EFFECT OF UNEMPLOYMENT ON OUTPUT GROWTH IN NIGERIA: EVIDENCE FROM OKUN'S LAW

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Abstract

The study investigated the effects of unemployment on economic growth and the agricultural, industrial and services sectoral output growth. To achieve this, economy-wide output growth and sectoral output growth models were specified, using the neoclassical theory-based economy-wide and sectoral growth accounting equations as the main theoretical framework. In addition to the unemployment rate, 5 control variables (viz: labour force growth, private capital stock growth, foreign direct investment, government expenditure and literacy rate) were also included in all equations while the 3 sectoral output growth variables for the agricultural, industrial and services sector were the dependent variables. The OLS estimation method was employed, appropriate diagnostic tests were carried out, and remedial econometric measures were adopted to ensure the validity of the model estimates. Annual data covering the period of 1999 to 2022, sourced from the CBN, the World Bank and the IMF databases were employed in the analysis. It was found from the study that unemployment has a negative effect on economic growth as well as output growth in each of three sectors (viz: agricultural, industrial and services). Based on this finding, it is recommended that the authorities formulate and implement policies that will reduce the unemployment rate.

Keywords: Economic Growth, Unemployment and Sectoral Output

JEL Codes: O4, E24, O13, O14 and N7

1. Introduction

Achieving economic growth is a top priority for governments in both developed and developing countries. This is because there is a strong connection between economic growth and overall social and economic development within a country. Additionally, research indicates that economic growth is influenced by numerous factors. However, for short-term macroeconomic analysis, it is important to consider inflation and unemployment rates as significant factors.

The unemployment rate particularly has been identified as a macroeconomic determinant of economic growth in what is referred to as Okun's Law. According to this, increasing unemployment simply implies that the resources for producing output have simply not been engaged and thus remain idle and therefore output will continue to fall as unemployment increases. While several empirical studies have examined this issue (Cetin et al., 2015; Karikari-Apau & Abeti, 2019; Kukaj, 2018; Yolanda et al., 2020; and Rasheed, 2023), not many studies have been done in the Nigerian context. Particularly, it is desirable to know whether there are differences in the sectoral effect of unemployment. In order words, the predicted negative granted that it affects aggregate economic growth in the Nigerian setting (in respect of which there has hardly been any empirical evidence to this effect), it is of policy relevance to know if there are differences in sectoral effects of it. Hence, this study seeks to investigate not only the effect of unemployment on the economic-wide output growth in Nigeria but also verify the validity of Okun's law in the country and investigate whether and how such an effect pertains to the sectoral output growth in the form of growth of agricultural, industrial and services sectoral outputs.

The subsequent sections of the paper are structured as follows: the second section provides a comprehensive review of the pertinent literature, while the third section focuses on the methodology. The fourth section of the paper focuses on presenting and discussing the results obtained from data analysis. The fifth section, on the other hand, is dedicated to discussing the conclusion and recommendations of the paper.

2.0 Literature Review

2.1 Theoretical Review

The theoretical review of this study encompasses two main theories: Okun's Law and economic growth theories. These theories serve as a foundation for understanding the relationship between unemployment and economic growth, providing insights into the mechanisms and dynamics at play in the economy.

Put forward by Okun (1962), Okun's Law sheds light on the crucial connection between unemployment rates and an economy's production capacity. It essentially proposes an inverse relationship between the two: lower unemployment signifies a stronger labour market, often accompanied by rising economic output GDP, reflecting a more active and productive economy. Conversely, higher unemployment indicates a slowdown in growth and a decrease in GDP. There are two interpretations of this law, one posits that higher output growth leads to a decrease in unemployment. They explain that output growth that is higher than usual is associated with a reduction in the unemployment rate while output growth that is lower than usual is associated with an increase in the unemployment rate, and this is why unemployment goes up in recessions and down in expansions (Blanchard & Johnson, 2013). This interpretation implies that on average, an increase (decrease) in the economic growth rate explains decreases (increase) in the unemployment rate. The second interpretation, explains that the largest cost of unemployment is lost in production. People who cannot work do not produce, so high unemployment will result in a very high fall in output (Dornbusch et al., 2010). This version sees changes in the unemployment rate as explaining the decrease or increase in the economic growth rate. This paper goes with the second interpretation because the interest is to examine the effect of unemployment on economic growth.

Concerning economic growth theories, numerous such theories can be found in the academic literature. Significant ones among them include the classical theory, Schumpeter theory, neo-classical theory, and the endogenous growth theory. These theories will be reviewed sequentially in the paragraphs below.

Adam Smith (1776) posited in his exposition, a pivotal work in classical growth theory, that the division of labour among workers into specific tasks is the primary catalyst for growth. Furthermore, he highlighted that the availability of specific tools and equipment enables workers to enhance their efficiency. To achieve this, continuous capital accumulation is crucial, contingent upon capital owners being able to retain and reinvest profits. Smith illustrated this concept with the metaphor of the "invisible hand" of profits, which motivates entrepreneurs to engage in investment, productivity enhancements, and reinvestment for their gain, ultimately benefiting the entire economy indirectly.

In the Schumpeter (1911) theory, as elucidated by Adusei (2012), a well-established financial system accelerates technological innovation and economic growth by offering financial services and resources to entrepreneurs likely to effectively implement innovative products and processes. The theory underscores the significant role of credit in the economy, asserting that funds for investment do not stem from current income savings but rather from credit creation by the banking sector. Schumpeter further posited that entrepreneurs expand their ventures primarily through bank loans, not based on savings deposited in banks. Banks themselves generate credit to accommodate business borrowers, potentially leading to price inflation. Consequently, credit creation assists investors by freeing them from the savings routine, making forced savings a crucial mechanism for capital accumulation.

