International Journal of Academic Management Science Research (IJAMSR)
ISSN: 2643-900X
Vol. 6 Issue 8, August - 2022, Pages: 38-54

Labour Underutilization and Output Degeneration in Nigeria: Empirical Evidence from a Traditional Production Function

Ubong Edem Effiong[1*] Michael Akpan Udofia[2] & John Polycarp Ekpe[3]

[1,2]Department of Economics, University of Uyo, P.M.B. 1017, Uyo, Akwa Ibom State, Nigeria
[3]Department of Economics, University of Nigeria, Nsukka
*ORCID: https://orcid.org/0000-0003-4677-1268

Abstract: *The crux of this study was to determine the influence of labour underutilization on output growth in Nigeria using a linear production function. With data of the range 1991 to 2019 which were analysed using the ordinary least squares (OLS), fully modified OLS, and dynamic OLS, the result indicated that the effect of labour force participation rate and employment-population ratio has been positive and significant. Meanwhile, underutilization of labour (unemployment) has been wielding a negative and substantial effect on output growth in Nigeria validating the prediction of Okun's law. In summary, employment generated a positive and significant sway on output growth while unemployment led to output attenuation. With the dynamic OLS being the base model, a unit percent increase in labour force participation rate cause output growth to amplify by 2.0423% on the average; while a unit percent increase in employment to population ratio causes output growth to accelerate by 1.5046% on the average. For the rate of unemployment where the OLS is the base model, a unit percent increase in unemployment is associated with a 1.3512% degeneration in output growth. This points to the fact that for Nigeria to accelerate its growth, there is a need for actionable policies to boost labour employment across different sectors of the economy.*

Keywords: unemployment, Solow growth model, economic growth, production function, Okun's law, NAIRU.

1 Introduction

The role of labour has earlier been stressed in the science of economics as a crucial variable in the production produce hence, its noteworthy influence on growth. The labour force is seen as a key component in the neoclassical theories of economic growth, along with capital and technical advancement. These models being based on the Cobb-Douglass production function forms the basis of the theory of economic growth accounting earlier developed by Solow (1956) and Abramovich (1956) and later elaborated by Denison (1985), Meddison (1982), among other scholars. By differentiating the production function, the growth accounting aims to quantify the actual effects of the key growth determinants. This distinction allows for "the growth rate of total output to be expressed as the sum of the growth rates of labour and capital, weighted by their respective income shares, as well as the change in total factor productivity" (Raleva, 2014). The Lewis (1954) model has also portrayed the importance of labour in growth in which growth is believed to occur when surplus labour from the traditional agriculture sector is transferred to the modern industrial sector, with the growth arising from the surplus labour absorption steering industrialization and sustained development (Todaro & Smith, 2011).

Apart from these earlier models that reflects on the importance of labour in growth, the Okun's law has been recognized as one of the core attempt to establish a link between growth and labour utilization. In this regards, Okun's law describes the link between an economy's aggregate output and unemployment (Okun, 1962). A change in aggregate demand, according to Okun's law, causes aggregate production to vary around the potential. This causes firms to hire new employees, causing the employment rate to change in the other direction. According to a recent study undertaken by Bhat *et al*. (2019) to test the validity of Okun's Law in India, there is a negative association between economic growth and India's unemployment rate. Other studies reporting similar result include Calmforms & Holmlund (2000), Daveri & Tabellini (2000), Chio (2007), Muhammad *et al*. (2011), Chang-Shuai and ZI-Juan (2012), Rafindadi (2012), Taylan (2012), Bakere (2012), Madito & Khumalo (2014), Shahid (2014), Abdul-khaliq (2014), Dahmani (2015), Nagel (2015), Soylu, Çakmak & Okur (2018), Ojima (2019), Xesibe & Nyasha (2020), Elorhor (2019), Hjazeen *et al*. (2021), and Vijaya & Balu (2021) recently. This points to the importance of labour on the overall economic growth. Thus, it could be inferred that increasing labour underutilization is likely to weaken the economic growth of a nation.

The link between economic growth and unemployment demonstrates a strong association between the pace of economic growth and the rate of decline in unemployment rates (Hjazeen *et al*., 2021). A rise in the growth rate either increases or reduces the employment rate and unemployment rate respectively. The link between economic growth and unemployment has been empirically explored in the economic literature using the Okun law, which states that "there is an inversely proportionate relationship between the change in the growth rate (GDP) and the change in the unemployment rate" (Okun, 1962; cited in Hjazeen *et al*., 2021). As far back as the 1990s, unemployment has been noted to be one of the most serious issues (Agion & Howit, 1994). It follows that increased employment leads to higher growth since it is more advantageous to engage in the development of human capital if this happens primarily via learning-by-doing on the job thus, job creation is viewed as a way to combat poverty by boosting the level of economic activity, which leads to economic growth (Elorhor, 2019).

According to Calmforms & Holmlund (2000), unemployment on its own might limit long-term growth. Economic growth, defined as a rise in the production of finished goods and services produced within a country's boundaries over a given period of time (or an increase in a country's actual Gross Domestic Product (GDP) over time), essentially refers to long-term general improvements in the economy (Calmforms & Holmlund, 2000). According to Daveri and Tabellini (2000), significant economic growth is frequently accompanied with a very high capacity utilization (optimal use of resources), a high quality of living, a low unemployment rate, and social advancement. Meanwhile, this position has been countered by studies which have reported a "jobless growth" in some countries (see (N'Zué 2001; Siphambe, 2007; Ajilore & Yinusa, 2011; Arewa & Nwakanma, 2012; Akeju & Olanipeun, 2014; Ademola & Badiru, 2016; Ali & Allan, 2017; and Seth et al., 2018).

The Nigerian economy has recorded substantial increase in the rate of labour underutilization (unemployment) in recent years. The rate of unemployment was reported to be 14.23% in the fourth quarter of 2016 before rising to 20.42% in the fourth quarter of 2017. The unemployment rate stood at 21.83% in the first quarter of 2018 and rose steadily to the tune of 23.13% in the third quarter of 2018 before recording a massive rise to 27.10% and 33.28% in the second and fourth quarter of 2020 respectively. The employment to population ratio has also maintained a declining trend over the years as observed by the plummeting rate from 58.16% in 1991 to 52.78 in 2015 before reaching 50.24% in 2019. A similar trend is observed for the labour force participation rate since the rate plummets from 61.12% in 1991 to 60.02% and 54.40% for 2011 and 2015 respectively before reaching a mild progress to 56.66% as at 2019 (World Bank, 2021).

This rising trend of unemployment associated with the declining labour employment is a clear indication of labour underutilization in Nigeria over the years. The growth in the output of the Nigerian economy (GDP growth) has witnessed dramatic changes over the years, with recent rates falling far below 15.33% recording as at 2002. For instance, the growth rate reported as at 2010 was 8.01% which plummeted to a negative growth rate of -1.62% in 2016. Following this was a 0.81% recorded in 2017 which rose slightly to 2.21% in 2019. This was followed by a negative growth rate of -1.79% as at 2020 arising from the negative influence of the Covid-19 on the global economy. Could this rising trend of unemployment accompanied with the declining employment to population ratio and labour force participation rate culminate to output degeneration in Nigeria?

It is within this background that this paper seeks to ascertain the influence of labour underutilization on output growth in Nigeria from 1991 to 2019. The specific objectives are listed as follows:

i. to ascertain the influence of labour force participation rate on output growth in Nigeria,
ii. to examine the effect of employment-population ratio on output growth in Nigeria, and
iii. to investigate the impact of unemployment on output growth in Nigeria.

This study will therefore utilize an econometric approach in achieving the above objectives, by subjecting the variables of interest to regression analysis.

2 Review of Related Literature

2.1 The Theoretical Literature Review

The theoretical basis of this study centres on the traditional production function under the Solow growth theory and Okun's law. This is because these theories have a clear link in explaining the connection between labour employment and economic growth.

2.1.1 The Solow Growth Model

The Solow neoclassical growth theory proposes a continuous production function that connects output to interchangeable capital and labour inputs. In other words, the production function connects increases in output to increases in labour and other factors. However, Solow theory built on the Harrod - Domar (or AK) design by inserting a third independent variable, technology (which might be labour augmenting by increasing the effective quantity of labour), to the growth equation. It allows for the production mix where substitution can be done between capital and labour (Solow, 1956; cited in Elorhor, 2019).

The traditional production function, Y= f (K, L), is presumed branded by constant returns to scale. Given the Cobb – Douglas production function which is widely used in economic analysis,

$$Y = f(K, L) \quad (2.1)$$

Of which Y denotes output, K denotes capital, and L denotes labour input.

More formally, the typical elucidation of the Solow neoclassical growth model uses an aggregate production function of the form

$$Y = K^{\alpha}(AL)^{1-\alpha} \quad (2.2)$$

Introducing time (t) in the production function, Equation (2.2) becomes

$$Y(t) = K(t)^{\alpha} A(t) L(t)^{1-\alpha} \quad (2.3)$$

In which Y = real gross domestic product, K = stock of capital (which may include human capital as well as physical capital), L = labour, and A = the productivity of labour which grows over time at an exogenous rate.

