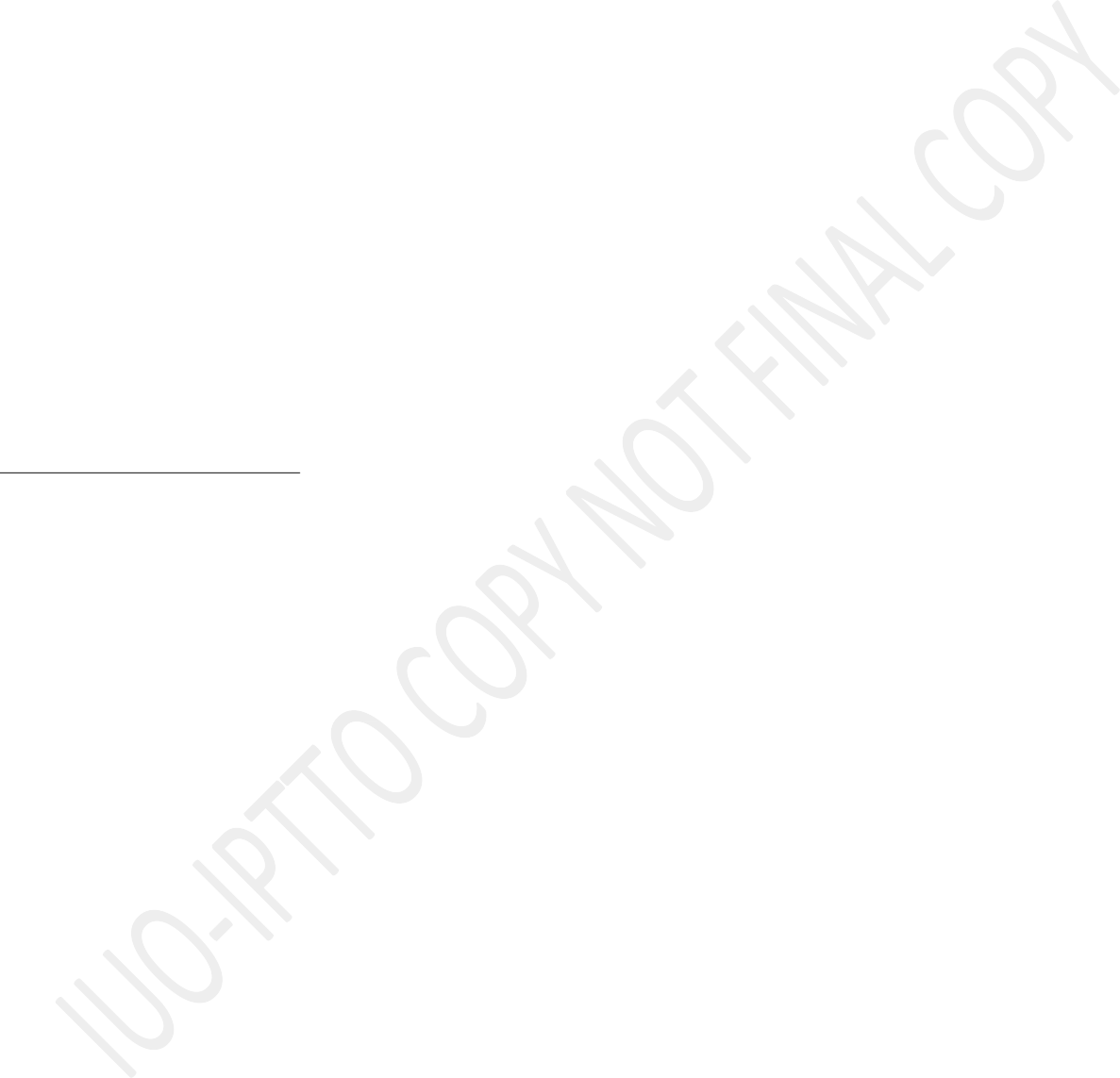
|  |  |  |  |
| --- | --- | --- | --- |
| RGDP does not Granger Cause WEMPL | 27 | 4.523 | 0.023 |
| WEMPL does not Granger Cause RGDP |  | 0.312 | 0.735 |
| POPG does not Granger Cause VEMPL | 27 | 7.210 | 0.004 |
| VEMPL does not Granger Cause POPG |  | 11.908 | 0.000 |
| RGDPG does not Granger Cause VEMPL | 27 | 0.547 | 0.586 |
| VEMPL does not Granger Cause RGDPG |  | 0.583 | 0.567 |

Note: EMPLYER = employers’ type of employment; WEMPL = waged employment; VEMPL = vulnerable employment. Source: Author’s computation

In order to observe clearer causality exercise, the Granger causality test in terms of the type of employment involves is also conducted. Examination of the types of employment involved has been to be critical in explaining unemployment conditions in Nigeria. For instance, this study has shown that unemployment rate is low in the country, but vulnerable employment rate is quite high. Thus, it is important to observe the kinds of employment that population dynamics Granger cause in Nigeria. In the other panel of Table 4.9, it can be seen that RGDP growth granger causes wage employment, suggesting that improvement in growth actually benefits wage employment (which is a type of productive employment). Population growth is also shown to Granger cause vulnerable employment. Note that population growth Granger causes neither wage employment nor employers’ type of employment (which are the real productive employment types). Thus, it is seen that population growth only increases vulnerable employment, not productive employment. This outcome justifies the insignificant impact of population growth on unemployment since most employment is made up of vulnerable employment in Nigeria.

### Analysis of Elasticity on employment

Finally, employment elasticities with respect to population growth and economic growth are performed. Employment elasticity with respect to population growth is defined as the

responsiveness of employment to a unit change in population. These elasticities are performed for the three types of employment (including wage, employers, and vulnerable employment).Elasticity with respect to population shows how employment changes as the population force for the particular group changes. The results of the elasticities are reported in Table 4.10. Total employment elasticity with respect to population is 6.77 while elasticity with respect to output growth is 1.205. This shows that total employment responds more to population growth than to economic growth. This reveals that a one percent rise in population leads to a

6.77 percent rise in employment, but a one percent rise in economic growth leads to a 1.2 percent rise in employment. This is a positive elasticity, which also confirms the results obtained in the ARDL estimation.

**Table 4.10: Elasticities of different employment groups**

*Type of employment Elasticity with respect to population*

*growth*

*Elasticity with respect to economic growth*

Total employment 6.777 1.205

Vulnerable employment 8.726 1.498

Employers -0.777 -0.011

Wage employment -8.706 -1.547 Source: Author’s computation 2021

𝒆𝒎𝒑𝒍𝒐𝒚𝒎𝒆𝒏𝒕𝒕−𝒆𝒎𝒑𝒍𝒐𝒚𝒎𝒆𝒏𝒕𝒕−𝟏

(

Note: elasticity with respect to population is computed as

𝒆𝒎𝒑𝒍𝒐𝒚𝒎𝒆𝒏𝒕𝒕−𝟏 )×𝟏𝟎𝟎

𝒑𝒐𝒑𝒖𝒍𝒂𝒕𝒊𝒐𝒏𝒕−𝒑𝒐𝒑𝒖𝒍𝒂𝒕𝒊𝒐𝒏𝒕−𝟏

( 𝒑𝒐𝒑𝒖𝒍𝒂𝒕𝒊𝒐𝒏𝒕−𝟏 )×𝟏𝟎𝟎

When the employment types are broken down, it can be seen that the positive total employment elasticity with respect to population growth was fully accounted for by vulnerable employment. This is seen by the very large positive vulnerable employment elasticity of 8.73, which shows that a one percent rise in population over the period led to a rise in vulnerable employment by as much as 8.73 percent. This means that the increased population in Nigeria

only increases the wrong segment of employment, which is vulnerable employment. The elasticities of employers and wage employment types with respect to population growth are both negative. This means that with increased population, the productive segment of employment shrinks, while the unproductive segment expands. Note that the vulnerable employment can be found in all forms of low-wage self-employment like recharge card sellers or hawkers in the informal sector. This is the reason while population growth or labour force growth appears to have negative impact on unemployment.