The theory of Neoclassical growth, as explained by Banton (2023), implies that output growth is dependent on growth in capital, labour, and technological input. A rise in the savings rate only boosts the steady-state levels of output per capita and per capita capital stock over time, without affecting the output growth rate. This is attributed to the diminishing marginal product of capital, where further capital increases lead to output declines. The theory also predicts that population growth diminishes capita and output per head levels, increasing the output growth rate.

Liberto (2023) described that the endogenous growth model as positing that economic growth emanates internally within the economy, specifically through endogenous mechanisms rather than exogenous ones. This standpoint stands in contrast to the neo-classical growth theory, which asserts that external factors like technological advancements, capital, and labour serve as the primary drivers of economic expansion. The endogenous growth theory postulates that population growth, human capital accumulation, and knowledge acquisition are the fundamental determinants of economic progress. Within a knowledge-centric economy, underpinned by strong intellectual property rights, the concept of diminishing returns to capital accumulation is eradicated due to the positive spill over effects stemming from investments in technology and human capital. Notably, productivity enhancement is contingent upon disparities in expenditures directed towards research and development as well as education in endogenous models, consequently leading to accelerated technological advancements. Nonetheless, it is contended that validating endogenous growth models through empirical evidence remains a formidable challenge due to the presence of assumptions that defy precise measurement.

2.2 Empirical Review

A thorough review of the literature on the effects of change in unemployment on output growth reveals a variety of empirical studies that have investigated this subject across different countries and contexts. The empirical review is classified into two, studies that cover Africa and those that cover non-African countries.

In regards to non-African countries, several such studies have reported the expected negative effects of changes in unemployment on economic growth while others reported a nil effect. These studies include Shahid (2014) who investigated the effect of unemployment on economic growth in Pakistan, using ARDL to analyse time series data from 1980 to 2010 and found a long-run negative effect of unemployment on economic growth. Cetin et al. (2015) examined the impact of unemployment on economic growth in 15 EU countries from 1984 to 2012 using panel OLS and also found a negative effect of it. Dritsakis and Stamatiou (2016) investigated the relationship between the unemployment rate, economic growth, and inflation rate in Greece using a dynamic unrestricted error correction model and data from 1995 to 2015, it revealed that unemployment has a negative effect on economic growth in both the short and long run. Mohseni and Jouzaryan (2016) examined the role of inflation and unemployment on economic growth in Iran from 1996 to 2012, the ARDL result revealed a long-run negative effect of unemployment on economic growth. Kukaj (2018) using the Fixed Effect model investigated the relationship between unemployment and GDP growth in seven Western Balkan countries between 2001 and 2015 and found that unemployment negatively affects economic growth. Yolanda et al. (2020) analysed the effect of investment and unemployment on economic growth and poverty in North Sumatra Province of Indonesia, using pooled data from 2014 to 2018, and found a negative effect of unemployment on economic growth. Shah et al. (2022) assessed the impact of unemployment on the growth rate in Pakistan from 1974 to 2020, the ARDL result showed that unemployment rates negatively affect economic growth. Finally, Amalia and Miranti (2023) examined the effect of high unemployment rates on economic growth in Bali Province, Indonesia from 2017 to 2021 using the Random Effect model, and concluded that high unemployment rates negatively affect economic growth in Bali. On the other hand, Altamimi (2019) analysed the effect of the unemployment rate on the growth rate of the GDP of Jordan for the period 2009-2016 by employing the OLS technique, the result showed that unemployment has nil effect on economic growth in Jordan. Also, Sinha (2022) examined the impact of unemployment, inflation, capital stock, and human capital investment on India's economic growth from 1990 to 2021, the ARDL results showed that unemployment does not significantly impact real GDP in India in the long run.

Concerning the second strand of studies which covers African countries, the majority of the studies have similarly reported negative effects of unemployment on economic growth while just a few reported nil effect. These include Jibir et al. (2015) who examined the impact of unemployment on economic growth in Nigeria from 1982 to 2014 using the OLS technique and found a negative effect of unemployment on economic growth. Similarly, Abula and Mordecai (2016) investigated the impact of unemployment on economic growth in Nigeria between 1981 and 2015 using OLS and VECM, but the result revealed no effect of unemployment on economic growth. In South Africa, Makaringe and Khobai (2018) investigated the trends and effects of unemployment on economic growth, using quarterly data from 1994Q1 to 2016Q4, the ARDL result revealed a long-term negative effect of unemployment on economic growth. Also, Elorhor (2019) analysed the effect of unemployment on economic growth in Nigeria from 1986 to 2008 by employing the OLS method and found a negative effect of unemployment on economic growth. Covering a wider range of countries, Eshun (2020) tested Okun's Law in 10 West African countries by adopting the Fixed Effect method to analyse data collected from 2004 to 2017 and confirmed the negative effect of unemployment on economic growth in West Africa. In South Africa, using a different approach and more data range than Makaringe and Khobai (2018), Sere and Tchereni (2020) studied the non-linear relationship between economic growth and unemployment from 1994Q1 to 2019Q4 using the ARDL model for estimation. The result showed that unemployment has nil effect on economic growth in South Africa. In a more recent study on Nigeria, Rasheed (2023) employed the ARDL model to test Okun’s Law by investigating the effect of unemployment on economic growth from 2010 to 2020. The result supported the prediction of Okun’s Law by revealing a negative effect of unemployment rates on economic growth, corroborating the earlier findings by Jibir et al. (2015); and Elorhor (2019). Sekwati and Dagume (2023) analysed the effect of unemployment and inflation on economic growth in South Africa from 1994 to 2018 and also confirmed its negative effect. Lastly, Nambie et al. (2023) empirically analysed the contribution of income inequality, financial inclusion, investment, and unemployment on economic growth in 42 Africa from 2001 to 2022. The Two-step system generalised method of moments (GMM) was used for estimation and the paper found that income inequality and unemployment have negative effects on economic growth.