The Robert Solow theorem has portrayed that the foundation for economic growth subsists by increasing the employed labour force (Solow, 1956; cited in Elorhor, 2019). Since output is produced with capital and labour, technological possibilities are represented by the production function expressed in Equation (2.1) where L captures the total employment. This is due to the fact that population is rising exogenously, the labour force increases at a constant relative rate n (Elorhor, 2019). Therefore,

$$L(t) = L_0^{nt} \quad (2.4)$$

Solow regards n as Harrod Domar's natural rate of growth in the absence of technological change, and L(t) as the available supply of labour at time (t). The right-hand side of Equation (2.4), L_0^{nt}, shows the rate of the growth of labour force from period o to period t. Then again, the Equation (2.4) can be viewed as a supply curve of labour. The labour supply "is a vertical line, which shifts to the right in time as the labour force grows, then the real wage adjusts. Simply put, unemployment declines due to fall in real wages so that all available labour is employed, and the national output rises rapidly" (Solow, 1956; cited in Elorhor, 2019).

As postulated in the Solow growth theorem, "growth in labour employed as a result of employment generation encourages economic growth" (Solow, 1956). The question is how much of a country's growth can be explained by labour force growth? According to Solow's model, "a one percent growth in the labour force leads to a 0.64 percent increase in output. This alone tells how important employment of labour is to economic growth" (Solow, 1956; cited in Elorhor, 2019).

2.1.2 Okun's Law

Okun's law describes the link between an economy's aggregate output and unemployment (Okun, 1962). A change in aggregate demand, according to Okun's law, causes aggregate production to vary around the potential. This causes firms to hire new employees, causing the employment rate to change in the other direction. According to a recent study undertaken by Bhat *et al*. (2019) to test the validity of Okun's Law in India, there is a negative association between economic growth and India's unemployment rate.

The link between economic growth and unemployment demonstrates a strong association between the pace of economic growth and the rate of decline in unemployment rates (Hjazeen *et al*., 2021). A rise in the growth rate either increases or reduces the employment rate and unemployment rate respectively. The link between economic growth and unemployment has been empirically explored in the economic literature using the Okun law, which states that "there is an inversely proportionate relationship between the change in the growth rate (GDP) and the change in the unemployment rate" (Okun, 1962; cited in Hjazeen *et al*., 2021).

In this study, unemployment is considered as a measure of labour underutilization and a significant decline in the rate of unemployment will have a direct and positive impact on the aggregate level of output and productivity (Vijaya & Balu, 2021). Transforming the above statement in line with Okun's law gives the following equations:

$$E_t - E_t^* = \beta(Y_t - Y_t^*) + \varepsilon_t, \beta > 0 \quad (2.5)$$

And

$$U_t - U_t^* = \varphi(E_t - E_t^*) + \epsilon_t, \varphi < 0 \quad (2.6)$$

Where E_t = log of employment, Y = log of output; U_t = unemployment rate, and * = long-run level. By substituting Equation (2.5) into Equation (2.6), we can obtain the Okun's law as follows:

$$U_t - U_t^* = \delta(Y_t - Y_t^*) + \omega_t, \delta < 0 \quad (2.7)$$

In which $\delta = \beta\varphi$ and $\omega_t = \varepsilon_t + \epsilon_t$. The δ coefficient in Okun's Law expressed in Equation (2.7) depends on the coefficients in the two relationships (Equation 2.5 and Equation 2.6) that are fundamental to the Law (Ball *et al*., 2013; cited in Vijaya & Balu, 2021).

As can be referenced from Equation (2.7) where $\delta < 0$, it is therefore clear that an inverse relationship exists between the rate of unemployment and economic growth. Using data from Nigeria, we made a scatter plot with a fitted line to check on the relationship between the two variables of interest. Figure 1 captures the outcome of the plot.

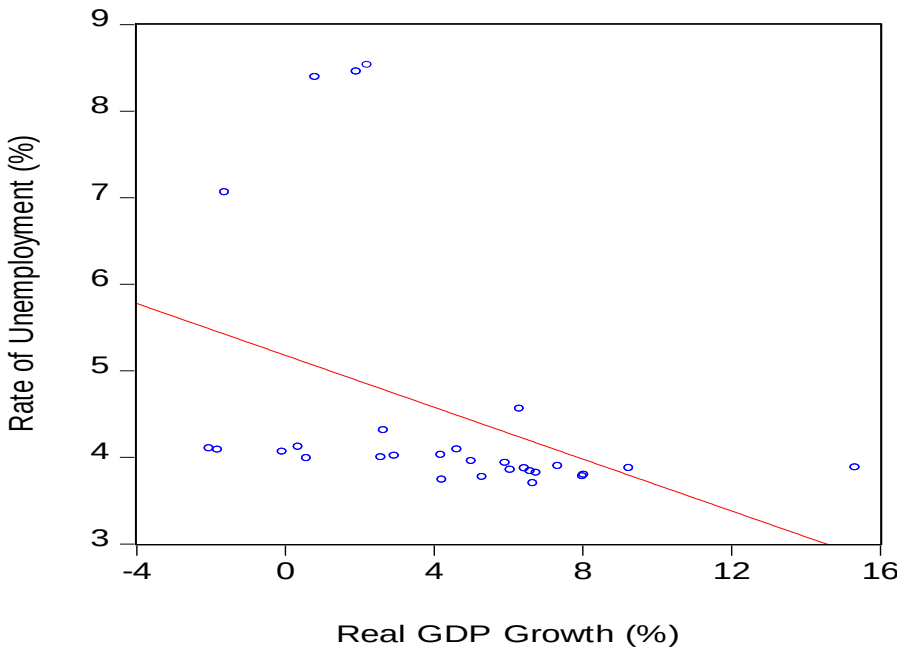

Figure 1: The scatter plot of the unemployment-economic growth relationship for Nigeria

From the fitted line in Figure 1, it is clear that the slope is negative thereby portraying the existence of an inverse relationship between unemployment and the rate of economic growth. the validity if this perceived inverse relationship will be ascertained with further empirical analysis.

Equation (2.5) portrays that $\beta > 0$ portraying that a direct relationship is prevalent amid changes in employment and changes in output. Figure 2 captures the plot of these two variables to detect their behaviour in the case of Nigeria.

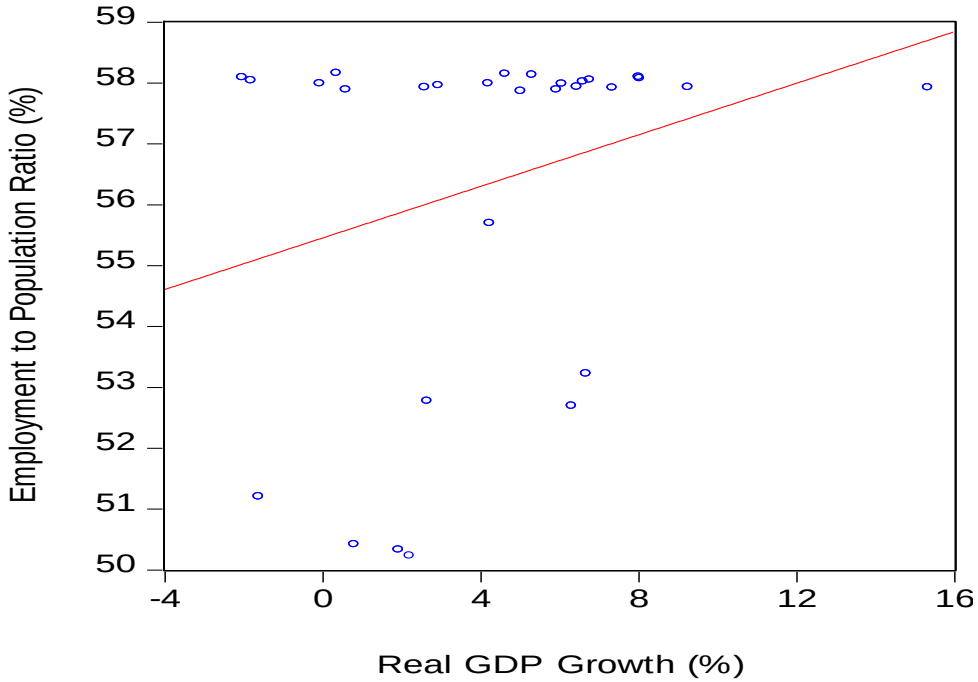

Figure 2: The scatter plot of the employment-economic growth relationship for Nigeria

With the scatter plot being fitted with the regression line, we can infer that a direct association exists between employment and output growth which aligns with the prediction of Equation (2.5). This further supports the Okun's law whereby if employment has a positive relationship with output growth, then unemployment will definitely have an inverse relationship.