The elasticities for the different years are also presented in the Charts below. In Figure 4.3, it can be seen that the elasticities of total employment with respect to (w.r.t.) population growth is mostly positive and more pronounced in recent years. The elasticities with respect to GDP growth was negative in the last three years in the analysis.

**Fig. 4.4: Elasticity of total employment**



**w.r.t. population**

**w.r.t. growth**

60

40

20

0

-20

0.3

0.2

0.1

0

-0.1

-0.2

-0.3

Source: Author’s computation 2021

1992

1994

1996

1998

2000

2002

2004

2006

2008

2010

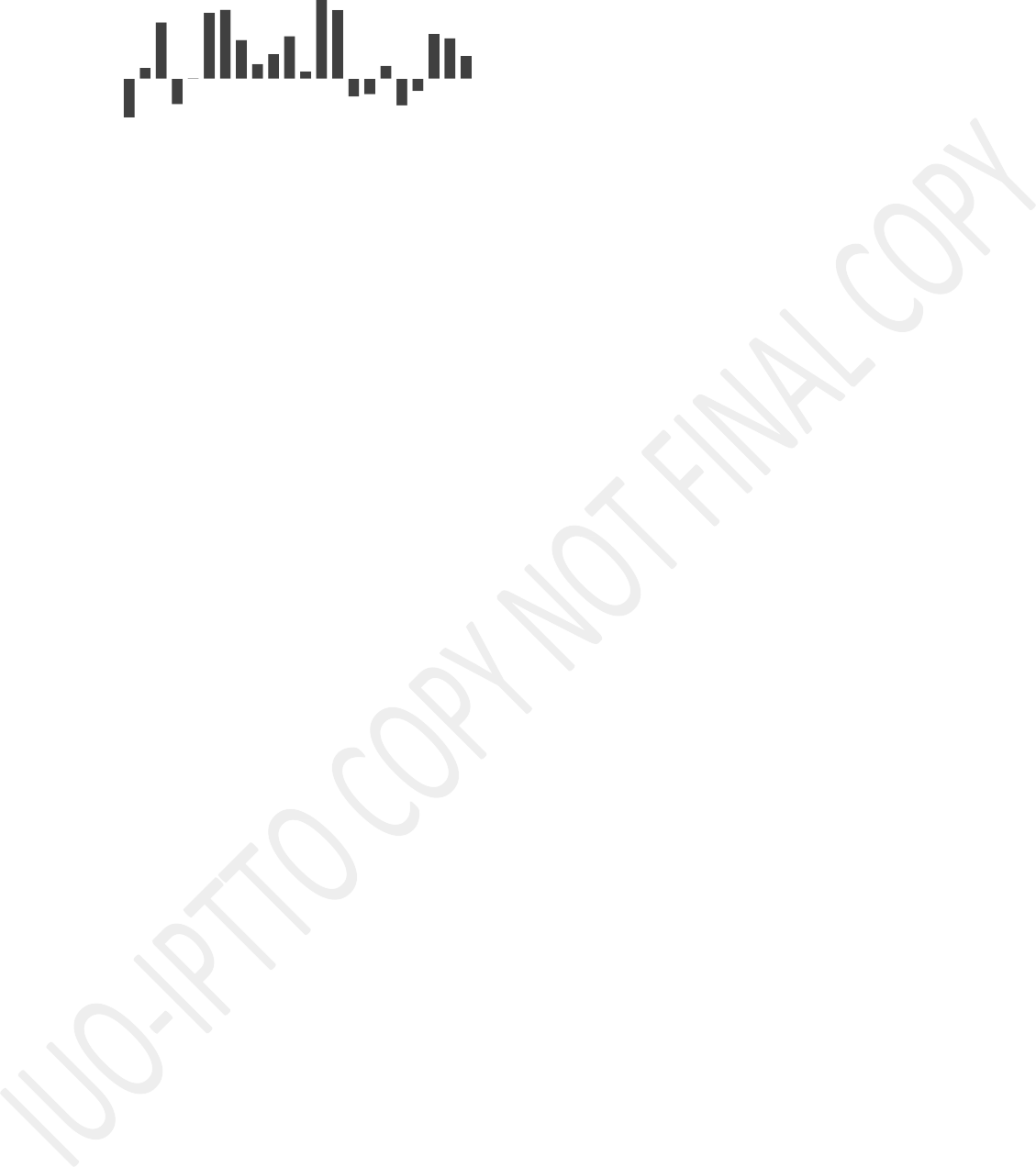
2012

2014

2016

2018

The elasticities of vulnerable employment are also reported in Figure 4.5. There is clear evidence that the elasticities are mostly positive and large with respect to population growth for most of the years. The years of negative elasticities are few and the negative elasticities are rather weak. This shows that population growth is the major source of unproductive and vulnerable employment in Nigeria.

**Fig. 4.5: Elasticity of vulnerable employment**



**w.r.t. population**

**w.r.t. population**

60

40

20

0

-20

-40

0.3

0.2

0.1

0

-0.1

-0.2

-0.3

Source: Author’s computation 2021

For the employers’ type of employment, the elasticities with respect to population growth is negative for most of the years and only positive for five years. This result shows that employers’ segment of the employment structure tends to shrink with annual population increases in Nigeria.

