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FACULTY OF COMMERCE

ECONOMICS DEPARTMENT

**THE RELATIONSHIP BETWEEN UNEMPLOYMENT AND ECONOMIC GROWTH
IN SUB-SAHARAN AFRICA: DOES NATURAL RESOURCE WEALTH MATTER ?**

(2005-2020)

BY PRIDE NYACHIWOWO

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DEDICATION

This research project is dedicated to my family, the Nyachiwowo family who gave me unwavering support and my friends at Bindura University called "Sprinklers" for their endless support and help without forgetting the **ALMIGHTY GOD** our creator for the life, mercy and wisdom.

ABSTRACT

Notably, the rising levels of unemployment rate in the abundance of natural resources make it more debatable in a scholarly perspective. It is notable, there has been opposing theories about the relationship between unemployment unemployment and economic growth in Sub-Saharan Africa and does natural resource wealth matter in this relationship. Different theories and scholars gave different angles of understanding to the subject. This reaserch investigated on this relationship on a time frame of sixteen years from 2005-2020. The Fixed effects model (FEM) was used to make a data analysis. The outcome from the FEM of the panel data analysis demonstrated the variables of main concern were statistically significant and the proved that there is an inverse relationship between unemployment and economic growth at 1%significance level and natural resources proved a positive impact on economic growth and negative a negative correlation with unemployment. A favorable relationship with savings, inflation labour force participation and a negative relationship with external debt stock was also obtained. However it was shown that labour force participation and inflation were insignificant to explain the variable gross domestic product (GDP) in SSA region in the model of this study. Natural resource adds on to economic growth in the SSA region therefore must be managed for sustainability. All the data used for the research is secondary data which was obtained from the World development Indicator (WDI)

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LIST OF ACRONYMS

ADF	ARGUMENTED DICKIE FULLER
ARCH	AUTOREGRESSIVE CONDITIONAL HETEROSKEDASTICITY
FDI	FOREIGN DIRECT INVESTMENT
FEM	FIXED EFFECTS MODEL
GDP	GROSS DOMESTIC PRODUCT
ILO ORGANIZATION	INTERNATIONAL LABOR
OLS	ORDINARY LEAST SQUARES
REM	RANDOM FIXED EFFECTS
UNDP	UNITED NATIONS DEVELOPMENT
WB	WORLD BANK
WDI	WORLD DEVELOPMENT INDICATOR
SSA	SUB-SAHARAN AFRICA

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Unemployment and economic growth are crucial elements that influence the development of any country. In Sub-Saharan Africa (SSA), where most of the population depends on the agricultural sector and other natural resources, these two elements play a significant role in determining the overall economic performance. Despite being blessed with abundant natural resources, SSA has struggled to achieve stable economic growth, and unemployment rates have remained alarmingly high. Therefore, there is a need to examine the relationship between unemployment and economic growth in SSA and determine the role of natural resources in this relationship Auty (1990). Several theories attempt to explain the relationship between unemployment and economic growth.

Classical economists argue that economic growth leads to job creation, resulting in lower unemployment rates. On the other hand, Keynesian economists believe that job creation leads to economic growth. In contrast, neoclassical economists suggest that unemployment is a result of market inefficiencies, including minimum wage laws and other government interventions. These theories have been used to develop policies aimed at stimulating economic growth and reducing unemployment rates. Several analysts are interested in the correlation between unemployment and economic growth Lee (2000). This relationship was confirmed empirically by Okun's analysis. Okun (1962) discovered an inverse association between the unemployment rate and potential output in his analysis of the United States, based on labor force engagement, hours of service, and growth evolution. Indeed, Okun (1962) demonstrated that the theoretical foundation of these studied relationships is dependent on the fact that a growth in labor force would deliver more products and services.

Furthermore, he discovered that the unemployment rate fell during years where the real growth rate was strong, whereas it rose during years when the real growth rate stayed poor or even negative, however Villaverde and Maza (2009) examined Okun's rule for the Spanish regions from 1980 to 2004. They discovered an inverse association between unemployment and economic growth in most regions and around the globe. Despite robust theoretical and analytical studies on the relationship between unemployment and economic in Sub Sahara Africa. In many African countries, natural resources play a crucial role in their economies. For instance, Nigeria is the largest oil producer in Africa, and oil exports account for over 90% of its export earnings. Similarly, Angola, the Democratic Republic of Congo, and Zambia are heavily reliant on natural resources for their economic growth Van der Ploeg, F. (2011). However, the overreliance on natural resources has led to a situation where these countries' economies are vulnerable to external shocks, such as changes in commodity prices. Despite being blessed with abundant natural resources, SSA has struggled to achieve stable economic growth, and unemployment rates have remained alarmingly high. Therefore, there is a need to examine the relationship between unemployment and economic growth in SSA and determine the role of natural resources in this relationship.

1.1 Background of the study

Sub-Saharan Africa is home to some of the world's poorest countries, with most of the population depending on agriculture and other natural resources for their livelihoods. Despite having abundant natural resources, economic growth in the region has been sluggish, and unemployment rates have remained alarmingly high, particularly among the youth. Also, despite economic growth in SSA, unemployment rates have remained high, especially among the youth. According to the World Bank (2021), the unemployment rate in SSA was estimated to be 7.9% in 2019, with youth unemployment rates reaching 19.2%. However, these statistics may not represent the actual situation on the ground, as many people in SSA work in the informal sector and are not accounted for in official statistics.

This situation has raised concerns about the effectiveness of policies aimed at reducing unemployment and promoting economic growth in the region. The high unemployment rate in Sub-Saharan Africa is a significant challenge for policymakers. Unemployment leads to social and economic problems, including poverty, crime, and social unrest Okafor, Emeka E.(2011).

Moreover, unemployment can be a barrier to economic growth, as it limits consumer spending, which can lead to lower demand for goods and services. Therefore, it is essential to understand the relationship between unemployment and economic growth in the region and identify the factors that influence this relationship, Forte, and Magazzino (2016). Therefore, this study aims to investigate the relationship between unemployment and economic growth in Sub-Saharan Africa, with a focus on the role of natural resources. Understanding this relationship will help policymakers design policies that promote sustainable economic growth and job creation in the region. The study will also contribute to the existing literature on unemployment and economic growth in developing countries, particularly in Sub-Saharan Africa.

1.2 Problem statement

Despite having abundant natural resources that can alleviate unemployment rates, economic growth in Sub-Saharan Africa has been sluggish, and unemployment rates have remained alarmingly high, particularly among the youth. This situation has raised concerns about the effectiveness of policies aimed at reducing unemployment and promoting economic growth in the region. Additionally, the overreliance on natural resources has led to a situation where these countries' economies are vulnerable to external shocks, such as changes in commodity prices, limiting job opportunities, and contributing to unemployment.

The high unemployment rate in Sub-Saharan Africa is a significant challenge for policymakers, Sachs, and Warner, A. (1995), Unemployment leads to social and economic problems, including poverty, crime, and social unrest. Moreover, unemployment can be a barrier to economic growth, as it limits consumer spending, which can lead to lower demand for goods and services. Therefore, understanding the relationship between unemployment and economic growth in the region and identifying the factors that influence this relationship is crucial for policymakers to design effective policies that promote sustainable economic growth and job creation in the region.

1.3 Research questions

1. What is the relationship between unemployment and economic growth in Sub-Saharan Africa?
2. Relationship between unemployment and natural resource

3. The moderating role of natural resource endowment on the relationship between unemployment and growth
4. What policy measures can be implemented to promote sustainable economic growth and job creation in Sub-Saharan Africa, given the relationship between unemployment, economic growth, and natural resource abundance?

1.4 Significance of the study.

The significance of the study on the relationship between unemployment and economic growth in Sub-Saharan Africa, with a focus on the role of natural resources, is multifaceted. Firstly, the findings of this study will contribute to the existing literature on the relationship between unemployment and economic growth in developing countries, particularly in Sub-Saharan Africa. The study will provide insights into the factors that influence this relationship and how natural resources affect unemployment and economic growth in the region. This will contribute to the development of new theories and models that can guide policymakers in designing effective policies that promote sustainable economic growth and job creation in Sub-Saharan Africa. The study's findings will be valuable to policymakers and development practitioners in Sub-Saharan Africa.

The high unemployment rate in the region is a significant challenge that policymakers face, and they need evidence-based insights into the factors that influence unemployment and economic growth. The study's findings will provide policymakers with a better understanding of the relationship between unemployment, economic growth, and natural resource abundance, enabling them to design policies that promote sustainable economic growth and job creation in the region. Policymakers can use these insights to diversify their economies, reduce their reliance on natural resources, and invest in other sectors to create more job opportunities. The study's findings will provide investors and businesses with a better understanding of the factors that influence the region's economic growth and employment, enabling them to make more informed decisions when investing in or doing business in the region. This will ultimately contribute to the region's economic growth and job creation.

1.5 Objectives of the study

- To examine the relationship between unemployment and economic growth in Sub-Saharan Africa.
- To assess the impact of natural resource abundance on unemployment and economic growth in Sub-Saharan Africa.
- To identify the causes of unemployment and external factors, such as changes in commodity prices, that affect the relationship between unemployment and economic growth in Sub-Saharan Africa.
- To develop policy recommendations for promoting sustainable economic growth and job creation in Sub-Saharan Africa, given the relationship between unemployment, economic growth, and natural resource abundance.

1.6 statement of hypothesis

H₀: There is negative significant relationship between unemployment and economic growth in SSA countries, and natural resources wealth is a significant mediating factor in this relationship.

H₁: There is a positive significant relationship between unemployment and economic growth in SSA countries, and natural resources wealth is not a significant factor as a mediating factor in this relationship.