It can thus be observed from the empirical studies reviewed in the above paragraphs that there is no consensus as regards the effect of unemployment on economic growth. Also, most of the studies analysed the effect of unemployment on economy-wide output growth while ignoring the effect of unemployment on sectoral output growth. However, knowing the sectoral effect will give policymakers an understanding of how unemployment affects the key sectors of the economy. Thus, the motivation of this study is to fill this gap in the literature.

3. Methodology

3.1 Theoretical Framework

Concerning the effect of unemployment on economic growth, the theoretical foundation is premised on Okun's Law. The choice of Okun's law is because it provides a quantitative framework for analysing the relationship between unemployment and economic growth. The law states that an increase in the unemployment rate will cause a reduction in economic growth. Unemployment represents underutilised labour resources; therefore, when fewer people work, it results in lower overall production and economic output. In its simplified form, this can be expressed as:

$$(\frac{\Delta Y}{Y})_t = \alpha - \beta \Delta u_t \text{ ------------------------------------ } (1)$$

where $(\frac{\Delta Y}{Y})_t$ is the GDP growth rate, Δu_t is the first difference or change in the unemployment rate, α *and* β are the constant and intercept respectively and the subscript t is the period.

Concerning the growth theory, Dornbusch et al. (2010) provided the derivation of the growth accounting equation which is rooted in the neo-classical production function, as described below, starting with a neoclassical production function:

Assume an aggregate production function:

$$Y = Af(K,\ L) \ldots\ldots (2)$$

where A = indicator of the level of technology, K = capital stock, L = labour, and Y = output,

This production function implies that output is a function of labour, capital and technology.

Taking a total derivative of Y in the above Equation (2) gives Equation (3) below:

$$\Delta Y = MPL.\Delta L + MPK.\Delta K + F(K,N).\Delta A \ldots\ldots (3)$$

where MPL and MPK stand for marginal productivities (or partial derivatives of Y concerning each) of labour and capital respectively. If Equation (3) above is divided by Equation (2), then the following will be arrived at:

$$\frac{\Delta Y}{Y} = \frac{MPL}{Y}.\Delta L + \frac{MPK}{Y}.\Delta K + \frac{\Delta A}{A} \ldots\ldots (4).$$

Multiplying and dividing the first and second part of the Right-Hand Side (RHS) by L and K respectively will give:

$$\frac{\Delta Y}{Y} = \left(\frac{MPL}{Y}L\right)\frac{\Delta L}{L} + \left(\frac{MPK}{Y}K\right)\frac{\Delta K}{K} + \frac{\Delta A}{A} \ldots\ldots (5)$$

Assuming a perfectly competitive market, so that factors are paid their respective marginal products, then, MPL = w and MPK = r, where w and r are the market wage rate and net capital rental rate. It should be noted that $\frac{MPL}{Y} * L$ and $\frac{MPK}{Y} * K$ represent the shares of labour and capital in the total income (Y) respectively. Replacing the labour and capital shares with $1 - \alpha$ and α respectively will give us the growth accounting equation below:

$$\frac{\Delta Y}{Y} = (1 - \alpha)\frac{\Delta L}{L} + \alpha\frac{\Delta K}{K} + \frac{\Delta A}{A} \ldots\ldots (6)$$

Equation (6) shows that the sum of weighted growth rates of inputs (with the weight being a share of total output accruing to each factor of production) and the productivity growth rate on the right-hand side gives the growth of output on the left-hand side.

3.2 Model Specification

To determine the effect of unemployment on economic growth, the neo-classical growth equation adopted in this study is extended through the level of technology (A), which can be construed broadly as embodying productivity and efficiency in all ramifications. This extension is through the identification of possible determinants of productivity growth **(**$\frac{\Delta A}{A}$**)** and specification of the total factor productivity growth **(**$\frac{\Delta A}{A}$**)** function.

Unemployment and Other Factors Affecting Productivity Growth, $\frac{\Delta A}{A}$

The factor productivity growth, $\frac{\Delta A}{A}$, constitutes a growth of all factors, except growth in the explicitly identified factors of production [which are only labour and capital in the above Equation (6)], that influence economic growth. In the discussion here, such factors include unemployment, which is the main postulated determinant that is of primary interest. Added to this are the control variables, which are the labour force growth, private capital stock growth, foreign direct investment, government expenditure and literacy rate.