**Fig. 4.6: Elasticity of employers’ employment**



**w.r.t. population**

**w.r.t. growth**

0.8

0.6

0.4

0.2

0

-0.2

-0.4

-0.6

0.001

0.0005

0

-0.0005

-0.001

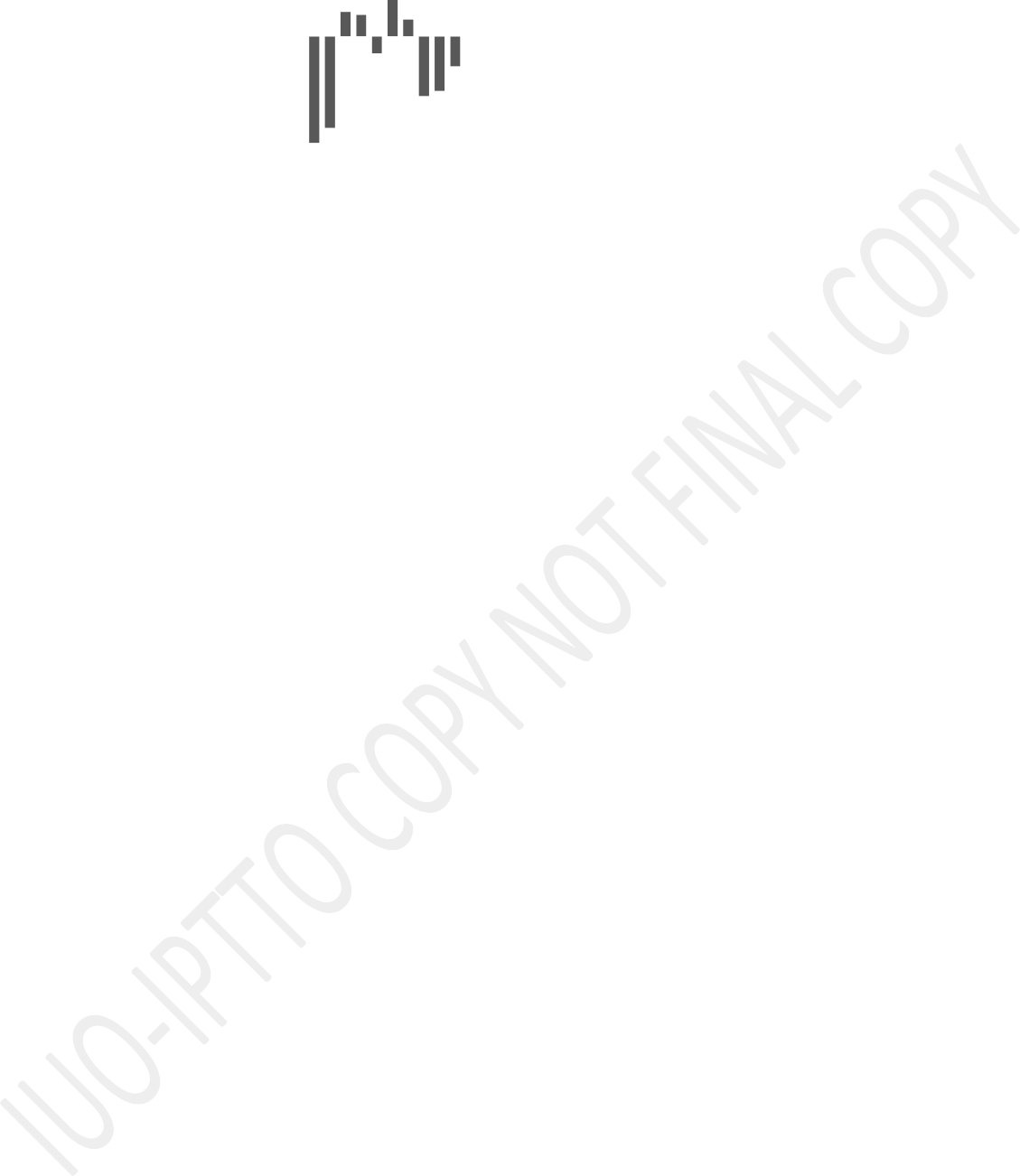
-0.0015

-0.002

Source: Author’s computation 2021

The elasticities with respect to wage employmentshows the clearest negative elasticity with respect to population growth. This means that for most of the years, expansion in population led to massive declines in wage (or formal employment). This shows that population growth is not good for productive and formal employment in Nigeria.

**Fig. 4.7: Elasticity of wage employment**

Source: Author’s computation 2021

**w.r.t. population**

**w.r.t. population**

30

20

10

0

-10

-20

-30

-40

-50

0.3

0.2

0.1

0

-0.1

-0.2

-0.3

1992

1994

1996

1998

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2004

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1992

1994

1996

1998

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2002

2004

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2008

2010

2012

2014

2016

2018

### Discussion of Results

The results obtained from the empirical analysis are far-reaching and generally apt for policy as well as empirical directions. It is on the basis of this that the discussion of this result is conducted. First, it is established that though population may stimulate unemployment in the short run, the long run effect is to reduce unemployment. This implies that in the short run population growth leads to more unemployment in the country by putting pressure on the supply side, especially given the limited demand and productive capacity of the economy. Similar findings were made by Bloom, Canning and Sevilla (2001), Adegbami (2013) and Adegboye (2020)who found that blossoming populations may not actually overshoot unemployment, especially given the capacity of the economy to expand non-productive and informal employment almost at an inexhaustible elasticity. It appears that the economy has the capacity to adjust in order to accommodate the growing population in terms of job provision. The types of jobs being provided is however another issue. It is shown in the study that unemployment falls in the long run with increased population, but the decreased unemployment level occurs because more informal jobs are being created. Thus, population growth is actually harmful for productive employment growth in the long in Nigeria.

The study also found that that it is not population growth in general that affects unemployment, but the structure of population. Dao (2012) also found similar results and confirms that the age structure of population is critical both for welfare and long run performance of the economy. As the ECA (2016) has also found, the reason for the significant effect of the population structure rather than the entire population changes can be linked to issues of labour force participation rate which are different for young people and women and which can be influenced by cultural norms and role models. Such norms restrict women’s employment options to unpaid household work and other unproductive employment. As the result has also shown that education matters for reducing unemployment in the long run, the huge disadvantage against girls and women in terms of limited access to education, as compared with males limits their prospects for jobs in the formal labour market.

For the other population factors, the study also showed that growing urban centres significantly boosts both employment expansion and economic growth in the long run in Nigeria. This result therefore shows that it is the management of the population growth, rather than population growth itself that matters for both unemployment reduction and economic growth in the long run in Nigeria.

The result also emphasised the role of skills in unemployment reduction in Nigeria. However, studies have shown that there are low enrolment rates (especially at higher levels of education) as well as low completion rates, low quality of education and a failure to direct school learning with the needed skills have contributed to the mismatch of skills that has driven more unemployment in the country. This is an area that needs strong policy action as also highlighted by Makinde and Adegbami (2019) and Gbagolo and Eze (2014).

The positive effect of population factors (including fertility rates) on employment surprisingly agrees with the outcome of research on developed economies. For instance, Da Rocha and Fuster (2005) demonstrate that fertility had positive impacts on women employment for European countries. They provided explanation for this outcome on the basis of probability of finding jobs. Apparently, when the probability of finding jobs is low in a country, the effect of fertility on employment will be positive. For the case of ECOWAS countries, the high rate of unemployment contributes to the positive relationship.

**CHAPTER FIVE**

**SUMMARY, CONCLUSION AND RECOMMENDATION**

## SUMMARY OF FINDINGS

This study sets out to provide an empirical investigation and examine the relationship between population growth and unemployment in Nigeria. It is argued that population dynamics may deliver different patterns of effects on either the economy or in the fight to reduce unemployment in Nigeria. Thus, this study considers the effects of both population and population structure (age and gender) on unemployment in Nigeria within a dynamic structure. In order to capture the distributional relationship between population growth and unemployment, the study also considers how population systems impact different employment structures in the economy. This is a further extension of the study over previous research in the relationship. Annual time series data for the period 1981 to 2019 were used in the empirical investigation of the study. Given the nature of relationship between population and unemployment, a dynamic framework was devised for the study and the Autoregressive Distributed Lags (ARDL) technique was employed in the empirical analysis of the study. Based on the analysis in the study, the following findings were made:

* + 1. That population growth does not significantly impact unemployment in the short run, rather, it is the structure of population that does.
    2. That population structure has significant negative impact on unemployment in the long run, indicating that rise in population structure tends to reduce unemployment rate in the long run.
    3. That population growth however affects only vulnerable and informal employment and not productive employment. This implies that population growth effectively limits productive employment in the long run in Nigeria.
    4. That it is not total population growth that relates to unemployment in Nigeria, rather it is the structure of population growth that relates to unemployment. The age structure matters for short run impacts while gender structure matters for long run impacts.

