Three Essays on the Effects of Natural Resources Rents, Institutions and Demographic Factors on Economic Growth

A Thesis Submitted to the University of Strathclyde for the Award of the Degree of

Doctor of Philosophy in Economics

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Declaration of Authentication and Copyright

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Student Signature with Date . . . .

First Supervisor : Professor Roger Perman with Date............................

Second Supervisor: Dr. Nikolaos Danias with Date.................................

Acknowledgement

Dedication

This thesis is dedicated to:

The Trinity

For His abundance grace upon me from the beginning of my academic career to the present level and His kindness in seeing me through the PhD Economics program.

Mr Moses Ajayi (Late) and Mrs Dorcas Tolabo Ajayi (Late)

My beloved parents who gave birth to me, gave me sound education to first degree level. For their love and care, parental counsel and industrious spirit.

Bliss Ayomifolarin Ajayi

My lovely son whose birth coincide with my relocation to the United Kingdom for the PhD Economics program.

Organization of the thesis

This thesis- 'Three Essays on the Effects of Natural Resources Rents, Institutions and Demographic Factors on Economic Growth' is set out as follows: Chapter one is the introduction to the thesis in pages 10 to 16, next are the three substantive papers, with Chapter Two on the empirical investigation of oil rents, institutions and diversification as determinants of economic growth in Nigeria within the pages 17 to 74. The next Chapter (Three), examines the effects of oil rents and institutions as determinants of OPEC economic growth in pages 75 to 121. The fourth chapter is an empirical essay on the impacts of demographic indicators, political institutions and natural resource rents on economic growth from pages 122 to 173. The last chapter (Chapter 5) is the concluding segment of the thesis which entails the critical findings of this thesis, research plans for the future and some sort of policy recommendations to draw the thesis paper to a close in pages 174 to 179.

List of Abbreviations

GRO Per capita real GDP growth rate

REN Oil rents or total natural resource rents as a percentage of GDP

DEM Democratic institution quality

BGT Budgetary institution quality

POI Political right institution quality

GEFI Government effectiveness institution quality

ACOI Anti-corruption institution quality

LEGI Legal institution quality

AGV Agriculture-led diversification proxy by food export

HEA Health of the population proxy by mortality rate per 1000 population

EXR Official real exchange rate to US dollar

VGS Gross savings as a percentage of GDP

WERO OPEC oligopoly power proxy

POPS Total population size

POPG Population growth rate

MIGR International migration rate

DTM Demographic transition model

EDUC Educational attainment

LIFE Life expectancy at birth

CPL Volume of daily crude oil produced

FUE Fuel subsidy regime of the Nigerian government (proxy)

PRIC Spot price of crude oil

RESE Volume of crude oil reserve

NNPC Nigeria National Petroleum Corporation

CBN Central Bank of Nigeria Statistical Bulletin

IMF International Monetary Fund

NNDC Niger Delta Development Commission

ICPC The Independent Corrupt Practices Commission

INEC Independent National Electoral Commission

OPEC Organization of Petroleum Exporting Countries

BP British Petroleum

EFCC Economic and Financial Crime Commission

GETS General-to-Specific (GETS) model selection

GMM Generalised methods of moment

UNESCO United Nations Education, Scientific and Cultural Organization

Publication from the Thesis

Below is the title of the publication from this thesis in a peer-reviewed journal :

[**1**].'Did Diversification Impact Economic Growth in Nigeria in the Last 20 Years of Democratic Government (1999–2019)? A Vector Error Correction Model'. Published in Journal of Economic and Sustainable Development; November, 2020. DOI: 10.7176/JESD/11-22-02.

Abstract

This thesis consists of three distinct but interrelated essays on the implications of resources rents, institutions and demographic indicators for economic growth. Chapter two utilises time-series data to investigate the impacts of oil rents, institutions, and diversification on the Nigerian economy's growth. Chapter three applies panel data to determine the effects of oil rents and institutions on OPEC economies' growth. Chapter four uses extensive panel data of 216 economies and extends our study to consider the implications of demographic factors, political institutions, and natural resource rents on economic growth. Given the potential for endogeneity in regression analysis of the drivers of growth, we draw our main results from estimators that consider possible endogeneity. For the Nigerian economy, oil rents positively impact economic growth, contingent on good institutions. Our findings suggest that the quality of democratic institutions in Nigeria is significant for economic growth. Diversification of the economy also shows a positive effect on growth. For the OPEC economies, oil rents have negative implications for its economic growth. We find empirical evidence that institutional qualities: the legal, anti-corruption and government effectiveness qualities positively impact OPEC economic growth. Chapter four shows that the population size and growth rate have an asymmetric impact on economic growth. This thesis contributes to the literature by developing varying institutional qualities for Nigeria and OPEC. Furthermore, we develop a model for the OPEC oligopoly power and demonstrates that countries' population growth rates and size are crucial drivers of growth. We observe that whilst democracy promotes economic growth; it does not necessarily follow that those states that are not democratising will lag in growth. The main conclusions of the thesis are that the existence of strong institutions is crucial for resource-producing countries. Demographic factors are significant for growth, and diversification of the economy is vital for economic growth.