Economic theory predicts a negative effect of change in unemployment on economic growth (Blanchard & Johnson, 2013). This negative effect association stems from several key factors. Firstly, high unemployment rates signify a significant portion of the available workforce remaining unutilised, leading to a decline in the overall production capacity of the economy. When there are fewer workers producing goods and services, the total output of the economy, which is measured by Gross Domestic Product (GDP), decreases. As a result, unemployed individuals have less money to spend, leading to lower consumer spending and reduced overall demand. This prompts businesses to decrease production, potentially creating a harmful cycle that slows down economic growth (Blanchard & Johnson, 2013; Sidrauski, 1967). Lastly, prolonged unemployment can lead to a decline in the skills and knowledge base of the workforce, making it harder for them to re-enter the workforce and contribute to future economic growth (Mincer, 1991). Additionally, high unemployment rates are often accompanied by social problems like poverty, crime, and social unrest, which can place a significant strain on the economy, diverting resources away from productive activities and hindering growth potential (Layard et al., 1994). Therefore, on *a priori* grounds, this study also expects a negative effect of change in unemployment on economic growth.

Concerning the control variables, a higher literacy rate is generally expected to have a positive effect on economic growth. An educated workforce fosters increased productivity and innovation, as highlighted by Lucas (1988). This skilled labour force is better equipped to make informed decisions and adapt to technological advancements (Psacharopoulos, 1997). While a temporary mismatch between skills and available jobs might occur in rare cases (Autor, 2015), the overall impact of a literate population leans towards positive economic growth. Similarly, FDI is expected to have a positive effect on economic growth, since inflow typically creates jobs, reducing unemployment and increasing household incomes, which in turn stimulates further economic activity and growth. Foreign investors might also invest in critical infrastructure projects such as roads, ports, and telecommunications, enhancing the overall efficiency of the economy and making it more attractive for further investment. Regarding government spending, this can positively influence economic growth when directed toward infrastructure development, such as roads, bridges, and utilities, which enhance productivity. Expenditure on human capital development, including education and healthcare, improves workforce quality and productivity, driving long-term growth. Additionally, spending on public goods and services, like law and order, creates a stable environment for economic activities, boosting investor confidence. During economic downturns, increased government spending acts as a counter-cyclical measure, stimulating demand and supporting economic recovery. On the other hand, if the government expenditure is not channelled to infrastructural development, human capacity building or institutional improvements, especially, if it is ridden with corruption and carried out where low quality of political governance prevails, this may have an adverse effect on productivity and also retard economic growth. For this study, it is posited that a positive effect of government expenditure on economic growth exists.

Mathematical Format of the Productivity Growth ($\frac{\Delta A}{A}$) Relationship

Following the above, a linear time series data-based deterministic equation for the total factor productivity growth is as specified below:

$$\left(\frac{\Delta A}{A}\right)_t = \beta_3\, \Delta u_t + \beta_4 FDI_t + \beta_5 LRT_t + \beta_6 GEXP_t \text{ --- } (7)$$

where: Δu_t = change in unemployment; FDI = foreign direct investment; LTR = literacy rate; GEXP = government expenditure while t subscript stands for period. It is expected that $\beta_3 < 0$; β_4 to $\beta_6 > 0$

To examine the effect of unemployment on growth, the growth accounting model in Equation (6) is re-specified. This is done by substituting the productivity growth ($\frac{\Delta A}{A}$) Equation (7) into the growth accounting Equation (6) and transforming the result into an econometric growth model by adding the intercept β_0 and the stochastic error term (U), thus:

$$\left(\frac{\Delta Y}{Y}\right)_t = \beta_0 + \beta_1 \left(\frac{\Delta L}{L}\right)_t + \beta_2 \left(\frac{\Delta K}{K}\right)_t + \beta_3 \Delta u_t + \beta_4 FDI_t + \beta_5 LRT_t + \beta_6 GEXP_t + \cup_t \text{--- } (8)$$

where: $\beta_1, to\ \beta_9$ represent the parameters to be estimated, with β_1 = 1 - α and β_1 = α in the growth accounting Equation (6). The a priori expectation concerning the parameters $\beta_3, to\ \beta_9$ are as previously stated mathematically in connection with Equation (7) while the earlier growth accounting Equation (6) implies: $\beta_1,\ \beta_2 > 0$. Also, the $\frac{\Delta Y}{Y}$, $\frac{\Delta L}{L}$, and $\frac{\Delta K}{K}$ are as defined in connection with the growth accounting Equation (6) (where α and $1 - \alpha$ are now replaced by β_1 and β_2 for notational convenience) while acronyms for other explanatory variables are as defined in connection with the productivity growth Equation (7).

This paper follows the majority of studies in the literature like Eshun (2020); Sere and Tchereni (2020); Shah et al. (2022); and Amalia and Miranti (2023); who adopted the unemployment rate instead of the first difference in unemployment. Thus, Equation (8) is respecified as:

$$\left(\frac{\Delta Y}{Y}\right)_t = \beta_0 + \beta_1\left(\frac{\Delta L}{L}\right)_t + \beta_2\left(\frac{\Delta K}{K}\right)_t + \beta_3 U_t + \beta_4 FDI_t + \beta_5 LRT_t + \beta_6 GEXP_t + \cup_t \quad \text{---} (8a)$$

where U_t = Unemployment rate and other parameters are as earlier defined

But the prime interest in this study is not just to analyse the economy-wide output growth but, instead, to analyse the sectoral output growth and this would require "stepping down" the above Equation (8) for the overall economic growth to the level or context of sectoral output growth.