## CONCLUSION

Today, employment is increasingly a top priority for many developing countries since it is considered as capable of delivering poverty-reduction effects. This consideration is much more relevant when distributive economic opportunities are considered. In this study, we set out to establish the link between population growth and unemployment in Nigeria. The study has highlighted two challenges that have serious implications for unemployment in general. First, is the weak nature of demographic transition in the population system which has largely bloated certain age structures of the population? Second, is the dynamic nature of population effects on unemployment in the country? This throws up two aspects for adequate consideration in terms of reducing unemployment in Nigeria: the need to get the more young people into employment, and reducing informality and vulnerability in employment. Consequently, a single approach to the analysis may not be sufficient to adequately evaluate the interlinkages.

A broad highlight from the study indicated that population changes could also provide strong background for analyzing how unemployment changes over time in Nigeria. Major consequences of the nature of employment changes in the country have been shown to include incessant rural- urban migration (with consequences for agricultural output and productivity), dual and segregated labour markets, and the increasing informalities in the urban sector. The study

empirically demonstrated that such demographic ramifications have effectively affected the pattern of employment in Nigeria.

## RECOMMENDATIONS

The general and particular findings in this study suggest some policy directions which may provide a basis for useful recommendations for the policy authorities. First, there is need to evolve policies that ensure full demographic transition on the basis of population dynamics in Nigeria. There is clear indication that fertility rates in the sub-region are too high and have actually limited any demographic dividend that could accrue to unemployment reduction in Nigeria. Issues of dependency ratio and the age structure of employment need policy dimensions for adequate adjustment to the efficient levels.

There is need for proactive health systems and policy planning in the country. There is also need for comprehensive integration of population factors into development planning at all levels, including mechanisms to promote coordination of various intervention efforts undertaken by all institutions and the private sector. In this manner, the patterns of population changes, especially age and gender structures as well as fertility rates will be incorporated into employment policies in Nigeria. In the long run such integration will ensure that the search for more employment drives down population growth rates in the country.

The negative effects of population on unemployment can also be considered from the perspective of the type of employment that people engage in – which is mostly low-productivity, traditional sector-based jobs. These jobs usually require more family member participation to drive its prosperity. Thus, there is need to evolve means to ensure that the traditional sector jobs are transformed into modern jobs. This can be done by ensuring that government and the private sector increase market demand and economic opportunities through increased investments

targeted at labour-intensive industries and labour-surplus areas, supportive trade policies that protect these industries, as well as provide more and better linkages between formal firms, informal firms and informal workers.

Education is important in determining whether the population in a country benefit (in terms of employment) from any form of demographic transition. The study has shown the strong positive effects of education in boosting employment, irrespective of the direction of population growth. Thus, more individuals should be given more training in courses that may guarantee more employment in the country. In particular, programme should be prepared to ensure that more individuals take better advantage of the entrepreneurship training and financing opportunities in order to boost more modern sector employment. Moreover, efforts to close the gender gap in accessing education and employment particularly for women should be encouraged.

Finally, rapid and steady growth patterns that lead to sustained employment should be reinvigorated. In particular, sectors that are more employment-yielding, such as agriculture and modern services, should be singled out and receive more investments for the desired results.

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## APPENDICES

ARDL Long Run Form and Bounds Test Dependent Variable: D(UNEMPL)

Selected Model: ARDL(1, 0, 2, 0, 1, 0, 2, 1, 2)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:28



Sample: 1981 2019

Included observations: 37

Levels Equation

Case 2: Restricted Constant and No Trend

Variable Coefficient Std. Error t-Statistic Prob.

POPG 0.295971 0.237147 1.248045 0.2272

ADEPR -0.737436 0.177719 -4.149442 0.0005

FERT 0.831633 0.590877 1.407456 0.1754

URBANR 1.276919 0.468152 2.727574 0.0134

AGRSH -0.896145 0.506777 -1.768321 0.0931

LRGDP -0.480347 0.203521 -2.356977 0.0473

SSER -0.455883 0.150123 -3.036730 0.0068

TOPEN -0.365780 0.072378 -5.053753 0.0001

C 325.8795 212.0080 1.537109 0.1408

EC = UNEMPL - (29.5971\*POPG -7.3744\*ADEPR + 83.1634\*FERT + 12.7692

\*URBANR -0.8961\*AGRSH -48.0348\*LRGDP -4.5588\*SSER -0.3658

\*TOPEN + 325.8795 )

ARDL Error Correction Regression Dependent Variable: D(UNEMPL)

Selected Model: ARDL(1, 0, 2, 0, 1, 0, 2, 1, 2)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:29

Sample: 1981 2019

Included observations: 37

ECM Regression

Case 2: Restricted Constant and No Trend

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(ADEPR) | -0.532526 | 0.151271 | -3.520347 | 0.0023 |
| D(ADEPR(-1)) | 1.095260 | 0.206702 | 5.298738 | 0.0000 |
| D(URBANR) | -0.283256 | 0.124181 | -2.280996 | 0.0343 |
| D(LRGDP) | -0.293613 | 0.101212 | -2.900966 | 0.0092 |
| D(LRGDP(-1)) | 0.316306 | 0.111126 | 2.846380 | 0.0103 |
| D(SSER) | -1.456363 | 0.843584 | -1.726400 | 0.1005 |
| D(TOPEN) | -0.179554 | 0.041063 | -4.372695 | 0.0003 |
| D(TOPEN(-1)) | 0.191199 | 0.046207 | 4.137866 | 0.0006 |
| CointEq(-1)\* | -1.006168 | 0.126688 | -7.942114 | 0.0000 |
| R-squared | 0.732553 | Mean dependent var | | 0.432432 |
| Adjusted R-squared | 0.656140 | S.D. dependent var | | 3.215592 |
| S.E. of regression | 1.885610 | Akaike info criterion | | 4.314153 |
| Sum squared resid | 99.55469 | Schwarz criterion | | 4.705998 |
| Log likelihood | -70.81183 | Hannan-Quinn criter. | | 4.452296 |
| Durbin-Watson stat | 2.514048 |  | |  |

\* p-value incompatible with t-Bounds distribution.

F-Bounds Test Null Hypothesis: No levels relationship

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test Statistic | Value | Signif. | I(0) | I(1) |
| F-statistic | 4.280236 | 10% | 1.85 | 2.85 |
| k | 8 | 5% | 2.11 | 3.15 |
|  |  | 2.5% | 2.33 | 3.42 |
|  |  | 1% | 2.62 | 3.77 |

ARDL Long Run Form and Bounds Test Dependent Variable: D(UNEMPL)

Selected Model: ARDL(1, 2, 2, 0, 1, 0, 2, 1, 2)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:31

Sample: 1981 2019

Included observations: 36

Levels Equation

Case 2: Restricted Constant and No Trend



C

265.4286

221.7324

1.197067 0.2487

EC = UNEMPL - (0.8724\*LABFG -7.2020\*ADEPR + 115.3685\*FERT + 16.0580\*URBANR -0.8586\*AGRSH -66.6122\*LRGDP -4.7782\*SSER

-0.2708\*TOPEN + 265.4286 )