2.2 Empirical Literature Review

Some studies have attempted to validate the Okun's law or in other cases directly examined the influence of unemployment on the growth of an economy. N'Zué (2001) examined the employment elasticities of a few chosen factors as well as the temporal evolution of economic growth and employment in the modern private sector in Ivory Coast. The empirical findings imply that "employment and economic growth in Côte d'Ivoire do not move together over time (they are not cointegrated), meaning that there may and has been jobless growth in the nation". Economic growth and employment were shown to be adversely associated in Côte d'Ivoire during the course of the investigation, according to econometric estimates. Employment and development assistance have the same inverse relationship. Investment and employment do, however, have a favourable correlation. Therefore, investment is essential to solving the unemployment and poverty crises.

Islam (2006) draws the conclusion that the relationship between growth, employment, and poverty was hindered by the slow employment growth. The study bases this on seven nation case studies. Nearly always, low employment intensity or increase was correlated with slow employment growth. Geidenhuys and Marinkov (2007) made an effort to address the subject of how variations in output affect unemployment in South Africa. They estimated the link between economic activity and the unemployment rate as a result. The findings showed that an "Okun's law connection existed in South Africa between 1970 and 2005, with higher evidence supporting asymmetries during recessions". Also, Noor et al. (2007) studied similar relationship for the Malaysian economy and discovered a negative correlation among the output and unemployment.

Siphambe (2007) recognized and outlined reasons for Botswana's growth without prior employment growth. The study claims that "despite the great GDP growth, the economy has not been able to generate enough jobs as a result of this expansion. This is due to the mining industry's significant contribution to growth, despite the fact that it has few prospects to create new jobs due to the capital-intensive nature of its operations". The aforementioned highlights the necessity to further elaborate on the labour market's role in connecting macroeconomic growth in Botswana to the alleviation of poverty by considering the potential that the growth spurt produced in Botswana is really "jobless growth". Daveri and Tabellini (2007) established empirical backing for the hypothesis that "unemployment affects economic growth negatively, since higher employment entails higher aggregate income in the economy". Also, Chio (2007) inspected the unemployment effect of economic growth, which he termed "employment intensity of growth". The study also validated the inverse relationship concerning the two macroeconomic variables.

Sodipe (2008) examined the current situation and future potential for unemployment in Nigeria in the context of the country's growing growth rate and rise in output. Before and after rectifying for unit root of the time series data using the Hodrick-Prescott filter, a straightforward model of employment and employment growth was developed and estimated using the OLS method. According to the study, "there is a strong and positive correlation between employment and both governmental spending and economic growth. On the other hand, a negative and substantial correlation between the GDP growth rate and the employment growth rate was found". The report promotes more employment, foreign direct investment, and a governmental spending plan that is employment-centred.

Muhammad, Inuwa, & Oye (2011) used a regression analysis to analyze the impact of unemployment on Nigeria's GDP during 2000 through 2008. The findings revealed that unemployment has a substantial (above 65 percent) impact on the Nigerian GDP and that there is an inverse link concerning the two variables, implying that as unemployment surges, GDP plummets. To present empirical data about the degree to which economic growth that has happened in Botswana is employment intensive and in which sectors, Ajilore & Yinusa (2011) employed both basic elasticities and econometric techniques. The results supported the idea that Botswana's economic growth is, in fact, "jobless growth" by confirming the poor labour absorptive capacity of the country's economy at both the aggregate and sectoral levels. This aligns with findings of Siphambe (2007) which also reported a "jobless growth in Botswana. Regarding policy, the report suggests "a prosperous mineral-led economy that is able to diversify into industries and pursuits that are by their very nature somewhat more labour-intensive".

Through the use of Okun's law, Fuad (2011) examined the link amid unemployment and economic growth in Jordan. Time series techniques were used to evaluate such link and to estimate Okun's coefficient using yearly data spanning the years 1970 to 2008. In particular, the study employed a simple regression between the unemployment rate and economic growth, a cointegration test, and Augmented Dickey-Fuller (ADF) for unit root. The empirical findings show that Jordan's data does not allow for the confirmation of Okun's law. Thus, it can be inferred that Jordan's unemployment issue is not caused by a lack of economic growth. Also, Kreishan (2011) considered the linkage between unemployment and economic growth in Jordan along with the application of Okun's law for 1970 through 2008. The study reported that the shortage of economic growth in Jordan do not elucidate her unemployment issue.

Taylan (2012) used a VAR Model to analyze the link between macroeconomic factors and economic development in Turkey from 2000Q1 to 2010Q2. Positive economic shocks, export growth, and inflationary pressures all lowered unemployment, according to his research. In addition, exchange rate, interbank interest rate, and money supply disruptions boosted unemployment. The results are found to adhere to the Phillips curve and Okun's Law recommendations. Specifically, a negative association exists between output and unemployment, while a positive relationship exists between unemployment and inflation. Arewa & Nwakanma (2012) performed an empirical review of the link amid output and unemployment using the "first difference and output-gap models" of Okun's rule. The research could not discover any evidence to back up Okun's law's applicability in Nigeria. Similarly, the study of Al-Habees (2012) was geared towards ascertaining the bond amid unemployment and the economic growth in some Arab countries, with special attention to Jordan by using a simple model of Okun law. The results showed that "a significant correlation exists between growth and changing rates of unemployment".

In their study, Chang-Shuai and ZI-Juan (2012) used the Granger causality test, unit root, cointegration, VAR, and VEC models to analyze the link between the unemployment rate, economic growth, and inflation in China. According to the study, growth in China was favourably benefited by inflation and adversely impacted by unemployment. The study also showed that there was a one-way causal relationship between inflation and growth, while a two-way causal relationship existed between inflation and unemployment. For Nigeria, Bakere (2012) did research on Nigeria's economic development, unemployment issues, and stabilization policies. Using OLS, the study unveiled "a negative relationship between Nigeria's inflation, unemployment, and economic growth". In a research on the dynamics of output and unemployment in Nigeria, Rafindadi (2012) employed the OLS and Threshold model and discovered a negatively nonlinear link between output and unemployment.

In confirming Okun's law in Nigeria, Babalola, Saka, & Adenuga (2013) compared two models (Short-run and Long-run) from 1980 through 2012. The unemployment rate as an independent variable was shown to be positive, as was real GDP growth as an independent variable. These findings contradict Okun's unemployment-output connection rule within the study period. Amassoma & Nwosu (2013) utilized an error correction modelling approach and co-integration technique to analyze the influence of unemployment on productivity growth in Nigeria from 1986 through 2010. The regression estimates based on the short run and long run models revealed that the unemployment rate had no effect on productivity growth in Nigeria.

In seven industrialized nations (G7), Ozei, Sezgin, & Topkaya (2013) looked into the connection amid economic growth and unemployment. Data between the years of 2000 and 2011 were analyzed using panel regression. The study's findings showed that "although productivity and economic growth variables significantly and strongly affected the decline in unemployment during the three-crisis period, after the crisis, the productivity effect shrank and became less significant, while the impact of economic growth as a factor in reducing unemployment persisted and increased".

Using the Pooled EGLS, Abdul-Khaliq, Soufan, & Shihab (2014) looked at the link amid economic growth and unemployment rates in Arab nations between 1994 and 2010. Economic growth was found to have a negative and substantial influence on the unemployment rate, suggesting that a 1 percent rise in economic growth will lower the rate by 0.16 per cent. Due to the dynamic interdependence between the variables used to measure the rate at which the economy was responding to the unemployment crisis, Madito and Khumalo (2014) used the Error correction mechanism to examine the affiliation amid unemployment and the economy in South Africa from 1971Q1 through 2013Q4. It was shown that each quarter, 62% of economic growth distortions was rectified. The aggregate findings indicated that economic growth and unemployment in South Africa had a negative association.

Using the Johansen cointegration approach and the Error Correction Method, Akeju & Olanipekun (2014) confirmed Okun's law in Nigeria. The results demonstrated that the unemployment rate and output growth in Nigeria have both a short- and long-term link. To lower the high unemployment rate in the nation, it is necessary to implement fiscal measures and boost the appeal of foreign direct investment (FDI). According to Shahid's (2014) research on "the impact of unemployment and inflation on economic development in Pakistan", there is an inverse link between the two. Onwanchukwu (2015) used the OLS regression approach to investigated the effect of unemployment on economic growth in Nigeria from 1985 through 2010. Consistent with the research, Nigeria's economic growth is not much impacted by unemployment.