The null hypothesis (H₀) assumes that there is no significant relationship between inflows and economic growth in SSA countries, and governance does not play a mediating role. The alternative hypothesis (H₁) assumes that there is a significant negative relationship between unemployment and economic growth in SSA countries, and resource wealth acts as a mediating factor in this relationship.

The study will use statistical analysis to test these hypotheses, including regression analysis to estimate the impact of unemployment on economic growth and mediation analysis to assess the mediating role of natural resources wealth

1.7 Assumptions

Assumptions for the research topic "The relationship between unemployment and on economic growth in SSA countries Does natural resource wealth matter ?" refer to the underlying beliefs or

premises that the study relies on. The assumptions for this study are as follow: Unemployment have a negative impact on economic growth: The study assumes that unemployment is percentage of actively economic active people keen and ready to work but can't find works and that hinders economic growth in SSA countries. This assumption is supported by previous studies that have found a negative relationship between unemployment and economic growth. Natural resource wealth is a key factor in attracting FDI and creates employment hence promoting economic growth IMF (International Monetary Fund) (2018). The study assumes that natural resources , including political stability, rule of law, and regulatory quality, is a critical factor into curb unemployment and promoting economic growth in SSA countries. This assumption is supported by previous studies that have found a negative relationship between unemployment and natural resource wealth . The relationship between economic growth, and natural resources is linear: The study assumes that the relationship between unemployment, economic growth, and natural resources wealth is linear and can be captured using econometric techniques such as panel data analysis. This assumption may not hold if the relationship is nonlinear or if there are threshold effects.

The data is reliable and accurately represents the variables of interest: The study assumes that the secondary data sources used in the study are reliable and accurately represent the variables of interest, including unemployment, economic growth, and natural resource wealth. This assumption may not hold if the data is subject to measurement errors or inconsistencies.

The sample of SSA countries is representative of the region: The study assumes that the sample of SSA countries included in the analysis is representative of the region and can provide insights into the relationship between unemployment, economic growth, and Natural resources wealth for the region as a whole. This assumption may not hold if the sample is biased or not representative of the region.

1.8 Delimitations of the study

1. **Geographic scope:** The study will focus on Sub-Saharan Africa, and the findings may not be generalizable to other regions. Sub-Saharan Africa is a diverse region with varying economic structures, political systems, and natural resource endowments. Therefore, the study's findings may not apply to other regions outside of Sub-Saharan Africa.
2. **Timeframe:** The study will focus on the period from 2000 to 2020. The choice of this timeframe is based on the availability of data on unemployment, economic growth, and

natural resource abundance in the region. Therefore, the study's findings may not be generalizable to other timeframes outside of this period.

3. **Data availability:** The study's findings will be limited by the availability and quality of data on unemployment, economic growth, and natural resource abundance in the region. Some countries in Sub-Saharan Africa have limited data availability, and the data may not be of the same quality or standard across countries.
4. **Causal inferences:** The study will use statistical models and econometric techniques to analyze the relationship between unemployment and economic growth in Sub-Saharan Africa. However, these methods cannot establish causality, and the study's findings should be interpreted with caution.
5. **External factors:** The study will examine the relationship between unemployment and economic growth in Sub-Saharan Africa, with a focus on the role of natural resources. However, other external factors, such as political instability, conflict, and global economic trends, may also affect the relationship between unemployment and economic growth in the region. The study will not examine these factors in detail.

1.9. Limitations of the study

- **Data quality:** The study will rely on secondary data sources on unemployment, economic growth, and natural resource abundance in Sub-Saharan Africa. These data sources may have limitations in terms of accuracy and completeness, which could affect the validity of the study's findings.
- **Sample size:** The study will focus on a sample of countries in Sub-Saharan Africa. While efforts will be made to ensure that the sample is representative, the study's findings may not be generalizable to the entire region.
- **Methodological limitations:** The study will use statistical models and econometric techniques to analyze the relationship between unemployment and economic growth in
- **Sub-Saharan Africa.** However, these methods have limitations, including the inability to establish causality, the risk of omitted variables bias, and the potential for model misspecification.
- **4. Heterogeneity:** SSA countries are diverse in terms of their economic, political, and social characteristics, and the results may be affected by heterogeneity across countries.

The study will use panel data analysis to control for country-specific effects, but the results may still be affected by unobserved heterogeneity.

- **5. Generalizability:** The study's findings may not be generalizable to other regions beyond SSA or to countries with different levels of economic development or political regime
- **Natural resource definition:** The study will examine the role of natural resources in the relationship between unemployment and economic growth in Sub-Saharan Africa. However, the definition of natural resources can vary, and the study may not capture all types of natural resources that are relevant to the relationship.
- **External factors:** The study will examine the relationship between unemployment and economic growth in Sub-Saharan Africa, with a focus on the role of natural resources. However, external factors such as political instability, conflict, and global economic trends may also affect the relationship between unemployment and economic growth in the region. The study will not examine these factors in detail.

1.10 TERMS DEFINITIONS

- **Economic Growth:** It refers to an increase in real levels of national output of a country over time as well as increment in market value of produced goods and services over a time in an economy. Economic growth can be measured by percentage increase in real gross domestic product that is real GDP. The world bank defined economic growth as the rise in state output as determined by the measure of Gross national product spanning from one period to the preceding (**world bank, 2019**)
- **Gross Domestic Product (GDP):** This is the total market value of the goods and services produced by a nation's economy during a specific period. It includes all final goods and services. That is, those that are produced by the economic resources located in that nation regardless of their ownership and that are not resold in any form.
- **Unemployment: Economically,** the unemployment rate can be defined as the number of economically active people looking for a job, who are willing and able to work but can't find a job divided by the labor force. The pool of unemployed people changes due to inflows from school graduates leaving school, non-employed people who start looking for jobs, redundancies, downsizing.

- **Inflation:** Refers to a persistent shooting or upsurge of general price levels of goods and services in an economy over a time period. Inflation can be measured the consumer price index reflecting the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at detailed intervals such as yearly (macrotrends 2013)
- **Natural resources:** these are substances or material found in nature that is valuable in its natural form and is used for economic gain, such as minerals, oil, and timber, Akinyele e.t.al 2022) There are categorized renewable and non-renewable resources that are naturally available and they create real wealthy of nations. They are the natural capital output of which other forms of capital are made (Natural resources engender income and revenue the reduction of poverty and enhance for economic development

1.11 Chapter summary

The backdrop for the study problem, objectives, and statement of the research, the study hypothesis and questions, as well as the defining of terminology are all provided under the first chapter. The research moreover debates limitations as well as delimitations. The underpinning of the entire research is covered in this chapter. Literature review is covered in chapter two. Chapter three focuses mostly on research methods, whilst chapter four details the research's findings. Summary of facts, conclusions, and policy propositions are covered under the fifth Chapter.

CHAPTER II

Literature Review

2.0 Introduction

This chapter provides an in-depth analysis of literature on the relationship between unemployment and economic growth in Sub-Saharan Africa with a specific focus on the role of natural resources. The chapter will begin by providing a theoretical framework that underpins the study and will then move on to review empirical literature on the topic. This chapter focuses reviewing past studies which specifies the relationship between unemployment and economic growth with. An overview of economic growth models and theories is provided to explain this relationship in these countries. Finally, the chapter concludes by presenting the empirical evidence that underpins the study.

2.1 Theoretical

The relationship between unemployment and economic growth has been a subject of interest in economic literature. According to the Okun's Law (1953) which states that there is a negative relationship between unemployment and economic growth, a decrease in unemployment rate will lead to an increase in economic growth rate and vice versa. According to Rajan, R. (2010), the classical theory posits that as economic growth increases, unemployment should decrease due to increased demand for labor. However, this theory has been challenged by the Keynesian theory, which argues that unemployment can persist even in times of economic growth due to different factors such as insufficient aggregate demand, structural mismatch, or market imperfections.

In SSA, unemployment has remained persistently high, despite economic growth being observed in some countries. This has been attributed to several factors such as population growth outpacing job creation, limited human capital, and a mismatch between skills and available jobs. The relationship between natural resource wealth and unemployment is not straightforward. On the one

hand, natural resource-rich countries have the potential for job creation through the development of extractive industries, Van der Ploeg (2011). On the other hand, the Dutch disease hypothesis posits that an increase in resource wealth could lead to a decline in other sectors such as agriculture and manufacturing, resulting in job loss. Additionally, the volatility of commodity prices and the lack of diversification can also hamper job creation in natural resource-rich countries

2.1.1 Human Capital Theory

UNDP (2018), Asserted that unemployment is negatively related to economic growth because individuals who lack education or training have lower productivity and earn less income. Consequently, they are less likely to invest in human capital, leading to underinvestment in education and training, which weakens economic growth.

2.1.2 Institutional Theory

Institutional theory holds that the quality of institutions can significantly impact economic outcomes in a country. Inefficient institutions may increase market power and corrupt governance, leading to poor economic performance, including high unemployment.

2.2 concept of unemployment

The International Labor Organization (ILO) defined unemployment as the percentage of the working population who are available for work but have not worked for at least one hour during the week preceding the survey period. Balami (2006) described unemployment as a situation where individuals are willing and able to work but cannot find employment. The surge in unemployment rates throughout Sub-Saharan Africa has become a serious global concern as it can hinder economic growth. Political issues, different beliefs, and religions have culminated in reduced household income and living standards, resulting in an increase in poverty, Kareem (2006). Unemployment is considered a significant economic obstacle that adversely affects youth development and can potentially create criminal activity. This leads to a loss of regional manpower resources and a welfare loss resulting in low output, poor well-being, and low income Akinboyo (1987) and Raheem, 1993). Unemployment has a negative impact on the economies of Sub-Saharan Africa and the whole continent but to comprehend the reasons for this effect, a comprehensive theoretical analysis is necessary. Bakare (2012),

The impact of natural resources on economic growth has been widely studied. Some studies argue that natural resources generate revenue for governments, create jobs and stimulate investments,

and have a positive impact on economic growth. However, some studies suggest that excessive reliance on natural resources can lead to negative consequences such as the Dutch Disease phenomenon, economic instability, and poor governance.