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LABFG | 0.872408 | 21.90498 | 0.039827 | 0.9687 |
| ADEPR | -0.720203 | 0.202968 | -3.548345 | 0.0027 |
| FERT | 1.153680 | 0.543949 | 2.120943 | 0.0499 |
| URBANR | 0.160579 | 0.483359 | 3.322153 | 0.0043 |
| AGRSH | -0.858560 | 0.557681 | -1.539517 | 0.1432 |
| LRGDP | -0.666122 | 0.234489 | -2.840736 | 0.0118 |
| SSER | -0.477815 | 0.165510 | -2.886926 | 0.0107 |
| TOPEN | -0.270797 | 0.115986 | -2.334736 | 0.0329 |

ARDL Error Correction Regression Dependent Variable: D(UNEMPL)

Selected Model: ARDL(1, 2, 2, 0, 1, 0, 2, 1, 2)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:32

Sample: 1981 2019

Included observations: 36

ECM Regression

Case 2: Restricted Constant and No Trend

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(LABFG) | -0.077028 | 1.730349 | -0.044516 | 0.9650 |
| D(LABFG(-1)) | 0.649627 | 0.234522 | 2.770001 | 0.0137 |
| D(ADEPR) | -0.412424 | 0.183017 | -2.253475 | 0.0386 |
| D(ADEPR(-1)) | 1.488801 | 0.264126 | 5.636705 | 0.0000 |
| D(URBANR) | 1.990809 | 1.151340 | 1.729123 | 0.1030 |
| D(LRGDP) | -0.439163 | 0.123970 | -3.542495 | 0.0027 |
| D(LRGDP(-1)) | 0.360195 | 0.114116 | 3.156373 | 0.0061 |
| D(SSER) | -1.794194 | 0.925569 | -1.938477 | 0.0704 |
| D(TOPEN) | -0.133835 | 0.039468 | -3.390989 | 0.0037 |
| D(TOPEN(-1)) | 0.168077 | 0.046500 | 3.614545 | 0.0023 |
| CointEq(-1)\* | -1.038685 | 0.135385 | -7.672081 | 0.0000 |
| R-squared | 0.756788 | Mean dependent var | | 0.450000 |
| Adjusted R-squared | 0.659503 | S.D. dependent var | | 3.259404 |
| S.E. of regression | 1.901932 | Akaike info criterion | | 4.370085 |
| Sum squared resid | 90.43361 | Schwarz criterion | | 4.853938 |
| Log likelihood | -67.66153 | Hannan-Quinn criter. | | 4.538963 |
| Durbin-Watson stat | 2.485976 |  | |  |

\* p-value incompatible with t-Bounds distribution.

F-Bounds Test Null Hypothesis: No levels relationship

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test Statistic | Value | Signif. | I(0) | I(1) |
| F-statistic | 3.767093 | 10% | 1.85 | 2.85 |
| k | 8 | 5% | 2.11 | 3.15 |
|  |  | 2.5% | 2.33 | 3.42 |
|  |  | 1% | 2.62 | 3.77 |

ARDL Error Correction Regression Dependent Variable: D(UNEMPL)

Selected Model: ARDL(1, 2, 2, 1, 2, 0, 2, 1, 2)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:33

Sample: 1981 2019

Included observations: 37

ECM Regression

Case 2: Restricted Constant and No Trend

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(MPOP) | 1.682727 | 0.021234 | 7.924457 | 0.0000 |
| D(MPOP(-1)) | -1.283907 | 0.019299 | -6.654443 | 0.0000 |
| D(ADEPR) | -0.987898 | 0.212838 | -4.641545 | 0.0003 |
| D(ADEPR(-1)) | 0.927494 | 9.187081 | 4.958850 | 0.0002 |
| D(FERT) | 0.701466 | 0.319655 | 2.194446 | 0.0444 |
| D(URBANR) | 0.361947 | 0.342405 | 1.057088 | 0.3072 |
| D(URBANR(-1)) | -0.133202 | 0.043212 | -3.082521 | 0.0076 |
| D(LRGDP) | -0.825965 | 0.122124 | -6.763327 | 0.0000 |
| D(LRGDP(-1)) | 0.764515 | 0.163356 | 4.680036 | 0.0003 |
| D(SSER) | -0.390070 | 0.084082 | -4.639150 | 0.0003 |
| D(TOPEN) | -0.088409 | 0.036104 | -2.448709 | 0.0271 |
| D(TOPEN(-1)) | 0.157936 | 0.043268 | 3.650157 | 0.0024 |
| CointEq(-1)\* | -1.133897 | 0.129517 | -8.754781 | 0.0000 |
| R-squared | 0.818503 | Mean dependent var | | 0.432432 |
| Adjusted R-squared | 0.727754 | S.D. dependent var | | 3.215592 |
| S.E. of regression | 1.677805 | Akaike info criterion | | 4.142688 |
| Sum squared resid | 67.56070 | Schwarz criterion | | 4.708687 |
| Log likelihood | -63.63973 | Hannan-Quinn criter. | | 4.342229 |
| Durbin-Watson stat | 2.534249 |  | |  |

\* p-value incompatible with t-Bounds distribution.



F-Bounds Test Null Hypothesis: No levels relationship

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test Statistic | Value | Signif. | I(0) | I(1) |
| F-statistic | 4.790387 | 10% | 1.85 | 2.85 |
| K | 8 | 5% | 2.11 | 3.15 |
|  |  | 2.5% | 2.33 | 3.42 |
|  |  | 1% | 2.62 | 3.77 |

Levels Equation

Case 2: Restricted Constant and No Trend



ARDL Long Run Form and Bounds Test Dependent Variable: D(LRGDP) Selected Model: ARDL(1, 0, 0, 2, 2, 0)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:40

Sample: 1981 2019

Included observations: 37

Levels Equation

Case 2: Restricted Constant and No Trend

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| MPOP | -0.685413 | 0.256616 | -2.670969 | 0.0174 |
| ADEPR | -0.520286 | 0.276826 | -1.879470 | 0.0797 |
| FERT | 1.559972 | 0.745835 | 2.091577 | 0.0539 |
| URBANR | 0.125034 | 0.625720 | 1.998251 | 0.0642 |
| AGRSH | -0.188068 | 0.556405 | -0.338006 | 0.7400 |
| LRGDP | -0.989506 | 0.356625 | -2.774639 | 0.0142 |
| SSER | -0.800065 | 0.205754 | -3.888446 | 0.0015 |
| TOPEN | -0.083071 | 0.158810 | -0.523084 | 0.6086 |
| C | -341.6146 | 127.8279 | -2.672457 | 0.0174 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| POPG | -0.174681 | 0.362205 | -0.482270 | 0.6336 |
| FERT | 1.024484 | 0.447570 | 2.288993 | 0.0304 |
| URBANR | 0.101504 | 0.022010 | 4.611758 | 0.0001 |
| SSER | 0.014929 | 0.015028 | 0.993376 | 0.3297 |
| TOPEN | -0.000527 | 0.000915 | -0.575981 | 0.5696 |
| C | 0.018362 | 2.763242 | 0.006645 | 0.9947 |

EC = LRGDP - (-0.1747\*POPG + 1.0245\*FERT + 0.1015\*URBANR + 0.0149

\*SSER -0.0005\*TOPEN + 0.0184 )

ARDL Error Correction Regression Dependent Variable: D(LRGDP) Selected Model: ARDL(1, 0, 0, 2, 2, 0)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:41

Sample: 1981 2019



7.112607

5

Value

\* p-value incompatible with t-Bounds distribution.