Sadiku, Ibraimi & Sadiku (2015) conducted an empirical study to scrutinize unemployment rapport with growth in FYR Macedonia with the aid of the VAR technique. Using quarterly data from 2000 through 2012, It was detected that no negative link concerning unemployment and economic growth as promulgated by Okun's Law exist; and also no direction of causality amid unemployment and economic growth was recorded. In order to establish the link between unemployment and inflation and real gross domestic product in Nigeria, Ademola & Badiru (2016) looked at the impacts of unemployment and inflation on economic performance in Nigeria from 1981 through 2014. The OLS technique uses a variety of diagnostic tests to determine how well-fit the data are for the analysis. The results of these tests show that the analysis's data are stationary at the level and that there are two cointegrating equations, which suggests that RGDP, unemployment, and inflation have a long-term relationship. According to the findings, economic growth is positively correlated with both unemployment and inflation.

Nagel (2015) established a negative correlation amid economic growth and unemployment while studying the correlation between GDP growth and unemployment. Khrais & ve Al-Wadi (2016) considered the bond between economic growth and unemployment in MENA countries for 1990 through 2016 using simple linear regression. The result portrayed a weak connection amid the identified variables. Airi *et al*. (2016) looked into the effects of unemployment on the Nigerian economy (1980-2010). The results of using the OLS method demonstrated that unemployment has a detrimental impact on the Nigerian economy's GDP.

Omitogun & Longe (2017) utilized the VAR approach to detect the dynamic effect of unemployment on the growth of the Nigerian economy for 1986 through 2015. The result indicated that the first-period lag and the third-period lag of unemployment wielded a positive influence on changes in output, while the second-period lag wielded a negative influence. The impulse response function portrayed that output growth responded negatively to shocks in unemployment; while the variance decomposition indicated that unemployment in the period 1 captures about 54% changes in economic growth; 47% in the period 5 and 58% in the 10th period, showing that the negative influence of unemployment on growth increases over time.

In their study, Seth, John & Dalhatu (2018) looked at the link between unemployment and economic development in Nigeria as well as the consequences of unemployment on that country's economic growth from 1986 to 2015. The ARDL Bound Testing and the Parsimonious ECM of the ARDL Model were used to evaluate the data. With good policies, the long-run increase in unemployment has a growth boosting mechanism on economic growth that is statistically significant since the results indicated that there is no long-run association between the unemployment rate and economic growth in Nigeria. Additionally, according to the short-run Parsimonious ECM, a 1% rise in unemployment caused a 20.6 % increase in real production in the third period. This demonstrates how unemployment in Nigeria stimulates the informal sector's expansion. A speed of adjustment of 65.5 percent between short-run disequilibrium and long-run equilibrium is shown by the Error Correction Term (ECT).

Using yearly series data from 1991 to 2017, Abraham and Nosa (2018) investigated the association between unemployment rate and output growth rate in upper middle-income countries in Sub-Saharan Africa (SSA). They used Panel Least Squares and Ordinary Least Squares estimation approach. The panel Least Squares estimate findings showed a negative link between the unemployment rate and the pace of output growth. Results from Botswana, Gabon, Mauritius, and South Africa in the country-specific research suggest an example of non-inclusive growth since there is a positive link between unemployment and production growth rates. The statistics on unemployment and output growth in Namibia and Equatorial Guinea, however, showed a negative influence.

Soylu *et al*. (2018) studied the association flanked by unemployment and economic growth based on Okun's law in Eastern European Countries from 1992 through 2014. From the result, cointegration among the unemployment and GDP growth (negative relationship) was reported. Elorhor (2019) investigated the effect of unemployment on growth within the Nigerian economy for 1986 through 2008 using stationary test, cointegration test, and error correction model to estimate the dynamic relationship. The result reported that the rate of unemployment and job vacancies wielded a negative and significant weight on growth.

Recently, Hjazeen, Seraj & Ozdeser (2021) investigated the impact of unemployment on Jordan's economy over the period 1991–2019. The ARDL model was utilized to investigate the link coupled with other control variables. Also, the ARDL bootstrap cointegration approach was utilized to examine the correlation and long-run rapport among the variables. The result indicated "a long-run liaison amid the unemployment rate, economic growth, education, female population, and urban population in Jordan". The finding further displays the negative bond amid economic growth and unemployment, cum a positive rapport amid the education, female population, and urban population and unemployment in Jordan.

With the empirical review offering mixed results on the nature of the link concerning labour underutilization and output growth, this opens room for more investigations to be conducted to fill the gap. This study is such an attempt which is geared towards detecting both the influence of labour employment and labour underutilization on output growth by building on a traditional production function and Okun's law to detect such. With our interest on the long-run influence, the paper adopts the cointegrating regression involving the ordinary least squares (OLS), fully modified OLS, and the dynamic OLS.

2.3 Stylized Facts on Unemployment in Nigeria

By utilizing the ILO modelled estimates of unemployment, the rate of unemployment in the economy is dissected into aggregate, gender and at the youth level. Table 1 presents the total, male, and female unemployment levels in Nigeria for selected years.

Table 1: Unemployment in Nigeria for Selected Years

Year	Unemployment, female (% of female labour force) (modelled ILO estimate)	Unemployment, male (% of male labour force) (modelled ILO estimate)	Unemployment, total (% of total labour force) (modelled ILO estimate)
1991	4.357	4.464	4.415
1995	4.557	4.499	4.526

2000	4.985	4.867	4.921
2005	4.884	4.595	4.728
2010	4.836	4.318	4.555
2015	5.140	4.201	4.627
2020	6.492	7.004	6.775
2021	6.668	6.977	6.839

Source: World Bank (2021)

It is clear from Table 1 that the unemployment at aggregate, female, and male segments has been exhibiting a rising trend over the years. At the female component, the rate of unemployment intensified from 4.357% in 1991 to 4.557% in 1995 representing a 4.590% increase between the two era. The was followed by a 9.392% increase in 2000 as the rate of unemployment reached 4.985%. The period 2005 and 2010 recorded a slight decline in the rate of unemployment is it declined from 4.884% in 2005 to 4.836% in 2010 representing a 0.963% decline in the rate of unemployment between the two years. This plummeted rate of unemployment did not last as the subsequent years witnessed a rising trend by rising to 5.140% in 2015 implying a 6.286% increase from the previous period. This rising trend was maintained through 2020 and 2021 as the female rate of unemployment was tagged at 6.668% indicating a 2.711% increase from the 6.492% recorded in 2020.

At the male category, unemployment grew by 0.784% as it rose from 4.464% in 1991 to 4.499% in 1995; with a further 8.180% growth as it rose to 4.867% in 2000. Though with a 5.589% decline in the rate of male unemployment in 2005 as male unemployment dropped to 4.595% with a subsequent consecutive years' decline to 4.201% in 2015, the rate of male unemployment to a sharp increase to 7.004% in 2020 implying a 66.722% growth before declining slightly to 6.977% in 2021 or a 0.385% decline.

Total unemployment also exhibits a similar trend with female unemployment as it grew by 2.514% between 1991 and 1995 as the rate rose from 4.415% to 4.526% for the two periods respectively; and then further surged to 4.921% in 2000 or 8.727% before it plummeted to 4.728% in 2005 or a 3.922% decline and 4.55% in 2010 or a 3.659% decline. Subsequent identified years were marked with a rising trend in total unemployment as it rose from 4.627% (or 1.581% growth) in 2015 to 6.775% (or 46.423% growth) in 2020 before rising further to 6.839% (or 0.945% growth) in 2021.

At the youth level (aged 16 – 24 years), Table 2 reflects that Nigeria has recorded a substantial increase in the rate of youth unemployment in recent times.

Table 2: Youth Unemployment in Nigeria for Selected Years

Year	Unemployment, youth female (% of female labour force ages 15-24) (modelled ILO estimate)	Unemployment, youth male (% of male labour force ages 15-24) (modelled ILO estimate)	Unemployment, youth total (% of total labour force ages 15-24) (modelled ILO estimate)
1991	8.548	9.058	8.779
1995	8.649	9.136	8.870
2000	9.102	9.649	9.338
2005	9.241	9.374	9.238
2010	9.211	8.922	8.971
2015	9.938	7.300	8.481
2019	12.207	12.475	12.303
2020	13.439	13.652	13.504

Source: World Bank (2021)

The female youth unemployment, as captured in Table 2, indicates a rising trend as it grew by 1.182% from 8.548% in 1991 to 8.649% in 1995 with a further 5.328% and 1.527% growth as the rate increased to 9.102% and 9.241% in 2000 and 2005 respectively. Although the rate of female youth unemployment plummeted by 0.325% in 2010 as it declined to 9.211%, a 7.893% growth was recorded in 2015 as the rate rose to 9.938%. This was accompanied by a huge growth in the female unemployment by 22.832% and 10.093% in 2019 and 2020 as the female unemployment rate rose from 12.207 in 2019 to 13.439% in 2020.

This similar trend was observed in the male category which rose from 9.058% in 1991 to 9.136% in 1995 with a further amplification to 9.649% in 2000 or a 5.615% growth. Though the rate declined slightly to 9.374%, 8.922%, and 7.300% in 2005, 2010, and 2015,

a tremendous 70.890% and 9.435% growth was recorded for 2019 and 2020 respectively as the rate rose to 12.475% and 13.652% in 2019 and 2020 respectively.