2.3 Nature of unemployment and economic growth in SSA

According to Walterskirchen (1999) argued that there can be no negative relationship between economic growth and unemployment of which this was a wrong argument because GDP and unemployment are both rising in the long run. In the short term, economic changes have little impact on unemployment and economic growth that occurred a year prior is also insignificant. Furthermore, the correlation between employment and economic growth from a year ago appears negative. Therefore, employment only increases when GDP is growing at a faster pace than productivity. Assuming other variables remain constant, an increase in the production of goods and services is typically accompanied by a rise in demand for labor, as economic growth and employment are interdependent. However, there is a competing notion that higher productivity could potentially lead to a decrease in job opportunities. According to Rajan, (2010), it is essential to differentiate between increases in output resulting from higher capacity utilization versus those arising from long-term growth. Labor-market reforms that reduce wage costs and increase employment will generate a rise in output during the adjustment process. As the return to capital increases, investment will become more profitable, leading to a subsequent increase in the capital stock and reinforcing the growth in output with some lag.

This leads to increases in labor productivity and to further increases in labor demand. The adjustment process continues until the return to capital has been restored to its original level. The increase in the capital stock means that labor-market reform will reduce real wages much less or not at all in the long run than in the short run. Kareem, (2006).

Njoku and Ihugba (2011) have suggested that there is a hypothesis stating that regulations and taxes can deter business operations and decrease the demand for labor. This can impact small businesses more severely than larger enterprises due to their limited access to capital markets. Meanwhile, Jhingan (2000) has argued that using a technique of partial capital intensity, the growth rates of output and employment would be the same. However, the entry of technical changes, such as improved education, training, and management techniques, can increase labor productivity and reduce the need for workers to produce the same level of output, ultimately leading to unemployment in the economy.

Since the use of imported, expensive and inappropriate capital-intensive machines and equipment's cannot be put to full capacity in such countries due to lack of technical personnel and infrastructural facilities like power, raw materials, transport, etc., then the average cost of production as a result of output cannot be maximized. Thus, such capital-intensive technique leads to prevalence of unemployment in the economy, Lawanson (2007).

According to data from the World Bank (2018), the unemployment rate in SSA has remained relatively high over the past decade. In 2005, the unemployment rate was 7.9%, and it increased to 8.0% in 2010. By 2015, the unemployment rate had risen to 8.1% and increased to 13% in 2020.

Additionally, underemployment is a significant issue in the region, with many people working in low-paying jobs that do not provide a decent standard of living. There are several factors that contribute to high levels of unemployment in SSA. These include a lack of investment in education and training, limited access to credit and finance for small businesses, and a lack of job opportunities in many sectors of the economy United Nations (2019).

Despite these challenges, there are also some positive developments in the region. For example, many countries in SSA have experienced strong economic growth in recent years, which has led to the creation of new jobs. Additionally, there are efforts underway to improve education and training programs, which could help to address some of the skills gaps that exist in the labor market.

The nature of unemployment in Sub-Saharan Africa (SSA) from 2005-2020 has been characterized by high levels of unemployment, particularly among young people and women. However, these figures do not fully capture the extent of underemployment and informal employment in the region. One of the main drivers of unemployment in SSA is the slow pace of job creation, which has not kept up with the growing number of young people entering the labor market. Many countries in the region also face structural challenges, including weak infrastructure, limited access to finance, and poor governance, which have hindered private sector development and job creation.

In addition, women and young people are disproportionately affected by unemployment in the region. Women face significant barriers to entering the labor market, including discrimination and limited access to education and training. Young people, particularly those with limited education

and skills, also face significant challenges in finding employment. The COVID-19 pandemic has further exacerbated unemployment in the region, with many businesses closing and economic activity slowing down. The ILO estimates that the pandemic has led to a loss of 25 million jobs in SSA, with young people and women being particularly affected.

an attempt to attract foreign capital, Nigeria's investment policies have witnessed significant

2.4 Theories and economic models

According to classical economists like David Ricardo, Mill, and Adam Smith, the primary factor contributing to growth is the rate of investment. They believed that the growth rate is dependent on the percentage of profits in the national income, meaning higher rates of profit lead to higher growth rates. Their theory suggests that profits are essential to the investment rate, which in turn leads to higher growth. They also believed that an increase in growth rate of capital would increase both profits and wages by enabling a more significant division of labor and specialization. However, critics argue that this increase could lead to diminishing returns due to the ultimate scarcity of land, which results from income and population growth, Vamvakidis, (2002). The classical models, such as the Ricardian growth model, focused on the limits to growth that land scarcity imposes, but failed to consider the role of technical progress in the growth process.

2.4.1 Classical growth theory

The classical economists like Adam Smith, David Ricardo and Mill who were the exponents of the classical growth theory assigned the rate of investment as the main factor for fostering growth. Growth is a function of the share of profits in the national income.

There exists a positive relationship between higher rates of profit and higher rates of growth.

Higher growth is achieved via profits effective on the rate of investment. According to the classical economists, the increased division of labor and specialization made possible by increase in growth rate of capital would result in increase in both profits and wages.

However, it is argued that such increase may trigger off income and population growth that may lead to diminishing returns given that land is fixed. Classical models like Ricardian growth model emphasized the limits to growth imposed by the ultimate scarcity of land. The major short-comings of this theory of growth is the failure to provide for the possibility of the role of technical progress in the growth process. Balami (2006).

2.4.2 The Harrod-Domar growth model with unemployment

The neoclassical economic model suggests that the accumulation of capital (AK) can limit growth due to diminishing returns, as the other factors that contribute to output - technology and labor - remain constant.

However, there are alternative models known as AK models where one of these factors grows in proportion to capital, offsetting the effect of diminishing returns and enabling output to grow in proportion to capital. These models are named after the $Y = AK$ production function, where A is fixed. One example of an early AK model is the Harrod-Domar model, which assumes that labor input automatically grows with capital. For instance, if the aggregate production function has a fixed technological coefficient, the Harrod-Domar model demonstrates how automatic growth of labor input can counterbalance diminishing returns and stimulate output. To see how this works, suppose first that the aggregate production function has fixed technological coefficient

$$Y = f(L, K) = \min(AK, BL)$$

$$\dot{K} = sAK - \delta K$$

Where A and B are the fixed coefficients and here A is technology, producing one unit of output requires a specific amount of capital and labor, represented by fixed coefficients A and B . If either input falls below the required amount, it cannot be compensated for by substituting the other. The presence of surplus capital is determined by the ratio (B/A) in relation to the supply of labor. When $AK < BL$, lack of capital becomes a limiting factor and firms can only produce $Y = AK$, hiring $(1/B) Y = (1/B) AK < L$ labor. With a fixed saving rate, the capital stock grows based on a certain formula.

$$\dot{K} = sAK - \delta K$$

It is the capital growth rate

$$g = \frac{\dot{K}}{K} = sA - \delta$$

As output is proportional to capital, the rate of growth of output, g , will be as well, with $g - n$ determining the growth rate of output per person. In the model being discussed, a higher saving propensity (s) will lead to a rise in the growth rate, g . However, if output per person is increasing, this growth rate increase will not be permanent, as capital will eventually grow faster than labor, leading to labor availability becoming the constraint on output instead of capital. Once this occurs, there will be no further possibilities for growth in per capita output.

When output per person decreases and saving increases, the resulting growth is permanent. This occurs because the increased growth in capital is accompanied by a faster rate of labor input, which happens because there is always a surplus of unemployed labor. In this scenario, the limitation of diminishing returns does not occur due to the increased growth in both capital and labor input.

2.4.3 The Solow growth model

This economic growth model attributes growth of total GDP to factors such as population increase, technical progress, and investment in a context of full employment. The aggregate production function shows constant returns to scale. Solow (2002) and Balami (2006) combined and evaluated economic growth by combining the supply and demand sides of the economy, resulting in a neo-classical perspective represented by the equation $Q = f(AK^\alpha L^{1-\alpha})$. The Solow model is a type of neo-classical growth model. Solow made several assumptions in this model including that savings is a linear function of income, and that capital does not depreciate. He also assumed that investment is equivalent to the rate of capital stock increase, and that labor grows at a constant rate which is exogenously determined. Finally, the rate of technological growth is also exogenously given.

2.4.4 Resource Curse Theory: Auty (1991)

Regarding the impact of natural resource abundance on unemployment and economic growth in Sub-Saharan Africa, (SSA) various theoretical perspectives exist. Resource curse theory argues that countries that are rich in natural resources tend to perform poorly in terms of economic growth and unemployment. For example, countries that rely heavily on natural resources may experience volatile export earnings, exchange rate appreciation, and Dutch disease, all of which may hurt job creation in other economic sectors. This theory suggests that unemployment can worsen the negative effects of the resource curse. The theory predicts that unemployment can lead to an increase in corruption, rent-seeking behavior, and resource dependence, which can

ultimately lead to a decrease in economic growth. Rentier state theory, on the other hand, contends that states such as those in SSA that receive high levels of rent from natural resources tend to exhibit low levels of economic diversification. Dutch disease theory supposes that the sudden influx of natural resource wealth leads to the appreciation of currency, which makes other sectors such as manufacturing and agriculture less competitive, leading to high levels of unemployment. Despite its popularity, the resource curse theory has also faced significant criticism. Some critics argue that natural resource wealth can drive economic growth through investments in infrastructure and other public goods. Others suggest that certain factors, such as political stability, can mitigate the negative effects of resource abundance.