Null Hypothesis: No levels relationship

Included observations: 37

ECM Regression

Case 2: Restricted Constant and No Trend

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(URBANR) | 0.037891 | 0.033228 | 1.140318 | 0.2645 |
| D(URBANR(-1)) | 0.103761 | 0.037728 | 2.750275 | 0.0107 |
| D(SSER) | 0.042726 | 0.008973 | 4.761750 | 0.0001 |
| D(SSER(-1)) | 0.035084 | 0.009630 | 3.643117 | 0.0012 |
| CointEq(-1)\* | -0.560897 | 0.071652 | -7.828017 | 0.0000 |
| R-squared | 0.754070 | Mean dependent var | | 0.042191 |
| Adjusted R-squared | 0.723329 | S.D. dependent var | | 0.041292 |
| S.E. of regression | 0.021719 | Akaike info criterion | | -4.696138 |
| Sum squared resid | 0.015095 | Schwarz criterion | | -4.478446 |
| Log likelihood | 91.87855 | Hannan-Quinn criter. | | -4.619391 |
| Durbin-Watson stat | 1.892533 |  | |  |

F-Bounds Test

Test Statistic

Signif.

I(0)

I(1)

F-statistic k

10%

5%

2.5%

1%

2.08

2.39

2.7

3.06

3

3.38

3.73

4.15

ARDL Long Run Form and Bounds Test Dependent Variable: D(LRGDP) Selected Model: ARDL(1, 0, 0, 2, 2, 0)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:41

Sample: 1981 2019



Included observations: 37

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LABFG | -0.044494 | 0.045059 | -0.987466 | 0.3325 |
| FERT | 0.784632 | 0.265529 | 2.954973 | 0.0066 |
| URBANR | 0.099952 | 0.017440 | 5.731347 | 0.0000 |
| SSER | 0.006480 | 0.015739 | 0.411689 | 0.6839 |
| TOPEN | -0.000396 | 0.000873 | -0.453729 | 0.6538 |

C 1.420134 1.989109 0.713955 0.4816

EC = LRGDP - (-0.0445\*LABFG + 0.7846\*FERT + 0.1000\*URBANR + 0.0065

\*SSER -0.0004\*TOPEN + 1.4201 )



\* p-value incompatible with t-Bounds distribution.

Null Hypothesis: No levels relationship

Value

Signif.

7.390738

5

ARDL Error Correction Regression Dependent Variable: D(LRGDP) Selected Model: ARDL(1, 0, 0, 2, 2, 0)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:42

Sample: 1981 2019

Included observations: 37

ECM Regression

Case 2: Restricted Constant and No Trend

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(URBANR) | 0.026634 | 0.032988 | 0.807373 | 0.4268 |
| D(URBANR(-1)) | 0.114729 | 0.037926 | 3.025054 | 0.0055 |
| D(SSER) | 0.039213 | 0.008747 | 4.482896 | 0.0001 |
| D(SSER(-1)) | 0.038248 | 0.009599 | 3.984596 | 0.0005 |
| CointEq(-1)\* | -0.574657 | 0.072016 | -7.979602 | 0.0000 |
| R-squared | 0.760230 | Mean dependent var | | 0.042191 |
| Adjusted R-squared | 0.730258 | S.D. dependent var | | 0.041292 |
| S.E. of regression | 0.021446 | Akaike info criterion | | -4.721502 |
| Sum squared resid | 0.014717 | Schwarz criterion | | -4.503811 |
| Log likelihood | 92.34779 | Hannan-Quinn criter. | | -4.644756 |
| Durbin-Watson stat | 2.033070 |  | |  |

F-Bounds Test

Test Statistic

I(0)

I(1)

F-statistic k

10%

5%

2.5%

1%

2.08

2.39

2.7

3.06

3

3.38

3.73

4.15

ARDL Long Run Form and Bounds Test Dependent Variable: D(LRGDP) Selected Model: ARDL(1, 0, 2, 0, 2, 0)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:43

Sample: 1981 2019

Included observations: 37



EC = LRGDP - (3.7153\*MPOP + 1.0829\*FERT + 0.0441\*URBANR + 0.0081

\*SSER + 0.0006\*TOPEN -185.8586 )

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| MPOP | 3.715344 | 1.171454 | 3.171566 | 0.0039 |
| FERT | 1.082916 | 0.110362 | 9.812428 | 0.0000 |
| URBANR | 0.044091 | 0.024302 | 1.814324 | 0.0812 |
| SSER | 0.008115 | 0.015300 | 0.530421 | 0.6003 |
| TOPEN | 0.000577 | 0.000696 | 0.829074 | 0.4146 |
| C | -185.8586 | 58.28620 | -3.188723 | 0.0037 |



\* p-value incompatible with t-Bounds distribution.

Null Hypothesis: No levels relationship

Value

Signif.

8.243075

5

ARDL Error Correction Regression Dependent Variable: D(LRGDP) Selected Model: ARDL(1, 0, 2, 0, 2, 0)

Case 2: Restricted Constant and No Trend Date: 09/07/21 Time: 21:43

Sample: 1981 2019

Included observations: 37

ECM Regression

Case 2: Restricted Constant and No Trend

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(FERT) | -0.102286 | 0.460236 | -0.222246 | 0.8259 |
| D(FERT(-1)) | -1.559160 | 0.529943 | -2.942128 | 0.0068 |
| D(SSER) | 0.043633 | 0.008273 | 5.274107 | 0.0000 |
| D(SSER(-1)) | 0.030959 | 0.007901 | 3.918350 | 0.0006 |
| CointEq(-1)\* | -0.779085 | 0.092449 | -8.427174 | 0.0000 |
| R-squared | 0.774138 | Mean dependent var | | 0.042191 |
| Adjusted R-squared | 0.745905 | S.D. dependent var | | 0.041292 |
| S.E. of regression | 0.020814 | Akaike info criterion | | -4.781258 |
| Sum squared resid | 0.013864 | Schwarz criterion | | -4.563566 |
| Log likelihood | 93.45327 | Hannan-Quinn criter. | | -4.704512 |
| Durbin-Watson stat | 1.439232 |  | |  |

F-Bounds Test

Test Statistic

I(0)

I(1)

F-statistic k

10%

5%

2.5%

1%

2.08

2.39

2.7

3.06

3

3.38

3.73

4.15

VAR Lag Order Selection Criteria

Endogenous variables: UNEMPL POPG ADEPR LRGDP URBANR AGRSH Exogenous variables: C

Date: 09/08/21 Time: 09:32 Sample: 1981 2019

Included observations: 35



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Lag | LogL | LR | FPE | AIC | SC | HQ |
| 0 | -208.1512 | NA | 0.008313 | 12.23721 | 12.50384 | 12.32925 |
| 1 | 107.1007 | 504.4030 | 1.01e-09 | -3.720038 | -1.853620 | -3.075751 |
| 2 | 164.8245 | 22.56707\* | 3.53e-10 | -9.961398\* | -3.495194\* | -3.764865 |
| 3 | 225.0879 | 55.09797 | 1.54e-10 | -6.347878 | -1.281887 | -7.599099\* |
| 4 | 305.0539 | 45.69489 | 5.05e-11\* | -8.860225 | -2.194447 | -6.559199 |

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error

AIC: Akaike information criterion SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria

Endogenous variables: LRGDP POPG TOPEN SSER FERT Exogenous variables: C

Date: 09/08/21 Time: 09:37 Sample: 1981 2019

Included observations: 35

Lag LogL LR FPE AIC SC HQ

0 -84.51898 NA 0.000115 5.115370 5.337563 5.192071

1 184.8959 446.4589 1.00e-10 -8.851194 -7.518038 -8.390988

2 245.0621 82.51363\* 1.47e-11 -12.86069\* -8.416572\* -10.01698

3 273.2849 30.64191 1.58e-11 -11.04485 -7.489770 -10.817637\*

4 313.7208 32.34873 1.15e-11\* -11.92690 -7.260859 -10.31618

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error

AIC: Akaike information criterion SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Breusch-Godfrey Serial Correlation LM Test:

|  |  |  |
| --- | --- | --- |
| F-statistic | 2.433441 Prob. F(2,20) | 0.1133 |
| Obs\*R-squared | 7.045827 Prob. Chi-Square(2) | 0.0295 |

Breusch-Godfrey Serial Correlation LM Test:



|  |  |  |
| --- | --- | --- |
| F-statistic | 0.850266 Prob. F(2,20) | 0.4422 |
| Obs\*R-squared | 2.821091 Prob. Chi-Square(2) | 0.2440 |

Null Hypothesis: POPG has a unit root Exogenous: Constant

Lag Length: 2 (Automatic - based on SIC, maxlag=9)

t-Statistic Prob.\*



Augmented Dickey-Fuller test statistic

1% level

5% level

10% level

-1.497910

-3.626784

-2.945842

-2.611531

0.5233

Test critical values:

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

Null Hypothesis: D(POPG) has a unit root Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

t-Statistic

Prob.\*

Augmented Dickey-Fuller test statistic Test critical values: 1% level

5% level

10% level

-5.172918

-3.621023

-2.943427

-2.610263

0.0001

Null Hypothesis: UNEMPL has a unit root Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

t-Statistic

Prob.\*

Augmented Dickey-Fuller test statistic Test critical values: 1% level

5% level

10% level

-0.935156

-3.615588

-2.941145

-2.609066

0.7659

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

Null Hypothesis: D(UNEMPL) has a unit root Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic -6.284994 0.0000

Test critical values: 1% level -3.621023

5% level -2.943427

10% level -2.610263

Null Hypothesis: LRGDP has a unit root Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=9)

t-Statistic Prob.\*



Augmented Dickey-Fuller test statistic

1% level

5% level

10% level

-0.096781

-3.621023

-2.943427

-2.610263

0.9424

Test critical values:

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

Null Hypothesis: D(LRGDP) has a unit root Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

t-Statistic

Prob.\*

Augmented Dickey-Fuller test statistic Test critical values: 1% level

5% level

10% level

-3.434088

-3.621023

-2.943427

-2.610263

0.0160

Null Hypothesis: ADEPR has a unit root Exogenous: Constant

Lag Length: 6 (Automatic - based on SIC, maxlag=9)

t-Statistic

Prob.\*

Augmented Dickey-Fuller test statistic Test critical values: 1% level

5% level

10% level

5.103584

-3.653730

-2.957110

-2.617434

0.0000

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

Null Hypothesis: AGRSH has a unit root Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

t-Statistic Prob.\*



Augmented Dickey-Fuller test statistic

1% level

5% level

10% level

-1.755287

-3.615588

-2.941145

-2.609066

0.3963

Test critical values:

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

Null Hypothesis: D(AGRSH) has a unit root Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

t-Statistic

Prob.\*

Augmented Dickey-Fuller test statistic Test critical values: 1% level

5% level

10% level

-6.796774

-3.621023

-2.943427

-2.610263

0.0000

Null Hypothesis: FERT has a unit root Exogenous: Constant

Lag Length: 0 (Fixed)

t-Statistic

Prob.\*

Augmented Dickey-Fuller test statistic Test critical values: 1% level

5% level

10% level

3.895550

-3.615588

-2.941145

-2.609066

0.0263

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

Null Hypothesis: LABFG has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic -2.334973 0.1670



Test critical values: 1% level -3.626784

5% level -2.945842

10% level -2.611531

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

Null Hypothesis: D(LABFG) has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic -5.923193 0.0000

Test critical values: 1% level -3.632900

5% level -2.948404

10% level -2.612874

Null Hypothesis: MPOP has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic -1.525660 0.5097

Test critical values: 1% level -3.621023

5% level -2.943427

10% level -2.610263

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

Null Hypothesis: D(MPOP) has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic -9.144277 0.0000

Test critical values: 1% level -3.626784

5% level -2.945842

10% level -2.611531

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

Null Hypothesis: SSER has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic 0.874598 0.9940



Test critical values: 1% level -3.621023

5% level -2.943427

10% level -2.610263

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

Null Hypothesis: D(SSER) has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic -2.994311 0.0466

Test critical values: 1% level -3.626784

5% level -2.945842

10% level -2.611531

Null Hypothesis: TOPEN has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic -1.921457 0.3192

Test critical values: 1% level -3.621023

5% level -2.943427

10% level -2.610263

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

Null Hypothesis: D(TOPEN) has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)

t-Statistic Prob.\*

Augmented Dickey-Fuller test statistic -5.392539 0.0001

Test critical values: 1% level -3.626784

5% level -2.945842

10% level -2.611531

Null Hypothesis: URBANR has a unit root Exogenous: Constant

Lag Length: 1 (Fixed)



t-Statistic

Prob.\*

Augmented Dickey-Fuller test statistic

-1.741519

-3.621023

-2.943427

-2.610263

0.4027

Test critical values:

1% level

5% level

10% level

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

Null Hypothesis: D(URBANR,2) has a unit root Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