At the aggregate, total youth unemployment rose steadily from the 1990s reaching 8.870% in 1995 of which the rising trend continued up to 9.238% in 2005. After it plummeted to 8.971% in 2010 and 8.481% in 2015, it followed a V-shape recovery by reaching 12.303% and 13.504% in 2019 and 2020 respectively, representing a 45.065% and 9.762% growth for the two years respectively.

2.4 Stylized Facts on Labour Employment in Nigeria

With the official working age being pegged at 15+ years, Table 3 captures the labour force participation rate in the Nigerian economy for selected years.

Table 3: Labour Force Participation Rate in Nigeria, Selected Years

Year	Labour force participation rate, female (% of female population ages 15+) (modelled ILO estimate)	Labour force participation rate, male (% of male population ages 15+) (modelled ILO estimate)	Labour force participation rate, total (% of total population ages 15+) (modelled ILO estimate)
1990	60.04	72.57	66.23
1995	59.88	72.02	65.89
2000	59.66	71.26	65.41
2005	59.19	70.79	64.94
2010	58.14	69.86	63.97
2015	54.81	66.56	60.66
2020	52.76	65.61	59.18
2021	52.99	65.92	59.44

Source: World Bank (2021)

It is clear that from Table 3, labour force participation rate has been showcasing a declining trend over the years and this is the reason for the rising unemployment in the country. at the female category, the female labour participation declined from 60.04% in 1990 to 58.14% in 2010 before plummeting to 52.99% in 2021. The male labour participation rate also declined from 72.57% in 1990 to 69.86% in 2010 with a further decline to 65.92% in 2021. It is worth noting that there exists a huge labour force participation disparity between the male and female population as the female rate is quite low in all the periods compared to the male. At the aggregate, the total labour force participation rate declined from 66.23% in 1990 to 63.97% in 2010 with a further decline to 59.44% in 2021.

Going by sector, Table 4 reflects on the labour employment in the agriculture, industry, and the services sectors.

Table 4: Labour Employment in Nigeria by Sectors, Selected Years

Year	Employment in agriculture (% of total employment) (modelled ILO estimate)	Employment in industry (% of total employment) (modelled ILO estimate)	Employment in services (% of total employment) (modelled ILO estimate)
1991	59.197	11.815	28.988
1995	58.681	11.620	29.699
2000	56.939	11.346	31.716
2005	53.654	11.198	35.148
2010	49.487	11.130	39.384
2015	43.850	12.889	43.262
2018	42.159	12.953	44.892
2019	41.537	12.976	45.488

Source: World Bank (2021)

Reference can be made from Table 4 pertaining to the sector that has been the higher employer of labour in Nigeria. In the 1990s, the agricultural sector was the highest employer of labour, employing about 60% of the total employment in the economy. This was

followed by the service sector with about 30% of the total employment. It can also be inferred that the share of agriculture to total employment has been declining, with the service sector gaining significant share. While the share of agriculture to total employment dropped from 53.654% in 2005 to 41.537% in 2019, the share of the service sector to total employment rose substantially from 35.148% to 45.488% in the same period. With the employment share of the service sector growing by 56.920% between 1991 and 2019, that of agriculture declined by 29.82% in the same period. Meanwhile, the share of the industrial sector to total employment has been meagre as it stood at 11.815% in 1991 and increased to 12.976% in 2019, representing just a 9.826% growth.

Given the total population of Nigeria, we can also ascertain the employment to population ratio over the years. Table 5 captures this ration at the female, male, and aggregate level for some selected years.

Table 5: Employment to Population Ratio in Nigeria, Selected Years

Year	Employment to population ratio, 15+, female (%) (modelled ILO estimate)	Employment to population ratio, 15+, male (%) (modelled ILO estimate)	Employment to population ratio, 15+, total (%) (modelled ILO estimate)
1991	57.410	69.340	63.306
1995	57.147	68.781	62.904
2000	56.685	67.795	62.190
2005	56.297	67.535	61.874
2010	55.331	66.840	61.053
2015	51.989	63.761	57.852
2019	50.844	62.522	56.669
2020	49.339	61.016	55.166

Source: World Bank (2021)

With a similar trend observed in the labour force participation rate, Table 5 also indicates that the employment to population ratio in Nigeria has been declining over the years. This is a clear indication that as the population grows by about 2.5% per annum, there has not been adequate growth in job employment to absorb the teaming labour force. While at the female component the employment to population ratio declined from 57.41% in 1991 to 56.297% in 2005 before reaching 49.339% in 2020, the male employment to population ratio also declined from 69.34% in 1991 to 67.535% in 2005 before reaching 61.016% in 2020. These values present the fact that more male employment out of the total male population of the working age are employed (an average of 60%) compared to the female population (an average of 50%).

At the aggregate, the total employment to population ratio also maintained a downward trend from 63.306% in 1991 to 61.874% in 2005 before reaching 55.166% in 2020; showing that about half of the population of the working age are not employed. This poses serious concerns based on the dangers inherent in declining labour employment in an economy. We will then examine empirically whether these declining trends has any substantial weight on the output growth of the Nigerian economy. We will then develop a separate model to capture the effect of labour force participation rate, employment to population ratio, and unemployment on output growth in Nigeria.

2.4 The Short-Run/Long-Run Link Between Output Growth and Labour Underutilization

The link concerning economic growth and the unemployment rate can be shaky in the short term (Levine, 2013). It is common for the unemployment rate to continue to drop after other major indicators of economic activity have started to improve. As a result, it is sometimes called “a lagging economic indicator”. “The fact that some businesses may have underutilized employees on their payrolls due to the costs associated with firing employees when product demand declines and rehiring them when product demand improves is one reason why unemployment may not decline significantly when economic growth first picks up after a recession” (Levine, 2013). Consequent upon this, firms may initially be able to boost output to keep up with increased demand at the start of a recovery without adding more employees by increasing the productivity of their present workers consequently, labour productivity growth momentarily exceeds its long-term trend rate (Levine, 2013).

Up until businesses start hiring new employees, production can only increase at a pace equal to the rate of productivity growth. The rate of growth in the labour supply and labour productivity will be combined to determine output growth as an economic boom continues. Employment will increase as long as growth in real GDP outpaces growth in labour productivity; the unemployment rate will decrease if employment growth outpaces labour force growth (Levine, 2013).

Changes in the rates of output growth and unemployment have a negative connection over a long period of time. At the beginning of the 1960s, economist Arthur Okun made the most renowned observation on the long-term bond concerning the two economic factors. Okun's law has been listed as one of the "basic principles" that the field of economics accepts as true (Blinder, 1997). Since it was initially proposed, Okun's law – which economists have developed – has been used to maintain a steady unemployment rate (Knotek, 2007).

Consequently, the rate of growth in potential output holds the key to understanding the long-term link concerning changes in the rates of GDP growth and unemployment. Potential output is "an unobservable measure of the economy's ability to generate goods and services when resources, like as labour and capital, are fully used" (Levine, 2013). When the economy is at full employment (defined as the unemployment rate being at a level consistent with a stable (nonaccelerating) inflation rate), the rate of increase of potential output depends on the labour supply and the rate of growth in potential productivity (Levine, 2013). When unemployment is high, as it is right now, potential GDP is not realized. The output gap is what this situation entails.

Increase in output will be equal to growth in the labour supply in the absence of productivity growth as long as each new member of the labour force is employed (Levine, 2013). There will not be enough new employment generated to accommodate all new job searchers if GDP growth is less than the pace of labour force expansion. The percentage of the work force that is employed will decrease as a result. Or to put it another way, the unemployment rate will go up.

Some of the new positions generated by firms to meet the increased demand for their goods and services will be filled by employees who are currently jobless if the rate of output growth exceeds the rate of labour force expansion. In other words, “as unemployment falls to relatively low levels, the unemployment rate will decrease and growing earnings will be more likely to meet the increased demand for labour than increasing employment numbers” (Levine, 2013). Consequently, there may be a chance that inflation may pick up at a faster pace. The nonaccelerating inflation rate of unemployment, or NAIRU, was estimated by the Congressional Budget Office to be around 5%, which is the point at which it becomes a danger (Arnold, 2008).

More individuals will be entering the labour force than are required to generate a given amount of goods and services if GDP growth equals labour force growth in the presence of productivity growth. There will be a decline in the work force's employment share. In other words, the unemployment rate will increase. The unemployment rate will decrease over time only “if GDP growth outpaces the growth rates of the labour force and productivity (potential output)” (Levine, 2013).

We model the long-run relationship in this study using the traditional production function embedded in the Solow growth model to ascertain the link concerning output growth and unemployment for the case of Nigeria.