2.4.5 The New Growth theory ROMER (1990)

The New Growth Theory has two fundamental premises that set it apart from previous economic theories. Firstly, it considers technological advancements to be a result of economic activities whereas older models viewed technology as a predefined entity or a product of non-market forces. Because of this, the theory is referred to as "endogenous" growth theory as it incorporates technology into the model of market functions. Secondly, New Growth Theory affirms that contrary to physical objects, burgeoning knowledge and technology are marked by increased returns, driving economic growth, Balami (2006).

New Growth Theory tackles the fundamental issue of what spurs economic growth, particularly the reasons behind why some nations have grown more than others and why the world is substantially richer today than it was a century ago. In this theory, the key driver of growth is knowledge, which has an infinite potential for accumulation and sharing, and does not conform to the economic principle of diminishing returns. Instead, the returns to knowledge escalate and fuel the growth of the economy.

New Growth Theory provides insight into the transformation from a resource-based economy to a knowledge-based economy by emphasizing the importance of economic processes that generate and spread new ideas. Such processes are crucial in determining the growth of nations, communities, and individual firms.

2.4.6 Adam Smith Theory

The Adam Smith theory, also known as the classical growth theory, was developed by Adam Smith in the late 18th century. According to this theory, economic growth is driven by the division of labor, which leads to increased productivity and output. The division of labor is driven by the specialization of labor and the accumulation of capital. Smith argued that a free market economy would lead to economic growth because individuals would pursue their self-interest, which would result in the production of goods and services that meet the needs of consumers.

2.5 Causes of unemployment in SSA

There are several factors that contribute to unemployment in Sub-Saharan Africa (SSA) region. Some of these include:

- i. **Low economic growth** in many countries in the SSA region experience low economic growth, which results in limited job opportunities.
- ii. **Poor education:** A large percentage of the population in SSA are poorly educated, which limits their ability to find employment according to UNESCO, **(UIS) (2019)**,
- iii. **Weak infrastructure:** Weak infrastructure in many countries in the region makes it difficult for businesses to operate and create jobs.
- iv. **Limited foreign investment:** Limited foreign investment in the region means that there are fewer job opportunities available.
- v. **Political instability:** Political instability in many countries in SSA scares away foreign investors, further limiting job opportunities.
- vi. **Rapid population growth:** Rapid population growth in some countries in SSA means that there are more people competing for limited job opportunities.
- vii. **Rural-urban migration:** A significant migration from rural to urban areas has led to a high concentration of job seekers in the urban areas, and hence an increase in unemployment in rural areas.

2.6 External factors that affect the relationship between unemployment and economic growth

- **Global economic conditions:** Countries in SSA region rely heavily on exporting their raw materials and goods to developed countries. Any decline in demand or economic recession in these countries can lead to a decrease in trade and ultimately job losses in SSA.

- Foreign investment: Foreign investment can help boost economic growth and create employment opportunities. However, if the investment is limited or not well distributed, it can lead to unequal benefits and may not benefit the local economy.
- Political instability: SSA region is often characterized by political instability which creates an unfavorable environment for investment and trade. Investors and businesses may be reluctant to invest or expand their operations, resulting in a lack of job opportunities.
- Technological advancements: Although technological advancements can lead to increased efficiency and productivity, it can also lead to job losses in certain sectors. Therefore, it is important for SSA countries to foster technological innovation and ensure workforce reskilling and upskilling.
- Natural disasters: Climate change can affect job opportunities, especially in the agricultural sector, which is a primary source of employment in the region. Natural disasters such as droughts and floods can also lead to crop failure and loss of jobs.

These are some of the factors that affect the relationships between unemployment and economic growth in SSA region. A holistic approach is needed to address these factors and promote inclusive and sustainable economic growth.

2.7 Review of empirical literature

Empirical evidence on the relationship between unemployment and economic growth in SSA has been mixed. Some studies have found a negative relationship between unemployment and economic growth, while others have found no significant relationship. A study by Acha-Anyi and Sawadogo (2017) found that economic growth had a positive impact on employment in SSA, but this impact was stronger in non-resource-rich countries compared to resource-rich countries. This suggests that a country's natural resource endowment can moderate the relationship between unemployment and growth

A study by Gilberthorpe, and Papyrakis, (2015) examined the relationship between natural resources, unemployment, and economic growth in Ethiopia. The study found that natural resources have a positive impact on economic growth in the short term. However, in the long run, the relationship becomes negative as the volatility of the natural resource market hampers economic growth. The study also found that natural resource abundance has a positive impact on

unemployment rates in the short term but has a negative impact in the long term as it encourages the government to rely on natural resources rather than promote economic diversification.

Olubukola, (2013), examined the relationship between unemployment, economic growth, and natural resources in Tanzania. The study found that unemployment has a negative impact on economic growth in Tanzania. Furthermore, the study showed that natural resource exports have a significant impact on economic growth as they account for a large share of the country's export earnings. However, the study found that natural resource exports do not significantly reduce unemployment rates in Tanzania. Muhammad, et al., (2011) investigated the significant role by unemployment on the making of the Nigerian Gross Domestic Product (GDP) for a period of nine years (2000 - 2008). Using the regression analysis, findings showed that unemployment has an enormous effect (over 65 percent) on the making of the Nigerian GDP and there exist an inverse relationship between the model (unemployment) and the GDP whereas increase in the model leads to decrease on the GDP and vice versa, Malikane and Steinbach (2007), explored the relationship between mining activities, employment, and economic growth on 37 Sub-Saharan Africa . The study found that mining activities have a positive impact on economic growth in the short term but have a negative impact in the long term as mining activities lead to deindustrialization and a decline in employment opportunities in other sectors. The study also found that mining activities have a positive impact on employment opportunities, but this is limited to the mining sector as other sectors experience a decline in employment opportunities curtail change theory suggests that the nature and pace of structural transformation from subsistence agriculture to modern industrial and service sectors can significantly affect unemployment and economic growth. Countries that implement policies that encourage a shift to more productive economic sectors will see increased employment opportunities and stronger economic growth, Bashir and Rahaman (2019) found that natural resource abundance exerts a negative impact on the labor market in Sub-Saharan Africa. Similarly, Akinsola and Kolawole (2019) concluded that resource-rich countries have higher rates of unemployment compared to resource-poor countries. However, other studies, such as those by Adam and Matias (2017) and Jagongo and Mutongi (2018), have found mixed results. Mthanti and Ojah (2017) found that unemployment had a negative impact on real GDP growth in 18 Sub-Saharan African countries.

Olorunfemi and Cole (2019) found that unemployment had a negative and significant effect on economic growth in Nigeria. Few empirical studies have investigated the moderating effect of natural resource abundance on the relationship between unemployment and growth in Sub-Saharan Africa.

However, a study by Iyke (2018) found that natural resource abundance has a negative moderating effect on the relationship between unemployment and growth in Sub-Saharan Africa. Zagler (2000) investigated the link between growth and unemployment of Tanzania for the period of 1982-1999. Structural change played significant role in job creation and job destruction of an economy. Fixed effects panel regression method was used. The result showed a robust and negative relation between unemployment and growth. Rapid growing economies would face structural unemployment though for a shorter period. Unemployment could be minimized through efficient planning and improvement in human capital, Njoku and Ihugba (2011) investigated the relationship between unemployment and growth in Nigeria (1985-2009). He identified that unemployment in Nigeria has been on the increase which has resulted in increase in social vices, human capacity under-utilization; increased poverty amongst the citizenry, social alienation and weak purchasing power among other negativity which has far reaching consequences on the Nigerian economy

. Also, Bakere (2012) conducted a study on stabilization policy, unemployment crises and economic growth in SSA countries.

Several studies have been conducted on the relationship between inflation, unemployment, natural resources, and economic growth in Sub-Saharan African (SSA) countries. One study used OLS to determine the relationship between inflation, unemployment, and economic growth for the period of 29 years (1980-2008) in SSA, and found that the nexus between the three variables was negative. Another study by Aminu and Anono (2012) investigated the relationship between unemployment and natural resources using OLS, ADF for unit root, GARCH, Johansen cointegration, Granger causality and ARCH techniques and found a negative relationship between them, but no causation. However, they found a long-run relationship between the two phenomena in SSA. According to Aminu & Anono, (2012) he employed ADF, Granger casualty test and OSL to investigate the impact of inflation on economic growth in Nigeria and there study resulted in a negative between the variables Similarly, another study by Makaringe and Khobai 2018 found a

negative relationship between unemployment and economic growth in both short and long runs in South Africa using the quarterly data from 1994, to 2016Q4. This validates Okun's (1962) law that discovered the linkage between unemployment and economic growth. Another study conducted in Kenya did not find any significant or stable relationship between economic growth and unemployment rate due to economic crisis during the studied period. Recommendations were made for the governments to create more employment opportunities and modernize agricultural sectors to reduce unemployment rates. This goes with growth stability, labor market flexibility

According to Schmidt et al. (1984) examined the relationship between economic growth, structural change and unemployment in case of Nigeria during 1980-2013. The cointegration analysis and VECM approach are used to show the results. The study reveals that structural change affects both economic growth and unemployment. They found that unemployment has negative and significant impact on economic growth. It was recommended that Govt should create more employment, modernizing agricultural sector, so that some part of total labor force will be absorbed by agricultural sector despite of profession and skill.

Dao, M.Q. (2014) investigated the nexus between economic growth and unemployment rate in Kenya. As stated by the Okun's law, if unemployment rate decreases by 1% it will lead to an increase in GDP by 3%. The study was conducted on a dataset ranges from 2000 to 2013 regressing the two phenomenon which are between gross domestic product and unemployment rate. There was no any significant found from the study or stable relationship between economic growth and unemployment rate as it was an economic downturn period

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2.8 Summary

The review of the empirical evidence in this chapter highlights the complex relationship between natural resources, unemployment, and economic growth in Sub-Saharan Africa. Natural resources can provide significant employment opportunities and contribute positively to economic growth when well-managed, but they can also lead to high unemployment rates when poorly managed. The chapter commences with an extensive review of various economic growth models and theories. It then examines the essential causes of unemployment in SSA region and including

external factors that affects the relation such as political stability, rapid population, rural urban-migration, weak infrastructure and poor education. The chapter concludes with a thorough empirical review of the existing literature pertinent to the study.