t-Statistic

Prob.\*

Augmented Dickey-Fuller test statistic Test critical values: 1% level

5% level

10% level

-4.009112

-3.626784

-2.945842

-2.611531

0.0037

**DATA SET**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **UNEMPL** | **PCI** | **POP** | **POPG** | **MPOP** | **RGDPG** | **ADEPR** |
| 1981 | 6.3 | 3098.70 | 75.44 | 2.75 | 50.28 | 1.03 | 89.30 |
| 1982 | 7.1 | 2822.10 | 77.43 | 2.63 | 50.27 | -1.79 | 90.29 |
| 1983 | 6.9 | 2715.40 | 79.41 | 2.57 | 50.26 | -7.58 | 91.08 |
| 1984 | 6.2 | 2947.90 | 81.45 | 2.56 | 50.26 | -0.51 | 91.63 |
| 1985 | 6.1 | 2927.50 | 83.56 | 2.6 | 50.25 | 8.52 | 91.92 |
| 1986 | 5.3 | 2833.00 | 85.77 | 2.64 | 50.26 | 1.90 | 92.51 |
| 1987 | 7 | 2970.00 | 88.05 | 2.66 | 50.27 | 0.17 | 92.74 |
| 1988 | 5.3 | 3101.90 | 90.40 | 2.67 | 50.28 | 6.23 | 92.66 |
| 1989 | 4.5 | 3368.50 | 92.79 | 2.65 | 50.29 | 6.66 | 92.32 |
| 1990 | 3.5 | 3286.90 | 95.21 | 2.61 | 50.31 | 11.63 | 91.76 |
| 1991 | 3.1 | 3292.40 | 97.67 | 2.58 | 50.31 | -0.55 | 91.66 |
| 1992 | 3.4 | 3264.40 | 100.16 | 2.55 | 50.32 | 2.19 | 91.29 |
| 1993 | 2.7 | 3212.80 | 102.70 | 2.53 | 50.33 | 1.57 | 90.71 |
| 1994 | 2 | 3205.40 | 105.29 | 2.52 | 50.33 | 0.26 | 89.95 |
| 1995 | 1.8 | 3260.70 | 107.95 | 2.52 | 50.34 | 1.87 | 89.08 |
| 1996 | 3.4 | 3277.80 | 110.67 | 2.52 | 50.36 | 4.05 | 88.82 |
| 1997 | 4.5 | 3292.60 | 113.46 | 2.52 | 50.37 | 2.89 | 88.38 |
| 1998 | 7.3 | 3254.60 | 116.32 | 2.52 | 50.38 | 2.50 | 87.82 |
| 1999 | 9.5 | 3333.60 | 119.26 | 2.53 | 50.40 | 0.52 | 87.22 |
| 2000 | 13.1 | 3407.80 | 122.28 | 2.54 | 50.41 | 5.52 | 86.62 |
| 2001 | 13.6 | 3479.80 | 125.39 | 2.54 | 50.43 | 6.67 | 86.76 |
| 2002 | 12.6 | 3720.00 | 128.60 | 2.55 | 50.45 | 14.60 | 86.79 |
| 2003 | 14.8 | 3867.90 | 131.90 | 2.57 | 50.46 | 9.50 | 86.76 |
| 2004 | 13.4 | 4018.90 | 135.32 | 2.59 | 50.48 | 10.44 | 86.69 |
| 2005 | 11.9 | 4156.70 | 138.87 | 2.62 | 50.50 | 7.01 | 86.60 |
| 2006 | 12.3 | 4316.10 | 142.54 | 2.65 | 50.51 | 6.73 | 87.09 |
| 2007 | 12.7 | 4461.50 | 146.34 | 2.67 | 50.53 | 7.32 | 87.43 |
| 2008 | 14.9 | 4653.90 | 150.27 | 2.69 | 50.54 | 7.20 | 87.65 |
| 2009 | 19.7 | 4900.40 | 154.32 | 2.7 | 50.56 | 8.35 | 87.79 |
| 2010 | 5.1 | 5150.60 | 158.50 | 2.71 | 50.57 | 9.54 | 87.86 |
| 2011 | 6 | 5414.40 | 162.81 | 2.71 | 50.59 | 5.31 | 88.22 |
| 2012 | 10.6 | 5657.60 | 167.23 | 2.72 | 50.60 | 4.21 | 88.46 |
| 2013 | 10 | 5922.80 | 171.77 | 2.71 | 50.61 | 5.49 | 88.55 |
| 2014 | 9.4 | 6371.20 | 176.40 | 2.7 | 50.63 | 6.22 | 88.45 |
| 2015 | 9 | 5914.10 | 181.14 | 2.68 | 50.64 | 2.79 | 88.15 |
| 2016 | 13.4 | 5810.50 | 185.96 | 2.66 | 50.65 | -1.58 | 88.09 |
| 2017 | 17.5 | 5818.81 | 190.87 | 2.64 | 50.66 | 0.82 | 87.77 |
| 2018 | 22.9 | 5830.27 | 195.87 | 2.62 | 50.66 | 1.91 | 87.11 |
| 2019 | 23.1 | 5873.78 | 200.96 | 2.6 | 50.67 | 2.27 | 86.01 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Date** | **URBANR** | **FERT** | **LABF** | **AGRSH** | **TOPEN** | **SSER** |
| 1981 | 22.67 | 6.76 | 52.83 | 15.50 | 16.48 | 23.92 |
| 1982 | 23.39 | 6.76 | 52.55 | 16.19 | 12.24 | 24.66 |
| 1983 | 24.12 | 6.76 | 52.33 | 17.39 | 10.07 | 25.2 |
| 1984 | 24.87 | 6.73 | 52.18 | 16.72 | 9.55 | 25.78 |
| 1985 | 25.64 | 6.70 | 52.10 | 18.26 | 9.77 | 26.25 |
| 1986 | 26.41 | 6.67 | 51.94 | 19.60 | 7.36 | 26.72 |
| 1987 | 27.21 | 6.63 | 51.88 | 18.94 | 19.33 | 27.24 |
| 1988 | 28.02 | 6.60 | 51.91 | 19.58 | 16.43 | 27.96 |
| 1989 | 28.84 | 6.56 | 52.00 | 19.23 | 21.19 | 28.56 |
| 1990 | 29.68 | 6.51 | 52.15 | 17.95 | 31.14 | 29.24 |
| 1991 | 30.18 | 6.46 | 52.18 | 18.70 | 35.40 | 29.93 |
| 1992 | 30.68 | 6.42 | 52.28 | 18.73 | 38.33 | 30.7 |
| 1993 | 31.18 | 6.37 | 52.44 | 18.79 | 30.53 | 31.55 |
| 1994 | 31.69 | 6.33 | 52.65 | 19.22 | 20.92 | 32.43 |
| 1995 | 32.21 | 6.29 | 52.89 | 19.54 | 58.92 | 33.38 |
| 1996 | 32.73 | 6.25 | 52.96 | 19.52 | 49.54 | 34.29 |
| 1997 | 33.25 | 6.21 | 53.08 | 19.76 | 50.77 | 35.22 |
| 1998 | 33.77 | 6.17 | 53.24 | 20.04 | 34.63 | 36.23 |
| 1999 | 34.30 | 6.15 | 53.41 | 20.95 | 38.65 | 37.26 |
| 2000 | 34.84 | 6.12 | 53.58 | 20.44 | 42.49 | 38.31 |
| 2001 | 35.67 | 6.10 | 53.55 | 19.89 | 39.66 | 39.39 |
| 2002 | 36.51 | 6.08 | 53.54 | 26.99 | 28.74 | 40.49 |
| 2003 | 37.36 | 6.05 | 53.55 | 26.38 | 38.85 | 41.63 |
| 2004 | 38.21 | 6.02 | 53.57 | 25.38 | 38.04 | 42.63 |
| 2005 | 39.07 | 6.00 | 53.59 | 25.40 | 45.12 | 43.65 |
| 2006 | 39.94 | 5.97 | 53.45 | 25.56 | 36.40 | 44.77 |
| 2007 | 40.82 | 5.94 | 53.35 | 25.53 | 37.04 | 45.9 |
| 2008 | 41.70 | 5.91 | 53.29 | 25.31 | 40.81 | 47.06 |
| 2009 | 42.59 | 5.88 | 53.25 | 24.73 | 31.81 | 48.33 |
| 2010 | 43.48 | 5.84 | 53.23 | 23.89 | 37.22 | 49.65 |
| 2011 | 44.37 | 5.81 | 53.13 | 23.35 | 41.47 | 50.61 |
| 2012 | 45.25 | 5.77 | 53.06 | 23.91 | 34.99 | 51.62 |
| 2013 | 46.12 | 5.74 | 53.04 | 23.33 | 30.79 | 52.01 |
| 2014 | 46.98 | 5.68 | 53.06 | 22.90 | 26.39 | 53.97 |
| 2015 | 47.84 | 5.61 | 53.15 | 23.11 | 21.16 | 53.6 |
| 2016 | 48.68 | 5.55 | 53.17 | 24.45 | 18.05 | 54.02 |
| 2017 | 49.52 | 5.48 | 53.26 | 25.08 | 21.80 | 54.53 |
| 2018 | 49.91 | 5.42 | 53.84 | 25.13 | 20.98 | 55.03 |
| 2019 | 50.04 | 5.35 | 53.91 | 25.16 | 21.22 | 56.11 |