3 Research Methodology

3.1 The Model

In general, our models follow the traditional (linear) production function where output is defined to be depending on labour and capital, Y = *f*(K, L), where Y is our output growth, K is capital stock (which is here captured as the gross fixed capital formation as a percentage of GDP), and K is labour input (where we will consider labour force participation rate, employment-population ratio, and unemployment rate). For each of the objectives, our models are specified as follows;

Model I: Modelling the influence of labour force participation rate on output growth in Nigeria.

$$GRTH = f(GFCF, LFPR) \quad (3.1)$$

In line with Equation (3.1), output growth (GRTH) is defined to depend on gross fixed capital formation (GFCF) and labour force participation rate (LFPR). The above equation is thus transformed as follows for estimation.

$$GRTH = \alpha_0 + \alpha_1 GFCF + \alpha_2 LFPR + \mu_1 \quad (3.2)$$

In Equation (3.2), α_i are the parameters to be estimated and μ_1 is the stochastic term of the modelled relationship.

Model II: Modelling the effect of employment to population ratio on output growth in Nigeria.

$$GRTH = f(GFCF, EPRT) \quad (3.3)$$

Equation (3.3) states that output growth depends on gross fixed capital formation (GFCF) and employment to population ratio (EPRT). The modelled relationship is transformed to a form amendable for estimation as follows:

$$GRTH = \beta_0 + \beta_1 GFCF + \beta_2 EPRT + \mu_2 \quad (3.4)$$

In Equation (3.4), β_i are the parameters to be estimated and μ_2 is the random term of the modelled relationship.

Model III: Modelling the impact of unemployment on output growth in Nigeria.

$$GRTH = f(GFCF, UNMP) \quad (3.5)$$

The growth model in Equation (3.5) portrays that output growth (GRTH) is a function of gross fixed capital formation (GFCF) and the rate of unemployment (UNMP) in the economy. By transformation to a form subjected to estimation, the equation becomes:

$$GRTH = \gamma_0 + \gamma_1 GFCF + \gamma_2 UNMP + \mu_3 \quad (3.6)$$

The above econometric model captures the β_i as the parameters to be estimated and μ_3 as the error term which is normally distributed based on the OLS assumption.

3.2 A priori Expectation

In line with Okun's (1962) law, the coefficient of the employment variables (labour force participation rate and employment to population ration) are expected to be positive (that is, $\alpha_2 > 0$, and $\beta_2 > 0$); while the coefficient of unemployment is expected to be negative ($\gamma_2 < 0$). Meanwhile, the coefficient of capital is expected to be positive ($\alpha_1 > 0$, $\beta_1 > 0$, and $\gamma_1 > 0$).

3.3 Nature/Source of Data

The data used in this study are time series in nature that span from 1991 through 2019, making a total of twenty-nine (29) observations. The choice of the time is subject to data availability, and the period has also captured a significant policy changes in the economy which could affect the variables of interest. The data so utilized were all obtained from the World Bank (2022) data base concerning World Development Indicators. This data source is valid and reliable because it is an official body that publishes statistics on nations across the world.

3.3 Analytical Technique

In line with the proposed traditional linear production function, the technique of analysis follows the ordinary least squares (OLS) approach. This approach yields a best, linear, unbiased, and efficient estimates of the parameters. To account for cointegration, we also employ the cointegrating regression analysis involving the fully modified OLS (FMOLS) and the dynamic OLS (DOLS). These approaches help us in estimating a stable long-run estimates of the parameters in the models. The choice of the base model for each of the estimation approaches will be depending on the significance of the variables involved and the R-squared. The model with the highest R-squared and significant variables will be chosen out of other approaches of estimation.

4 Empirical Result

4.1 Correlation Analysis

Starting with ascertaining the nature of association among the variables, the correlation study is conducted where Table 6 presents the result.

Table 6: Correlation Result

	GRTH	EPRT	GFCF	LFPR	UNMP
GRTH	1				
EPRT	0.2823	1			
GFCF	-0.3496	0.5555	1		
LFPR	0.1505	0.9312	0.7039	1	
UNMP	-0.3849	-0.8471	-0.2828	-0.6240	1

Source: Research Findings.

As can be inferred from Table 6, the labour employment variables (EPRT and LFPR) both has a positive correlation coefficient, portraying the fact that the two variables are directly related with output growth. Thus, as EPRT and LFPR increases/decreases, GRTH also increases/decreases. On the contrary, a negative coefficient of correlation is reported for GFCF and UNMP implying an inverse relationship. The implication is that when GFCF and UNMP increase/decreases, GRTH will decrease/increase, showing a movement in an opposite direction. The model is likely to be free from multicollinearity since the correlation between: GFCF and LFPR is 0.7039; GFCF and EPRT is 0.5555; and GFCF and UNMP is -0.2828. This is based on the rule of thumb argument that

multicollinearity is not a problem if the correlation coefficient is not above 0.80. it is also worth noting that the correlations between GRTH and the explanatory variables is weak as none of them is up to 0.50. Since correlation does not in any way imply causation, the effect of these variables can only be measured through regression analysis.

4.2 Influence of Labour Force Participation Rate on Output Growth

The Model I is concerned about determining the influence of labour force participation rate on output growth. Table 7 presents the empirical result under diverse estimation method.

Table 7: Empirical Result for Model I

Dependent Variable: Output Growth (GRTH)						
	OLS		FMOLS		DOLS	
Variables	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
GFCF	-0.3150 {-4.3462}	0.0002***	-0.3311 {-3.5824}	0.0014**	-0.3998 {-3.0770}	0.0068**
LFPR	1.3011 {3.7837}	0.0008***	1.3532 {3.2668}	0.0032**	2.0423 {2.7653}	0.0132**
C	-63.7379 {-3.3689}	0.0024**	-66.5399 {-2.9269}	0.0072**	-105.3752 {-2.5690}	0.0199**
R-squared	0.4339		0.4074		0.5493	
Adjusted R-squared	0.3904		0.3600		0.3372	

Source: Research Findings.

*Note: The numbers in braces {} are the t-statistics of the estimates, while the significance of the parameter estimates at 5% and 1% are captured by ** and *** respectively.*

Going by the OLS approach, the empirical result portrays that capital (GFCF) wielded a negative influence on GRTH, implying that the level of capital stock has not been sufficient to accelerate the desired growth or that the level of capital stock has not been growth inducing. This negative effect which is also significant goes outside our a priori expectation of a positive effect of capital on output growth. A 1% increase in capital is followed with a 0.3150% decline in output growth. For LFPR, the OLS estimate reported a positive effect which is also significant at the 1% level. This aligns with our a priori expectation and supports the prediction of the traditional production function where labour is crucial for growth. A 1% increase in LFPR is associated with an average of 1.3011% increase in output growth. It is clear in this result that labour absorption is critical for growth in an economy. The constant term is an indication that if capital and labour is held constant, the economy will plunge into a negative growth rate to the tune of -63.7397% which further portrays the importance of these variables in growth. The R-squared of 0.4339 portrays that labour and capital explains about 43.39% of the entire changes in the rate of output growth.

Under the FMOLS approach, a similar result is being recorded where capital put forth a negative and significant effect while labour force participation rate put forth a positive and substantial influence. From the coefficient of GFCF, a unit percent increase will cause output growth to shrink by an average of 0.3311%; while a 1% increase in labour force participation rate will accelerate output growth by 1.3532% on the average. The constant term also portrays that the economy will plunge into a deep economic meltdown given the negative growth rate of -66.5399% that will be recorded. The R-squared so obtained implies that the variables account for 40.74% of the overall variations in output growth in Nigeria for the study period.

The DOLS estimates presents an interesting result that is similar to that of OLS and FMOLS but the R-squared is quite high compared to other approaches, making the estimates of DOLS to be our base model. From the estimates, it is observed that GFCF still wield a negative and significant effect while labour force participation rate put forth a positive and substantial influence all at the 5% level of significance. A 1% increase in GFCF is associated with a 0.3998% decrease in output growth; while a 1% increase in LFPR will push output growth to increase by 2.0423% on the average. The constant term indicates that if we hold GFCF and LFPR unchanged, the economy will experience an economic downturn leading to a negative growth rate of -105.3752% on the average. The obtained R-squared is an indication that the variables account for about 54.93% of the entire variations in output growth in Nigeria for the study period.

4.3 Influence of Employment-Population Ratio on Output Growth

The empirical findings on the influence of employment to population ratio (being another measure of labour absorption) is presented in Table 8 where we still adopt the three approaches of estimation.

Table 8: Empirical Result for Model II

Dependent Variable: Output Growth (GRTH)

	OLS		FMOLS		DOLS	
Variables	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
GFCF	-0.2555 {-4.1888}	0.0003***	-0.2737 {-3.6607}	0.0012**	-0.3570 {-3.4674}	0.0029**
EPRT	0.9182 {3.9412}	0.0005***	0.9058 {3.3921}	0.0023**	1.5046 {2.8842}	0.0103**
C	-40.4951 {-3.2928}	0.0029**	-39.1625 {-2.7876}	0.0100**	-70.7350 {-2.4632}	0.0247**
R-squared	0.4505		0.4230		0.6481	
Adjusted R-squared	0.4082		0.3768		0.4825	

Source: Research Findings.