Accordingly, concerning such sectoral output growth equations that are specified for estimation, the study first starts with the sectoral output level, denoted by y, concerning each of the three sectors of agriculture, industry and services, bearing in mind that the economy-wide output level or GDP, denoted by Y, is simply an aggregation of these three categories of sectoral output, y. By deriving a growth accounting relationship for each category of y (which is not shown here for brevity) that corresponds to the economy-wide growth accounting Equation (6); and by specifying a productivity growth relationship for the sectoral output (also, not shown here for brevity) in the same manner that is done to arrive at the economy-wide productivity growth Equation (7); and, finally, by using this sectoral productivity growth relationship to replace the productivity term in the sectoral growth accounting equation would yield the sectoral output growth Equation (9) below. It is to be noted that in this final sectoral output growth Equation (9), it is the economy-wide capital stock growth ($\frac{\Delta K}{K}$) and labour force growth ($\frac{\Delta L}{L}$) that still appear, instead of sector-specific capital stock growth and labour force growth. This is due to the absence of sector-specific statistics on capital stock and labour force and, hence, their growth rates. Concerning the unemployment rate as well as the other 3 control variables (viz: FDI, LTR and GEXP), it is these same economy-wide explanatory variables that apply to the economy-wide output growth ($\frac{\Delta Y}{Y}$) which are retained here as postulated determinants of each sectoral output growth ($\frac{\Delta y}{y}$). Sector-specific equivalents of them are inapplicable, unlike the sector-specific equivalents of economic-wide capital stock growth and labour force growth which are applicable but not employed due to the non-availability of sectoral statistics on them. Meanwhile, it is to be noted that it is the same directions of their effects on economy-wide output growth that are posited earlier that are still being retained here on sectoral output growth too.

$$\frac{\Delta y}{y}\frac{\Delta y}{y_t} = \beta_0 + \beta_1\left(\frac{\Delta L}{L}\right)_t + \beta_2\left(\frac{\Delta K}{K}\right)_t + \beta_3 \Delta u_t + \beta_4 FDI_t + \beta_5 LTR_t + \beta_6 GEXP_t \quad \text{-----} (9)$$

The above sectoral output growth Equation (9) is estimated for each of the three sectors identified in this study, which are the growth of outputs of agricultural, industrial and services sectors, with these being denoted by $\frac{\Delta y_{agr}}{y_{agr}}$, $\frac{\Delta y_{ind}}{y_{ind}}$, and $\frac{\Delta y_{ser}}{y_{ser}}$ respectively.

3.3 Estimation Techniques

It is pertinent to stress that both descriptive and inferential analyses were carried out in this study. The descriptive analysis involves the use of summary statistics to describe each of the variables. Also, the study checked for the presence of a unit root concerning each variable, and the Ordinary Least Square (OLS) method of estimation was employed. Having conducted the post-estimation tests for serial correlation, heteroskedasticity, multicollinearity and normality test and having taken the appropriate remedial measure that the outcomes of the tests necessitate, the study then derives and presents the OLS estimates of the regression equations.

3.4 Data Sources and Measurement of Variables

The data used for this study is time series spanning between 1999 to 2022. The commencement date is chosen because that was the commencement of the current democratic era which is accompanied by the lifting of several economic sanctions imposed on Nigeria before this period as a result of the military rule, while the end date is chosen based on the availability of data. The definition of the variables employed, their sources and how they were measured are described below.

Concerning, real GDP growth, agricultural output growth or $\frac{\Delta y_{agr}}{y_{agr}}$, industrial output growth or $\frac{\Delta y_{ind}}{y_{ind}}$, and service growth or $\frac{\Delta y_{ser}}{y_{ser}}$, these were measured as the growth rate of their respective value-added and are sourced online from the online version of Central Bank of Nigeria's (CBN) Statistical Bulletin. Also, the unemployment rate or UNE is measured as a change in unemployment in the total labour force and it is sourced online from the World Bank's World Development Indicators (WDI)

FDI, according to the data source, is the net inflows of investment to acquire a lasting management interest (10 per cent or more of voting stock) in an enterprise operating in an economy other than that of the investor and it is measured as a percentage of GDP and it is sourced online from the World Bank's WDI. The literacy rate is measured as the adult literacy rate, the percentage of people ages 15 and above who can read and write with understanding a short simple statement about their everyday life. Capita stock growth or $\frac{\Delta K}{L}$ is measured as an annual percentage change in private capital stock that is sourced from the International Monetary Fund's Investment and Capital Stock dataset, IMF (2023). Lastly, labour force growth or $\frac{\Delta L}{L}$ is measured as an annual percentage change in the labour force (i.e., people aged 15 who are currently employed and those who are unemployed but seeking work as well as first-time job-seekers) and the data are sourced online from the World Bank's WDI.

4. Results and Discussion

4.1 Analysis of the Descriptive Statistics

Table 1 presents the summary statistics. The table consists of the columns for the variables and their description, mean, standard deviation (std. Dev.), minimum (min), and maximum (max) values.

Table 1: Descriptive Statistics

Variables and Description and Measure	Mean	Std. Dev.	Min	Max
$\frac{\Delta Y}{Y}$: GDP growth, annual % change in real GDP	4.263	2.682	0.1	10.6
$\frac{\Delta y_{agr}}{y_{agr}}$: Agricultural real output growth, %	6.6	10.6	1.9	55.6
$\frac{\Delta y_{ind}}{y_{ind}}$: Industrial real output growth, %	1.3	4.9	-8.9	12.2
$\frac{\Delta y_{ser}}{y_{ser}}$: Services real output growth, %	6.8	5.5	-2.2	20
$\frac{\Delta L}{L}$: Labor force growth, %	2.411	0.863	-1.615	2.760
$\frac{\Delta K}{K}$: Private capital stock growth, %	1.774	0.952	-1.505	3.223
U: Unemployment rate	4.117	0.623	3.507	5.633
LITR: Literacy rate, % of total population	58.457	4.78	51.08	70.20
GEXP: Government expenditure, % of GDP	16.074	5.025	9.754	30.857
FDI: Net foreign direct investment inflow, % of GDP	1.409	0.813	-0.040	2.900

Source: Author's computation (2024).