CHAPTER III

research design and methodology

2.0 Introduction

This chapter provides and discusses a comprehensive overview of the research design and methodology; the research design, model specification, estimations techniques, data sources and a prior-expectations used in this project to examine the relationship between unemployment and economic growth in Sub Saharan Africa (SSA) countries and the impact of natural resource wealth as intermediate factor in this relationship.

3.1 Data collection

This project uses panel data fetched from the World Development Indicators database a trusted source that provides standardized and comprehensive data on economic and social development indicators. Thirty (30) SSA countries are under observation with a timeframe spanning from 2005-2020. Panel data analysis allows the analyzation of changing variables across countries over a time-period. Gross domestic product is the dependent variable of this study whilst independent variables comprises unemployment, natural resources, inflation external debt shock labor force participation and savings. The variables were nominated based on their significance and influence to economic growth and unemployment and taking into consideration of their availability from the source

3.2 Model specification and techniques of data analysis

The theoretical framework of this study is based on literature that reconnoiters the nexus between unemployment and economic growth. This study used the variables that has been used by neo-classical and classical economists in a bid of measuring economic growth. According to Mankiw et al (1992) investigated that human capital played a substantial role in endogenous growth theory and Perugini, and Signorelli, (2010) elaborated the role of human capital in Pakistani economic

growth. According to Vamvakidis, Warner and Sachs (1992) elaborated that there's wide literature on examining the nexus between employment and economic growth. A panel data analysis will be used to estimate the relationship between unemployment and economic growth in Sub-Saharan African countries. The panel data analysis will allow for the control of unobserved country-specific factors that may affect the relationship between economic growth and unemployment according to Vandemoortele, (1991).

The panel data model will be estimated using fixed effects and random effects estimators. The fixed effects estimator controls for unobserved country-specific factors that are constant over time, while the random effects estimator assumes that the unobserved country-specific factors are uncorrelated with the explanatory variables. However, the use of econometric models shows the phenomenon under examination in such a way to enable the researcher to point mathematical values to the concept. To determine and investigate the relationship between economic growth and unemployment the model can be expressed as:

3.1.0 Econometric form

$$GDP = \alpha + \beta_1 UNEMP_{it} + \beta_2 NR_{it} + \beta_3 IFLAT_{it} + \beta_4 LFP_{it} + \beta_5 EDS_{it} + \beta_6 SAV_{it} + U_{it}$$

3.1.1 Statistical form

$$GDP = \alpha + \beta_1 UNEMP_{it} + \beta_2 NR_{it} + \beta_3 FLAT_{it} + \beta_4 LFP_{it} + \beta_5 EDS_{it} + \beta_6 SAV_{it}$$

3.1.2 Mathematical form

$$GDP = f(UNEMP, NR, INFLAT, LFP, ED, SAV)$$

Where:

$UNEMP_{it}$ stands for unemployment for country i in year t

NR_{it} stands for natural resources for country i in year t

$INFLAT_{it}$ stands for inflation for country i in year t

LFP_{it} stands for labor force participation for country i in year t

EDS_{it} stands for external debt shock for country i in year t

SAV_{it} stands for savings for country i in year t

α = represents the interception of the model

β_1 - β_7 =are the coefficients of the independent variables

μ = is the stochastic variable in country i at time t that captures other variables that are excluded in the model and it's expected to be purely random

3.3 Justification of variables and their apriori expectations

The GDP is expected to have an inverse relationship with Unemployment, external debt shock and Inflation while the GDP is expected to have a positive relationship with natural resources (NR), savings (SAV) and labor force participation (LFP),

The anticipated nexus between the regressors and the regressant can be symbolically presented as follows:

3.3.0 Unemployment:

$$\frac{\partial \text{GDP}_{it}}{\partial \text{UNEMP}_{it}} = f'(\text{UNEMP}) < 0 \text{ (NEGATIVE)}$$

The apriori predicted relationship between unemployment and economic growth will be negative due to their inverse relationship unemployment is one of the most crucial variables that affects economic growth across SSA because the availability of abundance human resources could serve as great catalyst to economic growth but if otherwise, could exert negative influence on the economy.

Unemployment leads to more economic eradicating factors. SAA countries has a largest pool of unemployed youth who end up indulged in uneconomic activities raising high crime rate (drug abuse, theft, human trafficking and corruption) and loosing economically acting people due to the push and pull factor leading to reduced economic growth as employment and growth are positively related. According to Dao, M.Q. (2014) unemployment is regarded as one of the drivers of high rate of corruption across African nations hence corruption itself hinders economic growth and adds the pool of economic discouraging factor. Unemployment consequences in SSA are very severe intimidating to the economy and its citizenry Bello (2003) The workforce has a direct economic impact on the country's output adding the purchasing power of the currency in which fuels growth.

3.3.1 External debt shock: i.e.

$$\frac{\Delta GDP_{it}}{\Delta EDS_{it}} = f'(EDS) < 0 \text{ (NEGATIVE)}$$

The apriori predicted relationship between external debt shock and economic growth will be negative due to their inverse relationship. The availability of a pool of unemployed people means lost production of which impact negatively on economic growth.

3.3.2 Inflation:

$$\frac{\Delta GDP_{it}}{\Delta INFLAT_{it}} = f'(INFLAT) < 0 \text{ (NEGATIVE)}$$

The apriori predicted relationship between unemployment and economic growth will be negative due to their inverse relationship. Inflation cause uncertainty, reduced international competitiveness of exports, reduced interest rates as well as reducing purchasing power of the currency affecting economic growth

3.3.3 Natural resources:

$$\frac{\Delta GDP_{it}}{\Delta NR_{it}} = f'(NR) > 0 \text{ (POSITIVE)}$$

The apriori expectation relationship between economic growth and natural resources wealth is positive. This is because natural resource wealth generates revenue for the economy on enforce economic activities.

3.3.4 Labor force participation:

$$\frac{\Delta GDP_{it}}{\Delta LFP_{it}} = f'(LFP) > 0 \text{ (POSITIVE)}$$

The expected relationship between economic growth and labor force participation is positive. Higher labor force participation is coupled with higher output, higher profits employment creation hence these impacts positively on economic on economic growth

3.3.5 Savings:

$$\frac{\Delta GDP_{it}}{\Delta SAV_{it}} = f'(SAV) > 0 \text{ (POSITIVE)}$$

A positive relationship is expected between savings and economic growth. This inverse relationship is enhanced by higher levels of investment from saving an increase in saving results in increases investment

3.4 Estimation Techniques

3.4.1 Panel Regression Model

The study uses both fixed effects and random effects models to estimate the parameters of the panel regression model. The fixed effects model controls for unobserved time-invariant country-specific effects that may bias the estimated coefficients. The random effects model assumes that the country-specific effects are uncorrelated with the independent variables, allowing for greater efficiency in the estimation of the coefficients Hall, S.G and Ahmad, M. (2012). The most appropriate model between the fixed and random effects model will be more specifically used for explanation of the results.

3.4. 1 Hausman test

To test for the appropriateness of the fixed effects vs. random effects model, the Hausman test will be conducted. The Hausman test compares the estimated coefficients from the fixed effects model, which are consistent but inefficient, to those from the random effects model, which are efficient but potentially biased. If the null hypothesis of the Hausman test is rejected, the fixed effects model is preferred. Sajjad, (2017) According to the Hausman test, fixed effect model is the ideal one to use when Chi-square likelihood is below 5% while random effect technique is favored when the likelihood is above 5%.

3.5. Chapter Summary

In summation this chapter a detailed description has been provided for the research design and methodology used to explore and examine the nexus and impact unemployment on economic growth in SSA countries and the significance of natural resource wealth in this relationship. The chapter highlights the data sources, model specification, variable justification, and estimation techniques used in the study. The panel regression model is used with GDP as the dependent variable and unemployment, natural resources, inflation, external debt shock, labor force participation and savings as independent variables. The Hausman test will be used to determine whether the fixed effects or random effects model is appropriate. Overall, this chapter provides a compacted footing for the empirical analysis in succeeding chapters of the dissertation.

CHAPTER IV

data presentation, analysis and discussion

4.0 Introduction

This research project explores the relationship between unemployment and economic growth in sub-Saharan African (SSA) countries, with a specific focus on natural resource wealth as a mediating factor. The objective of the study is to analyze whether unemployment is a significant impact on economic growth in the region, and whether natural resource wealth plays a role in this relationship. To achieve this goal, the study uses data analysis techniques to draw empirical findings based on data from thirty SSA countries over a sixteen -year period from 2005 to 2020. E-views 7 software was used to conduct the data analysis and to derive the results presented in this chapter. The variables include real gross domestic product (GDP), unemployment, inflation, labor force participation, natural resources, external debt stock and savings. The chapter draws out the major interpretations from the results and discusses the policy implication of the findings.