*Note: The numbers in braces {} are the t-statistics of the estimates, while the significance of the parameter estimates at 5% and 1% are captured by ** and *** respectively.*

It is clear form Table 8 that a similar result obtained when we were considering labour force participation rate is also obtained in the case of employment to population ratio under all the estimation approaches. Under the OLS approach, GFCF put forth a negative and substantial influence on output growth while employment to population ratio wielded a positive and significant influence, all being significant at the 1% level of significance. A unit percent increase in GFCF will cause GRTH to decline by 0.2555% on the average while a unit percent increase in EPRT will cause output growth to accelerate to the tune of 0.9182% which is almost a one-to-one effect. With GFCF and EPRT being held constant, output growth will plummet to -40.4951% indicating the importance of capital and labour in production. The R-squared indicates the explanatory variables in the model collectively explain 45.05% of the overall distortions the output growth in Nigeria during the study period.

In the FMOLS approach, the variables of interest are all wielding a significant influence on output growth at the 5% level of significance. While GFCF put forth a negative influence which is against our a priori expectation, EPRT wielded a positive influence which aligns with our expectation. A 1% increase in GFCF causes output growth to plummet by an average of 0.2737% while a 1% increase in EPRT will intensify output growth by an average of 0.9058% which is close to one-to-one influence. The constant term which is also significant at 5% portrays that the economy will experience a negative output growth of -39.1625% if GFCF and EPRT is held constant. The R-squared measures that 42.30% of the entire changes in output growth is as a result of the changes in GFCF and EPRT.

Using the dynamic OLS which is our base model in this case, the two variables still wields a significant influence on output growth with GFCF still wielding a negative effect and EPRT exerting a positive effect. It follows that as more of the working population is employed, productivity will be accelerated across different segments of the economy thereby amplifying the overall output growth within the economy. A 1% increase in EPRT leads to a 1.5046% increase in output growth on the average. The importance of increasing labour employment is further reflected in the negative constant term which portrays that if the variables are held constant, the economy will plunge to a negative growth rate of -70.7350% on the average. The R-squared signals that our model is able to explain 64.81% of the whole variations in output growth in Nigeria for the period under investigation.

4.4 Influence of Unemployment on Output Degeneration

Another concern is establishing an empirical link between unemployment (labour underutilization) and output growth. Table 9 presents the empirical findings. In this case, the OLS serves as the base model since it reported highest number of variables being significant.

Table 9: Empirical Result for Model III

Dependent Variable: GRTH						
	OLS		FMOLS		DOLS	
Variables	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
GFCF	-0.1738 {-3.0868}	0.0048**	-0.1872 {-2.4412}	0.0221	-0.2317 {-2.2414}	0.0386**
UNMP	-1.3512 {-3.2574}	0.0031**	-1.1883 {-2.2638}	0.0325	-1.3571 {-0.7687}	0.4526
C	15.1616 {5.4069}	0.0000***	14.988 {4.1353}	0.0003	17.1807	0.0367**
R-squared	0.3766		0.3420		0.5440	
Adjusted R-squared	0.3287		0.2893		0.3294	

Source: Research Findings.

*Note: The numbers in braces {} are the t-statistics of the estimates, while the significance of the parameter estimates at 5% and 1% are captured by ** and *** respectively.*

Under the OLS, GFCF put forth a negative and noteworthy influence on output growth which is against our a priori expectation while the rate of unemployment put forth a negative and substantial effect on output growth and is in accordance with our a priori expectation following Okun's law. This negative influence is in line with earlier findings of Calmforms & Holmlund (2000), Daveri & Tabellini (2000), Chio (2007), Muhammad *et al*. (2011), Chang-Shuai and ZI-Juan (2012), Rafindadi (2012), Taylan (2012), Bakere (2012), Madito & Khumalo (2014), Shahid (2014), Abdul-khaliq (2014), Dahmani (2015), Nagel (2015), Soylu, Çakmak & Okur (2018), Ojima (2019), Xesibe & Nyasha (2020), Elorhor (2019), Hjazeen *et al*. (2021), Vijaya & Balu (2021), and mixed findings for Abraham & Nosa (2018) on a cross-country study. Studies that have recorded a positive effect of unemployment on output growth include Siphambe (2007), Arewa & Nwakanma (2012), Akeju & Olanipeun (2014), Seth *et al*. (2018), Ajilore & Yinusa (2011), Ademola & Badiru (2016), and Ali and Allan (2017). Such positive effects of unemployment on economic growth has been regarded as "jobless growth" (Ajilore & Yinusa, 2011). The coefficient indicate that output growth will plummet by about 1.3512% if unemployment is increased by 1%. This portrays that labour underutilization in any economy will cause substantial output degeneration. As can be further observed, holding the explanatory variables constant will cause output growth to remain at 15.1616% on the average pointing to the need for unemployment reduction for the amplification of growth. The R-squared shows that the model explains about 37.66% of the total variations in output growth in Nigeria within the study period.

5 Conclusion

The importance of labour in production has been stressed in the traditional production function where output is defined as a function of labour and capital. The stock of labour is a measure of human capital which when optimally utilized will generate the desired growth in productivity. Thus, the efficiency of labour is expected to promoted output growth through the marginal physical product of labour. With this, it can be inferred that an additional unit of a labour input will continue to yield an increasing output insofar the law of diminishing returns does not set in. This is noted when the MPPL is not equal to zero in the production process. As employment of labour is expected to generate positive output growth, labour underutilization (unemployment) is therefore likely to generate a negative influence on growth – output degeneration. This idea is as established in Okun's law where it is predicted that an inverse relationship exists concerning economic growth and unemployment. With the rising trend in unemployment in Nigeria, this paper investigated the validity of Okun's law in Nigeria by examining how labour underutilization can cause output degeneration in the economy. To this end, the study utilized the linear production function where output is expressed as a function capital and employment and unemployment variables.

With the aid of data from 1991 to 2019 which were obtained from the World Bank database, we estimated three sets of models using the OLS, FMOLS, and DOLS approaches. The first model capturing the influence of labour force participation rate on output growth revealed a positive and significant effect of labour on output growth in Nigeria. This portrays that as labour force participation increase/decreases, output growth also increases/decreases in a substantial way. In the second model, we estimated the influence of employment to population ratio on output growth. The result also revealed a similar result where labour employment put forth a positive and significant influence on output growth portraying that as labour employment increases/decreases, output growth will also increase/decrease in a momentous manner. Going to the influence of labour underutilization (unemployment) on output growth in the third model, we realized an evidence supporting the prediction of Okun's law. The result showed that unemployment wielded an inverse (negative) and significant influence on the output growth in Nigeria. The implication here is that higher unemployment will reduce output growth since labour is not optimally utilized, while lower rate of unemployment implies greater utilization of human capital and the resultant effect will be a momentous growth in the economy. The policy implication of this findings is that for Nigeria to accelerate her growth, there is need for actionable policies to boost labour employment across different sectors of the economy. This is because more employment means more labour utilization which will boost the overall output of the country.

References

Abdul-Khaliq, S., Soufan, T., & Shihab, R. A. (2014). The Relationship Between Unemployment and Economic Growth Rate in Arab Country. *Journal of Economics and Sustainable Development*, 5(9), 56–59.

Abraham, I. O., & Nosa, A. L. (2018). Unemployment and Output Growth: Evidence from Upper-Middle Income Countries in Sub-Saharan Africa. *American Economic & Social Review*, 3(1), 32-43.

Abramovitz, M. (1956). Resource and Output Trends in the United States since 1870. *American Economic Review*, 46, 5-23.

Ademola, A S., & Badiru, A. (2016). The Impact of Unemployment and Inflation on Economic Growth in Nigeria (1981-2014). *International Journal of Business and Economic Sciences Applied Research (IJBESAR)*, 9(1), 47-55. Available at: http://hdl.handle.net/10419/144673

Agion, P., & Howit, P. (1994). Growth and Unemployment. *Review of Economic Studies*, 61.

Airi, S. E., Ounakpo, R. I., & Anebi-Atede, H. A. (2016). Impact of Graduate Unemployment on the Economic Growth of the Nigerian economy. *International Journal of Advanced Academic Research*, 2(3), 1-16.