Explanatory Notes: Std Dev = standard deviation, Coeff of var = coefficient of variation, Min = minimum, max = maximum. The total number of observations for each variable is 24

Table 1 reveals the mean and standard deviation of agricultural output growth or $\frac{\Delta y_{agr}}{y_{agr}}$ to be 6.6% and 10.6%, with a minimum value of 1.9% and a maximum value of 55.6%. The mean and standard deviation of industrial output growth or $\frac{\Delta y_{ind}}{y_{ind}}$ were 1.3% and 4.9% respectively, with a minimum value of -8.9% and a maximum value of 12.2%, while the mean and standard deviation of service output growth or $\frac{\Delta y_{ser}}{y_{ser}}$ were 6.8% and 5.5%, with a minimum value of -2.2% and a maximum value of 20%. The mean and standard deviation of $\frac{\Delta Y}{Y}$ were 4.263 and 2.682 respectively (which shows that there is no wide variation from the mean), with a minimum value of 0.1 and a maximum value of 10.6. Also, the mean and standard deviation of *U* were 4.117 and 0.623 respectively (suggesting that *U* is not scattered away from the mean value), with a minimum value of

3.507 and a maximum value of 5.633. The mean and standard deviation of $\frac{\Delta L}{L}$ were 2.411 and 0.863 respectively (suggesting that there is no wide variation from the mean), with a minimum value of -1.615 and a maximum value of 2.760, while the mean and standard deviation of $\frac{\Delta K}{K}$ were 1.774 and 0.952 respectively (implying that $\frac{\Delta K}{K}$ does not vary widely from the mean value), with a minimum value of -1.505 and a maximum of 3.223.

As for FDI, it had a mean and a standard deviation of 1.409 and 0.813 respectively, with a minimum value of -0.040 and a maximum of 2.900. in the same vein, LTR had a mean and a standard deviation of 58.457 and 4.78 respectively, with a minimum value of 51.08 and a maximum value of 70.20. Finally, the mean and standard deviation of GEXP were 16.074 and 5.025 respectively, with a minimum value of 9.754 and a maximum of 30.857.

Table 2: Unit Root Test

Variables	z-statistic	p-value	Order of Integration	Conclusion
$\frac{\Delta \boldsymbol{Y}}{\boldsymbol{Y}}$	-2.126	0..234	I(1)	Unit Root
	-4.887	0.000	I(0)	
$\frac{\Delta \boldsymbol{y_{agr}}}{\boldsymbol{y_{agr}}}$	-3.598	0.006	I(0)	Stationary
	NA	NA	NA	
$\frac{\Delta y_{ind}}{y_{ind}}$	-3.403	0.011	I(0)	Stationary
	NA	NA	NA	
$\frac{\Delta y_{ind}}{y_{ind}}$	-1.771	0.395	I(1)	Unit Root
	-5.446	0.000	I(0)	
$\frac{\Delta K}{K}$	-2.813	0.057	I(1)	Unit Root
	-5.038	0.000	I(0)	
$\frac{\Delta L}{L}$	-2.126	0.234	I(0)	Unit Root
	-6.934	0.000	I(1)	
U	-3.698	0.004	I(0)	Stationary
	NA	NA	NA	
FDI	-1.683	0.440	I(1)	Unit Root
	-4.683	0.000	I(0)	
LTR	-3.702	0.004	I(0)	Stationary
	NA	NA	NA	

GEXP	-1.526	0.521	I(1)	Unit Root
	-3.365	0.012	I(0)	

Source: Author's computation (2024).

Table 2 shows that based on a 5% significance level, $\frac{\Delta y_{agr}}{y_{agr}}$, $\frac{\Delta y_{ind}}{y_{ind}}$, U and LTR are stationary levels, while $\frac{\Delta Y}{Y}$, $\frac{\Delta y_{ind}}{y_{ind}}$, $\frac{\Delta K}{K}$, $\frac{\Delta L}{L}$, FDI and GEXP are stationary after the first difference.

4.2 Results of Regression Analysis

The OLS estimates of the alternative specification of the earlier Equations (8a) and (9) are presented in Table 2 as the four models. Specifically, the first model is the economic growth equation that is equivalent to the previously specified Equation (8a). Similarly, the other three model estimates are the sectorial output growth of agricultural, industry and services sectors that are variants of the earlier Equation (9). Concerning all the model estimates, the coefficients, t-statistics, and p-values are reported in the first, second, and third columns respectively. The decision rule for this study is that a coefficient is taken to be significant if the p-value is less or equal to the 0.05 benchmark so that it is taken as insignificant if it is greater than 0.05.