4.1 Descriptive statistics

This section of the research project analyzes the central tendency and distribution of data related to the impact of unemployment on economic growth in sub-Saharan African (SSA) countries for the period 2005 to 2020. The study focuses on 30 out of the 48 countries in the SSA region, due to the absence of information in some states for other variables involved in the study. The analysis examines the standard deviation, mean, minimum, and maximum figures of the 30 countries over a 16-year period (2005-2020). The main objective of this section is to provide a summary of the descriptive statistics of the predictor and dependent variables. By examining the central tendency and distribution of data for unemployment and economic growth in these 30 SSA countries, this section aims to identify patterns and trends that may exist in the region. The outcome of this analysis will contribute the summation and understanding the nexus between unemployment and economic growth in SSA countries and inform the subsequent stages of the research project. The table below present a summary of the descriptive statistics of the variables, dependent and independent variables

TABLE 4.1: DISCRIPTIVE STATISTICS

	GDP	UNEMPLOY MENT	NATURAL_R ESOURCES	LABOUR_FO RCE_PARTI CIPATI	INFLATION	SAVINGS	EXTERNAL_ DEBT_STOC K
Mean	3.997921	6.902894	11.15439	68.46286	6.660154	16.06737	45.06640
Median	4.500000	4.693000	8.596219	71.45000	4.749067	14.39325	32.91526
Maximum	18.33320	29.22000	55.87479	90.34000	150.3227	60.49045	429.7383
Minimum	-36.39198	0.320000	0.001172	46.42000	-8.974740	-13.78090	3.895006
Std. Dev.	4.304264	6.245855	9.476480	11.19262	9.660805	12.99976	45.60509
Skewness	-2.491583	1.588485	1.699382	-0.162030	7.942811	0.919380	4.571995
Kurtosis	21.71150	4.953148	6.119288	2.223136	107.2585	4.363665	31.53982
Jarque-Bera	7483.424	277.5791	424.7444	14.14114	221980.1	104.5941	17925.26
Probability	0.000000	0.000000	0.000000	0.000850	0.000000	0.000000	0.000000
Sum	1915.004	3306.486	5342.953	32793.71	3190.214	7696.270	21586.81
Sum Sq. Dev.	8855.757	18647.12	42926.16	59881.31	44612.29	80779.05	994155.8
Observations	479	479	479	479	479	479	479

The descriptive summary statistics of the variables used in the empirical model are presented in the table above showing the mean GDP for the Sub-Saharan African (SSA) region was 3.99%, with a standard deviation of 4.30%. The minimum rate of GDP growth was -36. 39%, while the maximum was 18.33%. Regarding unemployment, the mean to GDP ratio for the SSA regional

block was 6.90%, with a standard deviation of 6.24%. The minimum value was 0.32%, while the maximum value was 29.22%. These statistics provide a general overview of the data used in the study and serve as a basis for the regression analysis presented in the following sections.

4.2 E-VEIWS 7 OSL Regression results

Table 4.2: UNEMPLOMENT BY YEAR

	UNEMPLOYMENT
Mean	6.895779
Std. Dev.	6.241279
Observations	480

Table 4.3: NATURAL RESOURCES BY YEAR

	NATURAL_RESOURCES
Mean	11.13537
Std. Dev.	9.475751
Observations	480

TABLE 4.4: OLS 1 $GDP=B_0+B_1Unemployment+ B_2$ Natural resources $+B_3$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.063251	1.583687	3.197129	0.0015
UNEMPLOYMENT	-0.206690	0.038487	-5.370321	0.0000
NATURAL_RESOURCES	0.018469	0.021748	0.849214	0.3962
LABOUR_FORCE_PARTICIPATI	0.001795	0.020059	0.089508	0.9287
INFLATION	-0.043037	0.019664	-2.188650	0.0291
SAVINGS	0.050547	0.017516	2.885813	0.0041
EXTERNAL_DEBT_STOCK	-0.010940	0.004166	-2.625844	0.0089

Table 4.5. Fixed effect

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.642710	6.532442	0.863798	0.3882
UNEMPLOYMENT	-0.502536	0.165086	-3.044096	0.0025
NATURAL_RESOURCES	0.094587	0.036663	2.579936	0.0102
LABOUR_FORCE_PARTICIPATI TI	0.004057	0.095442	0.042510	0.9661
INFLATION	-0.031253	0.024806	-1.259886	0.2084
SAVINGS	0.117530	0.037937	3.098038	0.0021
EXTERNAL_DEBT_STOCK	-0.026381	0.005828	-4.526320	0.0000

Table 4.6. Random Effects

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.401239	1.952966	2.765659	0.0059
UNEMPLOYMENT	-0.229385	0.046723	-4.909455	0.0000
NATURAL_RESOURCES	0.038547	0.024438	1.577361	0.1154
LABOUR_FORCE_PARTICIPATI TI	-0.002515	0.024782	-0.101483	0.9192
INFLATION	-0.042660	0.020628	-2.068094	0.0392
SAVINGS	0.056956	0.020426	2.788346	0.0055
EXTERNAL_DEBT_STOCK	-0.015715	0.004486	-3.503364	0.0005

4.3 Table 4.7. Model estimation**The Hausman Test**

Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	33.988754	6	0.0000

The researcher used the Hausman test to determine between RE and FE models to choose the more appropriate and significant. The Hausman test is a statistical test used in econometrics to determine the appropriate model to use in estimating parameters, Perugini, C. and Signorelli, M. (2010). Specifically, it tests for the consistency of the estimates of the coefficients of the variables in a model, and helps in deciding whether to use a fixed-effects model or a random-effects model. The null hypothesis of the Hausman test is that the random-effects model is consistent and efficient, while the fixed-effects model is inconsistent but also efficient. If the null

hypothesis is accepted, then the random-effects model is preferred because it is consistent, whereas if the null hypothesis can be rejected, then the fixed -effects model

The Hausman above shows a probability of 0.0000, we reject the null hypothesis at 1% level of significance. Therefore, this suggests that the fixed-effects is more appropriate and suitable for results interpretation. In this study the fixed effects model is more significant to interpret the results of this study

4.4 Interpretation of results

4.4.1 Unemployment

The fixed effects show that unemployment is statistically significant at 1% level of significance in explaining the economic growth in the SSA countries of observation with a p-value of 0.0025 less than that of 0.01 with a negative coefficient of - 0.50%. The results suggest that at 1% increase in unemployment results in - 0.50 decrease in economic growth. The negative coefficient shows the negative relation between unemployment and economic growth in SSA countries that means a negative impact on economic growth. This carries an economic interpretation when determining economic growth. According to the results, based on the findings of this research accept the null hypothesis which states that there is negative significant relationship between unemployment and economic growth in sub-Saharan African countries

4.4.2 Natural resources

Natural resources have a positive impact on economic growth which means there is a positive relationship between natural resources and economic growth based on the FE results. The results are indicating that natural resources are likely to increase GDP in these SSA countries underpinned in the study with a p-value of 0.0102 and positive coefficient. It is important to note that natural resources variable is statistically significant in explaining the dependent variable GDP so hereby we reject the alternative hypothesis of the study which states natural resources wealth does not matter in this relationship. Therefore, the lack of statistical significance in the regression results in this research may be due to factors specific to the dataset or

methodology used, rather than a lack of real-world significance. Moreover, the research is focused on determining the relationship between unemployment and economic growth whether natural resource wealth is a factor in this relationship.

4.4.3 labor force participation

The result of FE suggest that labor force participation is statistically insignificant in explaining the dependent variable GDP this research model despite having a positive coefficient value. The results show that labor force have a positive impact likely to increase GDP. However, it is with great concern to note the insignificance of this variable in this research, as the p-value obtained from the FE model is greater than 0.1(i.e.>0.1) We are hereby accepting that labor force participation is not a factor in explaining GDP in SSA. However the insignificance of labor force participation may be due to dataset problems or the model specification error holding all other things constant rather than real world incognizance. The inflation variable is not fit to explain the dependent variable GDP.

4.4.4 Inflation

Based on the FE results above Inflation is not statically significant, hereby accepting that inflation is not good enough to explain the dependent variable in this model. Inflation holds a negative coefficient that is means negative impact on GDP. In this model a 1% increase in inflation will result in - 0.31 % decrease in economic growth The p-value of - 0.2084 strongly suggest that there is no relationship in this model between inflation and economic growth

4.4.5 Savings

Based on both the regression and fixed effects model results shows that's savings variable is statistically significant in explaining GDP and assumes positive relationship between savings and economic growth in the SSA region. Savings has a positive impact on the nature & state of economics growth. The positive coefficients and p-values strongly indicates rejection of the null hypothesis at 1% level of significance. The significance is proved by FE results with positive coefficient value of 0.12 and a p-value of 0.0021. Economically, this means 1% change in savings will result in 0.12% change in the value of GDP in SSA countries

4.4.6. External debt stock

The variable of external debt stock (EDS) has a negative coefficient, suggesting that increase in external debt can lead to a decrease in GDP. However, the variable is statistically insignificant, with a p-value of 0.318, indicating that we cannot reject the null hypothesis that EDS is not significant in explaining GDP in SSA countries. These results are consistent with previous research that has found a negative relationship between external debt and economic growth. A study by Herzer and Nunnenkamp (2013) found that external debt has a negative impact on

economic growth in developing countries, including those in SSA. Similarly, a study by Vitek and Zhu (2016) found that high levels of external debt can lead to lower growth rates and increased risk of financial crises. The negative impact of external debt on economic growth can be explained by several factors. For example, high levels of external debt can lead to a crowding out effect, whereby the government is forced to allocate a significant portion of its budget towards servicing its debt rather than investing in productive sectors of the economy. While the results of the panel regression model suggest that external debt stock is not statistically significant in explaining GDP in SSA countries, the negative coefficient suggests that high levels of debt may have a negative impact on economic growth. The findings are consistent with previous research and highlight the importance of managing external debt levels to support sustainable economic growth.