Ajilore, T., & Yinusa, O. (2011). An Analysis of Employment Intensity of Sectoral Output Growth in Botswana. *Southern African Business Review*, 15(2), 26-42.
Akeju, K. F., & Olanipeun, D. B. (2014). Unemployment and Economic Growth in Nigeria. *Journal of Economics and Sustainable Development*, 5(4), 138-44.
Amassoma, D. & Nwosu, P. I. (2013). The Impact of Unemployment Rate on Productivity Growth in Nigeria: An Error Correction Modeling Approach. *International Journal of Economics and Management Sciences*, 2(08), 01-13.
Arnold, R. (2008). Reestimating the Phillips Curve and the NAIRU. CBO, Working Paper 2008-06, August.
Al-Habees, M. A., & Rumman, M. A. (2012). The Relationship Between Unemployment and Economic Growth in Jordan and some Arab Countries. *World Applied Science Journal*, 18(5), 673–680.
Ali, N. H., & Allan, M. (2017). The Role of Integrated Marketing Communications in Increasing the Efficiency of Internet-Based Marketing Among Jordanian Consumers. *International Journal of Marketing Studies*, 9(4), 97–110.
Arewa, A., & Nwakanma, P. (2012). Potential-Real GDP and Growth Process of Nigerian Economy, An Empirical Re-Evaluation of Okun's Law. *European Scientific Journal*, 8(9), 25-33.
Babalola, S. J., Saka, J. O., & Adenuga, I. A. (2013). The Validity of Okun's Law in Nigeria: A Difference Model Approach. *Asian Economic and Financial Review*, 3(12), 1598-1608.
Ball, L. M., Leigh, D., Loungani, P., & Al., E. (2013). Okun's Law: Fit at 50? In IMF Working Papers (Vol. 13, Issue 10). Available at https://doi.org/10.5089/9781475574265.001
Bakare, A. S. (2012). Stabilization Policy, Unemployment Crises and Economic Growth in Nigeria. *Universal Journal of Management and Social Sciences*, 2, 4.
Bhat, T. A. (2019). The Validity of Okun's Law: Evidences from Indian Economy. *Theoretical and Applied Economics*, XXVI(4), 273–278.
Blinder, A. (1997). Is There a Core of Practical Macroeconomics That We Should All Believe? *American Economic Review*, 87(2), May.
Calmforms, L., & Holmlund, B. (2000). Unemployment and Economic Growth: A Partial Survey. Swedish Economic Review, 7.
Chang-shuai, L., & Zi-juan, L. (2012). Study on the Relationship Among Chinese Unemployment Rate. *Economic growth and Inflation. Advances in Applied Economics and Finance*, 1(1), World science Publishers, United states.
Chio, C. K. (2007). The Employment Effect of Economic Growth.
Dahmani, M. D., & Rekrak, M. (2015). Revisiting the Relationship Between Unemployment Rate and Economic Growth in Algeria, 1970–2014: Cointegration Approach Using ARDL Model.
Daveri, F., & Tabellini, G. (2000). Unemployment, Growth and Taxation in Industrial Countries. *Economic Policy*, 15.
Denison, E. (1985). *Trends in American Economic Growth, 1929-1982*. Washington: The Brookings Institution.
Elorhor, O. T. (2019). Unemployment and its Effect on the Growth of Nigeria Economy. *Journal of Economics, Management and Trade*, 23(2), 1-9. https://doi.org/10.9734/JEMT/2019/v23i230126
Fuad, M. K. (2011). Economic Growth and Unemployment: An Empirical Analysis. *Journal of Social Sciences*, 7(2), 218.
Geidenhuys, J., & Marinkov, M. (2007). Robust Estimates of Okun's Coefficient for South Africa. Working Paper.
Hjazeen, H., Seraj, M., & Ozdeser, H. (2021). The Nexus Between the Economic Growth and Unemployment in Jordan. *Future Business Journal*, 7(1), 41. Available at https://doi.org/10.1186/s43093-021-00088-3
Islam, R. (2006). The Nexus of Economic Growth, Employment and Poverty Reduction: An Empirical Analysis: Issues in Employment and Poverty. Discussion Paper No. 14. Employment Strategy Department, International Labour Office, Geneva.
Khrais, I., & ve Al-Wadi, M. (2016). Economic Growth and Unemployment Relationship: An Empirical Study for MENA countries. *International Journal of Managerial Studies Research*, 4(12),19–24.
Knotek, E. S. (2007). How Useful is Okun's Law? Federal Reserve Bank of Kansas City, Economic Review, Fourth Quarter.
Kreishan, F. M. (2011). Economic Growth and Unemployment: An Empirical Analysis. *Journal of Social Sciences*, 7(2), 228–231.
Levine, L. (2013). Economic Growth and the Unemployment Rate. Congressional Research Service, CRS Report for Congress, January 7. Available at www.crs.gov
Lewis, A. (1954). Economic Development with Unlimited Supplies of Labour. *Manchester School*, 22, 139-191.
Madito, O., & Khumalo, J. (2014). Economic Growth - Unemployment Nexus in South Africa: VECM Approach. *Mediterranean Journal of Social Sciences*, 5(20), 79-84.
Meddison, A. (1982). *Phases of Capitalist Development*. Oxford: Oxford University Press.
Muhammad, S. A., Oye, N. D., & Inuwa, I. (2011). Unemployment in Nigeria: Implication on the Gross Domestic Product (GDP) over the Years. *International Journal of Economics Research*, 2(1), 66-71.
Nagel, K. (2015). Relationships Between Unemployment and Economic Growth – The Review (Results) of the Theoretical and Empirical Research. *Journal of Economics and Management*, 20, 64–79.
Noor, Z. M., Nor, N. M., & Ghani, J. A. (2007). The Relationship Between Output and Unemployment in Malaysia: Does Okun's Law Exist? *International Journal of Economics and Management*, 1(3)337–344.
N'Zué, F. F. (2001). Employment and Economic Growth in the Cote d'Ivoire: An Analysis of Structural Determinants. *African Development Review*, 13(1), 98–113.

Ojima, D. (2019). Unemployment and Economic Development in Nigeria (1980–2017). *Advances in Social Science Research Journal*, 6(1), 110–121.

Okun**,** A. M. (1962). Potential GNP & Its Measurement and Significance. American Statistical Association, *Proceedings of the Business and Economics Statistics.*

Omitogun, O., & Longe, A. E. (2017). Unemployment and Economic Growth in Nigeria in the 21st Century: VAR Approach. *ACTA UNIVERSITATIS DANUBIUS (OECONOMICA)*, 13(5), 155-168.

Onwanchukwu, C. I. (2015). Does Unemployment Significantly Impact on Economic Growth in Nigeria? *Global Journal of Human-Social Science: E Economics*, 15(8), 23-26.

Ozei, H. A., Sezgin, F. H., & Topkaya, O. (2013). Investigation of Economic Growth and Unemployment Relationship for G7 Countries Using Panel Regression Analysis. *International Journal of Business and Social Science*, 4(6), 163-171.

Rafindadi, A. S. (2012). Macroeconomic Policy, Output and Unemployment Dynamics in Nigeria: Is There Evidence of Jobless Growth? *53th Annual conference of the Nigerian economic society on ''Youth Employment and Poverty Reduction in Nigeria,* NICON Luxiry Hotel, Abuja.

Raleva, S. (2014). Impact of Labour on Economic Growth in Bulgaria (1991 - 2013). *Economic Alternatives*, Issue 3, 1-14.

Sadiku, M., Ibraimi, A., & Sadiku, L. (2015). Econometric Estimation of the Relationship Between Unemployment Rate and Economic Growth of FYR of Macedonia. *Procedia Economics and Finance*, 19, 69-81.

Seth, A., John, M. A., & Dalhatu, A. Y. (2018). The Impact of Unemployment on Economic Growth in Nigeria: An Application of Autoregressive Distributed Lag (ARDL) Bound Testing. *Sumerianz Journal of Business Management and Marketing*, 1(2), 37-46.

Shahid, M. (2014). Effects of Inflation and Unemployment on Economic Growth in Pakistan. *Journal of Economics and Sustainable Development*, 5, 15.

Siphambe, H. K. (2007). Growth and Employment Dynamics in Botswana: A Case Study of Policy Coherence. Working Paper No. 82. International Labour Office, Policy Integration and Statistics Department, Geneva.

Sodipe, O. A. (2008). Employment and Economic Growth in Nigeria. An unpublished M.Sc. Research presented to the College of Business and Social Science, Covenant university, Ota, Ogun State.

Solow R. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70(1), 65-70. Available at https://doi.org/10.2307/1884513

Soylu, Ö. B., Çakmak, İ., & Okur, F. (2018). Economic Growth and Unemployment Issue: Panel Data Analysis in Eastern European Countries.

Taylan, T. D. (2012). Macroeconomic Variables and Unemployment: The Case of Turkey. *International Journal of Economics and Financial Issues*, 2(1), 71-78.

Todaro, M. P., & Smith, S. C. (2011). *Economic Development*. Eleventh Edition. Edinburgh Gate, Harlow: Pearson Education Limited.

Vijaya K. M., & Balu B. (2021). Impact of Human Capital Underutilization on Economic Growth: The Case of India. Available at https://doi.org/10.21203/rs.3.rs-914304/v2

World Bank (2021). World Development Indicators. Washington DC: World Bank Group.

Xesibe, Z., & Nyasha, S. (2020). Unemployment and Economic Growth in South Africa: A Re-examination. *International Journal of Sustainable Economics*, 12(2), 101–116.