Table 3a: OLS Estimates of the Regression Equations for Economic Growth ($\frac{\Delta Y}{Y}$) and Agricultural Sector Growth ($\frac{\Delta y_{agr}}{y_{agr}}$)

Variable	$\frac{\Delta Y}{Y}$			$\frac{\Delta y_{agr}}{y_{agr}}$		
	Coefficient	t-stat	p-value	Coefficient	t-stat	p-value
$\frac{\Delta K}{K}$	0.007	0.26	0.795	0.016	0.77	0.448
$\frac{\Delta L}{L}$	0.030	2.71	0.012	0.011	1.91	0.067
U	-0.129	-4.48	0.000	-0.030	-2.14	0.042
FDI	-0.003	-0.15	0.884	0.007	0.69	0.494
LTR	0.005	1.82	0.080	0.002	1.48	0.152
GEXP	0.007	1.71	0.100	0.002	0.61	0.545
Constant	0.1648	0.87	0.394	0.000	0.00	0.998
Observations	24	24				
R^2	0.372	0.110				
F Statistic	8.88	-	0.000	2.64	-	0.040

Breusch-Pagan test statistic for Heteroscedasticity	5.95	-	0.0147	20.98	-	0.000
Breusch -Godfrey test statistic for serial correlation	0.015	-	0.903	0.268	-	0.605
VIF statistic for Multicollinearity	1.59	1.59				
Jarque-Bera test statistic for normality	1.739	-	0.419	3.559	-	0.169

Source: Author's computation (2024).

Explanatory note: $\frac{\Delta Y}{Y}$ *= GDP Output Growth* $\frac{\Delta y_{agr}}{y_{agr}}$ *= Agricultural Output Growth, U= change in Unemployment Rate,* $\frac{\Delta K}{K}$ *= Capital Stock Growth,* $\frac{\Delta L}{L}$ *= Labour Force Growth, FDI = Foreign Direct Investment, GEXP = Government Expenditure, LTR = Literacy Rate. A coefficient is deemed statistically significant if its p-value is less than or equal to the 0.05 significance level employed in the study*

Table 3b: OLS Estimates of the Regression Equation for Economic Growth ($\frac{\Delta y_{ind}}{y_{ind}}$) and Agricultural Sector Growth ($\frac{\Delta y_{ser}}{y_{ser}}$),

Variable	$\frac{\Delta y_{ind}}{y_{ind}}$			$\frac{\Delta y_{ser}}{y_{ser}}$		
	Coefficient	t-stat	p-value	Coefficient	t-stat	p-value
$\frac{\Delta K}{K}$	-0.009	-1.01	0.323	0.000	0.00	0.999
$\frac{\Delta L}{L}$	0.018	3.10	0.005	0.001	0.10	0.922
U	-0.036	-2.42	0.023	-0.063	-3.27	0.003
FDI	-0.021	-1.78	0.088	0.010	0.93	0.361
LTR	-0.000	-0.33	0.742	0.004	2.12	0.044
GEXP	0.005	2.27	0.032	0.000	0.19	0.855
Constant	0.109	0.97	0.343	0.056	0.42	0.675
Observations	24	24				
R^2	0.348	0.499				
F Statistic	6.02	-	0.001	4.15	-	0.005
Breusch-Pagan test statistic for Heteroscedasticity	0.70	-	0.401	2.88	-	0.090
Breusch -Godfrey test statistic for serial correlation	0.329	-	0.566	0.176	-	0.675
VIF statistic for Multicollinearity	1.59	1.59				
Jarque-Bera test statistic for normality	0.268	-	0.875	0.815	-	0.960

Source: Author's computation (2024).

Explanatory note: $\frac{\Delta y_{ind}}{y_{ind}}$*= Industrial Output Growth,* $\frac{\Delta y_{ser}}{y_{ser}}$ *= Service Output Growth, U= change in Unemployment Rate,* $\frac{\Delta K}{K}$ *= Capital Stock Growth,* $\frac{\Delta L}{L}$ *= Labour Force Growth, FDI = Foreign Direct Investment, GEXP = Government Expenditure, LTR = Literacy Rate. A coefficient is deemed statistically significant if its p-value is less than or equal to the 0.05 significance level employed in the study.*

The R^2 for the four models (viz: economy-wide output growth, agricultural output growth, industrial output growth and services sector output growth) are 0.37, 0.11, 0.35 and 0.50 respectively while their corresponding *F* statistics are 8.88, 2.64, 6.02 and 4.15, with p-values that are below the benchmark of 0.05 significance level in all cases. This shows that the models are of good fit and have at least, modest explanatory powers.

Concerning the four models, the *VIF* statistics obtained on average is 1.59, which is below the threshold value of 10, above which multicollinearity may pose a serious concern (Gujarati & Porter, 2009). In the same manner, the result of the Breusch-Pagan test shows that two models suffer from heteroscedasticity (viz: a model for $\frac{\Delta Y}{Y}$ and $\frac{\Delta y_{agr}}{y_{agr}}$) as the p-values of the Breusch-Pagan test statistic are less than the 0.05 benchmark and these are corrected for, by obtaining the result presented in the upper section of Table 2 with robust standard error. For the remaining two models (viz: the models for $\frac{\Delta y_{ind}}{y_{ind}}$ and $\frac{\Delta y_{ser}}{y_{ser}}$), the estimates are free from heteroscedasticity as the p-values of the test statistics are above the 0.05 cut-off. Also, the result of the Breusch-Godfrey test shows that none of the models suffers from autocorrelation as the p-values of the computed test statistics are between 0.903 and 0.675, which are all higher than the 5% cut-off. Finally, the Jarque-Bera test statistics show that the residuals are normally distributed as the p-values of the test statistics are between 0.960 and 0.169, which are all higher than the 5% cut-off.

Having evaluated the diagnostic test, the performance of the specific variables in the models is now discussed below.