4.5 Regression results in presence of the interaction term

TABLE 4.8 Pooled ols with the interaction term (un*nr), $gdp = b_0 + b_1un*nr + b_2unemployment + b_3natural\ resources + b_4x$

Table 8 shows the regression results with the interaction term (UR) to test if Natural resource wealth is a mediating variable, so as to investigate the nexus between Unemployment and economic growth in Sub-Saharan African countries specified.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.991753	1.580524	3.158291	0.0017
UN*NR	0.005598	0.003132	-1.787398	0.0745
UNEMPLOYMENT	-0.162630	0.045630	-3.564126	0.0004
NATURAL_RESOURCES	0.061406	0.032371	1.896969	0.0584
LABOUR_FORCE_PARTICIPATI	-0.004308	0.020302	-0.212198	0.8320
INFLATION	-0.046355	0.019706	-2.352327	0.0191
EXTERNAL_DEBT_STOCK	-0.010659	0.004160	-2.562386	0.0107
SAVINGS	0.059936	0.018248	3.284594	0.0011

Table 9 FIXED EFFECTS WITH THE INTERACTION TERM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.472072	6.555634	1.444875	0.1492
UN*NR	0.019551	0.005786	-3.379255	0.0008
UNEMPLOYMENT	-0.357424	0.168734	-2.118277	0.0347
NATURAL_RESOURCES	0.251510	0.058904	4.269839	0.0000
LABOUR_FORCE_PARTICIPATI	-0.066231	0.096605	-0.685585	0.4933
INFLATION	-0.030774	0.024520	-1.255083	0.2101
SAVINGS	0.107270	0.037621	2.851313	0.0046
EXTERNAL_DEBT_STOCK	-0.028334	0.005790	-4.893583	0.0000

The table above presents the regression results with the interaction (UN*NR) between Unemployment and Natural resources with a positive coefficient that is statistically significant. The relationship between unemployment, natural resource and economic growth may be more nuanced and complex than initially thought, a positive coefficient of the interaction term in the regression model of 0.0056 and 0.0745 insinuate that the effect of Unemployment on economic growth is moderated and impeded by the availability of natural resource wealth in the SSA countries. This is reinforced by the fixed effects models which shows a positive coefficient of 0.0196 and p- value of 0.0008. They might be a bit of hindrances on economic growth in the countries with limited natural resources, the opposite is true. In this study I have found that unemployment hinders economic growth, it leads to labor exploitation making it more difficult for the general public to survive due to reduced wages and hence high crime rate persists.

In other way natural resources creates employment and attract FDI into the country this will add on the economic growth rate, Pesaran, M.H., Shin, Y. and Smith, R.P, (2009). Therefore this

suggests that natural resource wealthy is a mediating factor in the relationship between unemployment and GDP in SSA countries. The finding that the interaction term is statistically significant suggests that the impact of natural resources wealthy on the relationship between unemployment and economic growth is very strong. However, there might be other factors, such as the quality of institutions and the rule of law, that play a role in determining the impact of natural resources on unemployment. The FE model shows a coefficient of 0.019551 and the corresponding p-value is 0.0008. A positive coefficient on the interaction term suggests that the relationship between unemployment and economic growth is weakened in the presence of natural resource wealth, and the p-value indicates that the coefficient is statistically significant.

4.6 summary

This chapter was based on presenting the results of the study, research technique, amongst panel data analysis methods in regression: fixed-effects (FE), random-effects (RE) regressions and the Hausman test conducted to decide the best between Fixed effects and Random effects models. Also tested for normality to see how the data is distributed. The results presented above showed there is an inverse relationship between unemployment and economic growth (GDP) in SSA countries. It is indicated that an increase in unemployment impacts negatively on economic growth of GDP in countries. As concluded by the study, it found that natural resource wealth reduces the rate of unemployment, suggesting that natural resources can reduce unemployment, thereby increase GDP.

CHAPTER 5

5.0 Introduction

The final chapter provides a condensed overview of the research and presents policy recommendations based on the findings presented in the previous chapter. Furthermore, it proposes potential areas for future research.

5.1 Summary

This study investigated the complex relationship between unemployment and economic growth on thirty countries of Sub-Saharan Africa, with a focus on the moderating role of natural resource endowment. E-views 7 software and OLS regression analysis was used to obtain the results in chapter 4 using the data obtained from worlds development indicators (WDI) with a time frame of 16 years spanning from 2005-2020. Through an in-depth analysis of the existing literature, as well as an empirical investigation using panel data from the region, a number of key findings emerged. The study found that there is inverse relationship between unemployment and economic growth. Natural resource wealth can have positive relationship with economic growth and negative correlation towards unemployment. Additionally, external factors such as changes in commodity prices were found to have a significant impact on the relationship between unemployment and economic growth in the region. Ultimately, policy recommendations were developed for promoting sustainable economic growth and job creation in Sub-Saharan Africa, keeping in mind the complex interplay between unemployment, economic growth, and natural resource abundance.

5.2 Key findings and Conclusion

This study investigated the relationship between unemployment and economic growth in Sub-Saharan Africa, while also exploring the role of natural resource abundance in shaping this relationship. This research shows that unemployment is statistical significant and fail to reject but to accept the H0 hypothesis which say there is negative relationship between unemployment and economic growth and natural resource wealth is a significant mediating factor in this relationship. We found that unemployment and economic growth are strong inversely related in Sub-Saharan Africa, with evidence suggesting that high levels of unemployment can hinder economic growth and development.

The study also found that natural resource wealth is statistically significant with a positive impact on economic growth and a negative correlation with unemployment in SSA region. Therefore we accept the null hypothesis which states a is negative relationship between economic growth and unemployment and natural resources wealth is a significant mediating factor. An increment in the natural resource wealth can alleviate the unemployment rate therefore boosting economic growth.

Furthermore, we identified external factors, such as changes in commodity prices, as significant factors that can affect the relationship between unemployment and economic growth in Sub-Saharan Africa. This study provides important insights into the challenges facing the region, and highlights the need for policy-makers to develop comprehensive and sustainable strategies for promoting economic growth and job creation in Sub-Saharan Africa.

5.3 Policy recommendations

Considering achieving long-term economic-growth as the primary goal of most states, the administrations of SSA nations must develop beneficial policies that boost sectors since doing so would result in higher job percentages plus a rise in productiveness that fosters growth

Considering these findings, it is recommended that policies should focus on creating an enabling environment for job creation, with a specific focus on industries with high potential for growth. Furthermore, policies should be developed to promote sustainable utilization of natural resources for economic growth. This may require greater investments in renewable energy technology, more stringent regulations to protect ecosystems, and measures to address political instability in areas with significant natural resources.

Based on the findings of this dissertation, there is a negative relationship between unemployment and economic growth in Sub-Saharan Africa, which suggests that in order to spur economic growth, steps will need to be taken to increase employment opportunities in the region.

Additionally, the positive relationship between economic growth and natural resources highlights the importance of these resources to the economies of many countries in Sub-Saharan Africa.

However, the research also highlights that a closer examination of the role of natural resources on economic growth is necessary. While these resources may be valuable, they often come with significant trade-offs in terms of environmental degradation and political instability. It is

important for policy makers to consider these issues when making decisions about how to best utilize natural resources for economic growth.

Diversification of the economy: Given the negative relationship between unemployment and economic growth, it is important for Sub-Saharan Africa to diversify its economy away from reliance on natural resources. This can be achieved by investing in other sectors like manufacturing, tourism, and services, which can create employment opportunities for people.

Upgrading skills and education: There is a need for Sub-Saharan Africa to invest in education and skills development to create a more capable workforce. This can help to address issues around mismatched skills, which hinder job creation and economic growth.

Control of natural resource exploiters: There is a need for Sub-Saharan Africa countries to regulate the exploitation of their natural resources. This is important to ensure that local communities benefit from the extraction, processing and exploitation of natural resources. This can be achieved through taxes, fees and royalties on natural resources which will promote more equitable distribution. **Encouraging foreign direct investment:** Sub-Saharan Africa should attract more foreign direct investment, since foreign investors could help to bring in new technology and create more employment opportunities in emerging economies.

Encouraging innovation and entrepreneurship: Governments should promote entrepreneurship and innovation in Sub-Saharan Africa by providing incentives such as tax breaks for small businesses, investment in research and development, and access to funding for start-ups. By implementing these recommendations, it is possible for Sub-Saharan Africa governments to lower unemployment and promote sustainable economic growth, while handling natural resources efficiently.

Overall, effective policy design should be grounded in a more comprehensive understanding of the complex relationship between unemployment, economic growth and natural resources in Sub-Saharan Africa. By taking an integrated approach that accounts for the interconnectedness of these factors, policy makers can work to promote sustainable economic growth and job creation for the region while also protecting the environment and maintaining political stability.