The result shows that the coefficients of *U* are negative and statistically significant in all four models estimated, which provides reliable evidence of the negative effects of *U* on $\frac{\Delta y_{agr}}{y_{agr}}$, $\frac{\Delta y_{ind}}{y_{ind}}$, $\frac{\Delta y_{ser}}{y_{ser}}$ and $\frac{\Delta Y}{Y}$. Concerning the performances of the control variables, the coefficients of $\frac{\Delta L}{L}$ are positive and statistically significant in two models (viz: models for $\frac{\Delta y_{ind}}{y_{ind}}$ and $\frac{\Delta Y}{Y}$), so $\frac{\Delta L}{L}$ has positive effects on $\frac{\Delta y_{ind}}{y_{ind}}$ and $\frac{\Delta Y}{Y}$. The coefficients of $\frac{\Delta L}{L}$ in the models for $\frac{\Delta y_{agr}}{y_{agr}}$ and $\frac{\Delta y_{ser}}{y_{ser}}$ as well as the coefficients of $\frac{\Delta K}{L}$ in all the models are not statistically significant. The coefficients of LTR and GEXP are positive and statistically significant only in the case of the model for $\frac{\Delta y_{ser}}{y_{ser}}$ and $\frac{\Delta y_{ind}}{y_{ind}}$, so both LTR and GEXP have positive effects on $\frac{\Delta y_{ser}}{y_{ser}}$ and $\frac{\Delta y_{ind}}{y_{ind}}$.

5. Discussion of findings

The results obtained concerning the effect of unemployment on economy-wide output growth, agricultural output growth, industrial output growth and serves output growth indicate that unemployment has a positive effect on economy-wide output growth and each of the sectoral output growth. This finding is in line with the *a priori* expectation of this study and similar to empirical studies like Yolanda et al. (2020); Shah et al. (2022); Conteh (2021); and Obiekezie (2022) where the negative effect of change in unemployment on economic growth had similarly been reported. However, this is in contrast with the results of studies like Onwachukwu (2014); Seth et al. (2018); and Khan (2020) who have reported nil effect of unemployment on economic growth. It can be noted from the table that the magnitude of the coefficient of unemployment is higher in the services sector output growth model, followed by the industrial sector growth model and agricultural sector growth model and lastly in the agricultural output growth model so that the reducing effect of a percentage point increase in unemployment takes its greatest toll on services sectoral output growth, followed by industrial output growth, with least adverse effect on agricultural output growth.

Concerning the performances of the control variables, the result shows that labour growth has a positive effect on economy-wide output growth and industrial output growth. These observed positive effects are in line with the prediction of the earlier growth accounting Equation (6) that forms the basis of the theoretical framework adopted in the paper. It is also supported by the empirical studies of Khan et al. (2023) and Young (2018), among others, who similarly reported positive effects of labour force growth on economic growth. It is not surprising that the growth of the labour force does not have the expected effect on the growth of agricultural and services output, and that the capital stock does not have an effect on output growth in each sector. This is because these variables are for the overall economy and are not specific to individual sectors for which statistics are not available, as mentioned earlier in Section 3 of the paper.

Also, literacy rate and government expenditure have a positive effect on industrial output growth and services output growth These are also in line with the expectations of the study. At the empirical level, Abdulai and Abubakari (2022); Akanyonge et al. (2022); and Nguyen (2022) reported positive effects of government expenditure on economic growth, while Yeoh and Chu (2012); Bah (2023); and Khan et al. (2023) reported positive effects of literacy rate on economic growth

5. Conclusion and Recommendations

The study investigated the effects of unemployment on economic growth and the agricultural, industrial and services sectoral output growth. To achieve this, economy-wide output growth and sectoral output growth models were specified, based on both the economy-wide and sectoral output growth accounting equations as the main theoretical framework. In addition to changes in the unemployment rate, five control variables (viz: labour force growth, private capital stock growth, literacy rate, foreign direct investment, and government expenditure) were also included as explanatory variables in the economy-wide model as well as each sectoral output growth model, while the dependent variables employed were economic growth and the three sectoral output growth variables for the agricultural, industrial and services sector. The OLS method was employed to derive the estimates after post-estimation tests were conducted to test for serial correlation, heteroskedasticity, multicollinearity and normality of distribution of residuals and appropriate remedial econometric measures to ensure the validity of the reported estimates had been adopted. Data used are annual data covering the period of 1999 to 2022 and they were sourced online from the CBN's Statistical Bulletin, the World Bank's WDI database and the International Monetary Fund's Investment and Capital Stock dataset.

The study found that change in unemployment has a negative effect on economic-wide growth, agricultural output growth, industrial output growth and services output growth. The negative effects of change in unemployment on both the economic-wide growth and the sectorial output growth confirm the postulation of Okun's Law which predicts a negative effect of changes in unemployment on economic output growth. The result also shows that the output growth of the services sector is affected most by unemployment, followed by the industrial sector and lastly by the agricultural sector. Concerning the control variables, it was found that labour growth has positive effects on economic growth and industrial output growth. Literacy rate too has a positive effect on services output growth, while government expenditure was found to have a positive effect on industrial output growth.

In line with the findings above, it is recommended that authorities formulate and implement policies to reduce unemployment rates, thus increasing economic output growth and achieving more sustainable economic growth. Particularly, uneven focus should be placed on the need to reduce unemployment if policymakers are desirous of increasing output growth of the services sector since it is this sectoral output growth that has the highest degree of responsiveness to a unit change in unemployment rate among the three sectors analysed.

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