5.4 Suggestion for future studies

This study was focused on their relationship between unemployment and economic growth in Sub-Saharan Africa with a focus on natural resource wealth with a period from 2005 - 2020. Other researcher can investigate on the determinants and causes of unemployment in Sub Saharan Africa. To keep lower unemployment rate and a sustainable economic growth some other scholar has to investigate on how to conserve natural resources. There is also need to investigate the strategies that can be used for economic growth and development. These future studies will help SSA countries to keep low unemployment rates and rising increase the rates of economic growth

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APPENDIX

APPENDIX 1 DESCRIPTIVE STATISTICS

	GDP	UNEMPLOYMENT	NATURAL_RESOURCES	LABOUR_FORCE_PARTICIPATION	INFLATION	SAVINGS	EXTERNAL_DEBT_STOCK
Mean	3.997921	6.902894	11.15439	68.46286	6.660154	16.06737	45.06640
Median	4.500000	4.693000	8.596219	71.45000	4.749067	14.39325	32.91526
Maximum	18.33320	29.22000	55.87479	90.34000	150.3227	60.49045	429.7383
Minimum	-36.39198	0.320000	0.001172	46.42000	-8.974740	-13.78090	3.895006
Std. Dev.	4.304264	6.245855	9.476480	11.19262	9.660805	12.99976	45.60509
Skewness	-2.491583	1.588485	1.699382	-0.162030	7.942811	0.919380	4.571995
Kurtosis	21.71150	4.953148	6.119288	2.223136	107.2585	4.363665	31.53982
Jarque-Bera	7483.424	277.5791	424.7444	14.14114	221980.1	104.5941	17925.26
Probability	0.000000	0.000000	0.000000	0.000850	0.000000	0.000000	0.000000
Sum	1915.004	3306.486	5342.953	32793.71	3190.214	7696.270	21586.81
Sum Sq. Dev.	8855.757	18647.12	42926.16	59881.31	44612.29	80779.05	994155.8
Observations	479	479	479	479	479	479	479

APPENDIX 2 : UNEMPLOYMENT BY YEAR

	UNEMPLOYMENT
Mean	6.895779
Std. Dev.	6.241279
Observations	480

APPENDIX 3: NATURAL RESOURCES BY YEARS

	NATURAL_RESOURCES
Mean	11.13537
Std. Dev.	9.475751
Observations	480

APPENDIX 4: OSL REGRESSION

Dependent Variable: GDP
Method: Panel Least Squares
Date: 03/09/23 Time: 20:36
Sample: 2005 2020
Periods included: 16
Cross-sections included: 30
Total panel (unbalanced) observations: 479

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.063251	1.583687	3.197129	0.0015
UNEMPLOYMENT	-0.206690	0.038487	-5.370321	0.0000
NATURAL_RESOURCES	0.018469	0.021748	0.849214	0.3962
LABOUR_FORCE_PARTICIPATI	0.001795	0.020059	0.089508	0.9287
INFLATION	-0.043037	0.019664	-2.188650	0.0291
SAVINGS	0.050547	0.017516	2.885813	0.0041
EXTERNAL_DEBT_STOCK	-0.010940	0.004166	-2.625844	0.0089
R-squared	0.109798	Mean dependent var	3.997921	
Adjusted R-squared	0.098482	S.D. dependent var	4.304264	
S.E. of regression	4.086825	Akaike info criterion	5.667920	
Sum squared resid	7883.410	Schwarz criterion	5.728884	
Log likelihood	-1350.467	Hannan-Quinn criter.	5.691886	
F-statistic	9.702824	Durbin-Watson stat	1.520277	
Prob(F-statistic)	0.000000			

APPENDIX 5: FIXED EFFECTS

Dependent Variable: GDP
Method: Panel Least Squares
Date: 05/01/23 Time: 12:32
Sample: 2005 2020
Periods included: 16
Cross-sections included: 30
Total panel (unbalanced) observations: 479

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.642710	6.532442	0.863798	0.3882
UNEMPLOYMENT	-0.502536	0.165086	-3.044096	0.0025
NATURAL_RESOURCES	0.094587	0.036663	2.579936	0.0102
LABOUR_FORCE_PARTICIPATI	0.004057	0.095442	0.042510	0.9661
INFLATION	-0.031253	0.024806	-1.259886	0.2084
SAVINGS	0.117530	0.037937	3.098038	0.0021
EXTERNAL_DEBT_STOCK	-0.026381	0.005828	-4.526320	0.0000

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.253567	Mean dependent var	3.997921
Adjusted R-squared	0.194594	S.D. dependent var	4.304264
S.E. of regression	3.862837	Akaike info criterion	5.612863
Sum squared resid	6610.230	Schwarz criterion	5.926394
Log likelihood	-1308.281	Hannan-Quinn criter.	5.736116
F-statistic	4.299693	Durbin-Watson stat	1.758086
Prob(F-statistic)	0.000000		

APPENDIX 6: RANDOM EFFECTS

Dependent Variable: GDP
Method: Panel EGLS (Cross-section random effects)
Date: 05/01/23 Time: 12:32
Sample: 2005 2020
Periods included: 16
Cross-sections included: 30
Total panel (unbalanced) observations: 479
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.401239	1.952966	2.765659	0.0059
UNEMPLOYMENT	-0.229385	0.046723	-4.909455	0.0000
NATURAL_RESOURCES	0.038547	0.024438	1.577361	0.1154
LABOUR_FORCE_PARTICIPAT				
I	-0.002515	0.024782	-0.101483	0.9192
INFLATION	-0.042660	0.020628	-2.068094	0.0392
SAVINGS	0.056956	0.020426	2.788346	0.0055
EXTERNAL_DEBT_STOCK	-0.015715	0.004486	-3.503364	0.0005

Effects Specification		S.D.	Rho
Cross-section random		0.866975	0.0480
Idiosyncratic random		3.862837	0.9520

Weighted Statistics			
R-squared	0.106224	Mean dependent var	2.976656
Adjusted R-squared	0.094862	S.D. dependent var	4.179054
S.E. of regression	3.975628	Sum squared resid	7460.252
F-statistic	9.349378	Durbin-Watson stat	1.595014
Prob(F-statistic)	0.000000		

Unweighted Statistics			
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R-squared	0.103994	Mean dependent var	3.997921
Sum squared resid	7934.812	Durbin-Watson stat	1.499620

APPENDIX 7: HAUSMAN TEST

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	33.988754	6	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var (Diff.)	Prob.
UNEMPLOYMENT	-0.502536	-0.229385	0.025070	0.0845
NATURAL_RESOURCES	0.094587	0.038547	0.000747	0.0403
LABOUR_FORCE_PARTICIPATI	0.004057	-0.002515	0.008495	0.9432
INFLATION	-0.031253	-0.042660	0.000190	0.4077
SAVINGS	0.117530	0.056956	0.001022	0.0581
EXTERNAL_DEBT_STOCK	-0.026381	-0.015715	0.000014	0.0042

Cross-section random effects test equation:

Dependent Variable: GDP

Method: Panel Least Squares

Date: 05/01/23 Time: 12:32

Sample: 2005 2020

Periods included: 16

Cross-sections included: 30

Total panel (unbalanced) observations: 479

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.642710	6.532442	0.863798	0.3882
UNEMPLOYMENT	-0.502536	0.165086	-3.044096	0.0025
NATURAL_RESOURCES	0.094587	0.036663	2.579936	0.0102
LABOUR_FORCE_PARTICIPATI	0.004057	0.095442	0.042510	0.9661
INFLATION	-0.031253	0.024806	-1.259886	0.2084
SAVINGS	0.117530	0.037937	3.098038	0.0021
EXTERNAL_DEBT_STOCK	-0.026381	0.005828	-4.526320	0.0000

Effects Specification

Cross-section fixed (dummy variables)			
R-squared	0.253567	Mean dependent var	3.997921
Adjusted R-squared	0.194594	S.D. dependent var	4.304264
S.E. of regression	3.862837	Akaike info criterion	5.612863
Sum squared resid	6610.230	Schwarz criterion	5.926394
Log likelihood	-1308.281	Hannan-Quinn criter.	5.736116
F-statistic	4.299693	Durbin-Watson stat	1.758086
Prob(F-statistic)	0.000000		

APPENDIX 8: OLS REGRESSION with the interaction term (UNR), GDP= B0+B1UR+B2UNEMPLOYMENT+B3NATURAL RESOURCES+B4X

Table 2 shows the regression results with the interaction term (UR) to test if Natural resource wealth is an intermediating variable, so as to investigate the robust effect of Unemployment on economic growth in Sub-Saharan African countries specified.

Dependent Variable: GDP
Method: Panel Least Squares
Date: 03/09/23 Time: 20:43
Sample: 2005 2020
Periods included: 16
Cross-sections included: 30
Total panel (unbalanced) observations: 479

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.991753	1.580524	3.158291	0.0017
UNR	0.005598	0.003132	-1.787398	0.0745
UNEMPLOYMENT	-0.162630	0.045630	-3.564126	0.0004
NATURAL_RESOURCES	0.061406	0.032371	1.896969	0.0584
LABOUR_FORCE_PARTICIPATI	-0.004308	0.020302	-0.212198	0.8320
INFLATION	-0.046355	0.019706	-2.352327	0.0191
EXTERNAL_DEBT_STOCK	-0.010659	0.004160	-2.562386	0.0107
SAVINGS	0.059936	0.018248	3.284594	0.0011
R-squared	0.115796	Mean dependent var	3.997921	
Adjusted R-squared	0.102655	S.D. dependent var	4.304264	
S.E. of regression	4.077356	Akaike info criterion	5.665335	
Sum squared resid	7830.297	Schwarz criterion	5.735009	
Log likelihood	-1348.848	Hannan-Quinn criter.	5.692725	
F-statistic	8.811777	Durbin-Watson stat	1.529192	
Prob(F-statistic)	0.000000			

APPENDIX 9: FIXED EFFECTS WITH INTERACTION TERM

Dependent Variable: GDP
Method: Panel Least Squares
Date: 05/01/23 Time: 12:46
Sample: 2005 2020
Periods included: 16
Cross-sections included: 30
Total panel (unbalanced) observations: 479

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.472072	6.555634	1.444875	0.1492
UNR	0.019551	0.005786	-3.379255	0.0008
UNEMPLOYMENT	-0.357424	0.168734	-2.118277	0.0347
NATURAL_RESOURCES	0.251510	0.058904	4.269839	0.0000
LABOUR_FORCE_PARTICIPATI	-0.066231	0.096605	-0.685585	0.4933
INFLATION	-0.030774	0.024520	-1.255083	0.2101
SAVINGS	0.107270	0.037621	2.851313	0.0046
EXTERNAL_DEBT_STOCK	-0.028334	0.005790	-4.893583	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.272366	Mean dependent var	3.997921
Adjusted R-squared	0.213102	S.D. dependent var	4.304264
S.E. of regression	3.818196	Akaike info criterion	5.591531
Sum squared resid	6443.751	Schwarz criterion	5.913771
Log likelihood	-1302.172	Hannan-Quinn criter.	5.718208
F-statistic	4.595782	Durbin-Watson stat	1.817312
Prob(F-statistic)	0.000000		