'.........The World can, in effect get along without natural resources, so exhaustion is just an event, not a catastrophe.'

-Professor Robert Solow (1974). Culled from the paper titled *Economics of Resources* presented at the 86th Annual Meeting of the American Economic Association and published in American Economic Review(1974)

'Economic institutions shape economic incentives: the incentives to become educated, to save and invest, to innovate and adopt new technologies, and so on. It is the political process that determines what economic institutions people live under, and it is the political institutions that determine how this process works.'

- Acemoglu, D. and Robinson, J. (2012). - 'Why Nations Fail : The Origin of Power, Prosperity and Poverty'.

Chapter One: General Thesis Introduction

The oil sector is one of the foremost areas of research in economic literature, given the central role of oil in the global economy. The axiom that the *crude oil economy dictates the pace of the world economy* is probably a justification for the growing interest of researchers in the empirical studies on the oil sector. Substantial evidence exists within the literature for various theories as to the relationship arising between oil rents and economic growth. One prominent position asserts the favourable impact of oil rents on economic growth and development, notably in the advanced industrialised oil-producing economies, namely the USA, UK, Norway, Netherlands, Saudi Arabia and the United Arab Emirates, to mention but a few. On the opposing front, an alternative perspective aligns with the position favoured by Sachs and Warners (1999) and supports the resource curse hypothesis, also known as the Dutch disease, notably in relation to most of the developing oil-producing countries like Nigeria, Venezuela, Angola, Libya, and the Congo. Other notable characteristic of resource curse includes , the exchange rate volatility, oil-induced conflicts and wars, the potential crowd-out effect on education (amongst others) because some developing resource producing economies may neglect education development or see no justification for it. Many of these conditions permeates most of the developing oil producing states as observe in economic literature.

The natural assumption about an oil-producing economy is that the availability of a resource like oil will automatically spur economic growth. That assumption may be partly correct for the advanced oil-producing economies mentioned above but, in the context of developing oil-producing economies, the objective of 'oil rents for economic growth' appears to have been elusive in the past decades. That observation led economic thinkers to search for a new response to oil sector induced challenges, and it gave birth to the notion of institutional effects upon economic growth. By implication, institutional changes are a necessary condition for economic growth within an oil-producing economy, in addition to oil rents as derivatives of natural resources. To the institutional theorists, oil rents are neither a necessary, nor a suffi-

cient condition for long-term economic growth, all thing the same. An extensive justification of this position abounds in the literature, given the perennial challenges associated with oil price volatility and the instability in the global oil sector (Acemoglu and Robinson, 2012). This is often caused by factors exogenous to oil-producing cartels like OPEC, notably the development of the shale oil industry in the US and the rise in renewable energy sources. This thesis covers all of the above issues, and seeks to contribute to and expand the horizons of the literature in three inter-related but distinct chapters.

In Chapter Two, we explore the implications of oil rents, diversification and institutional qualities for the economic growth of Nigeria. The choice of the Nigerian economy is strategic. The country is the largest economy in Sub-Saharan Africa and one of the largest oil producers in the world, facing myriad economic challenges. Some analysts have referenced the Nigerian economy as a classic example of a resource curse economy (Sala-i-Martin and Subramanian, 2013) and, therefore, it is necessary to examine this assertion empirically to determine the impact of oil rents on the economy. Nigeria is characterised by weak institutions as posited in the literature (Acemoglu and Robinson, 2012), although institutional qualities are crucial to the growth of an economy. In the light of this, the second chapter of the thesis considers the quality of institutions in Nigeria by differentiating between political and economic institutions. We examine how political and economic institutions are evaluated and discuss the various forms of institutional qualities within Nigeria. In seeking to make a valuable contribution to the literature, we identify institutional qualities, which are numerous and subjective. Among the areas of focus are budgetary and fiscal planning. Political and economic institutions are linked; therefore, we hope to develop a set of economic indicators as proxies for institutional qualities. The Nigerian economy has remained largely underdeveloped, despite the enormous contribution of oil rents to total government income, with an approximate value of 80%. Factors constraining Nigerian growth include weak institutions, corruption, illiteracy, poor infrastructure, flawed policy formulation and implementation, and oil sector induced economic challenges. The combination of all of the above means that the large volume of oil rents available to the Nigerian states between 1967 and 2017 has not been reflected in the level of economic growth, unlike the experience of other developed oil-producing countries.

As a corollary of the above, successive governments have sought to diversify the Nigerian economy from *oil-dominated economy*. The agricultural sector used to be the primary source of government revenue before the discovery of oil in Nigeria in 1956. In Chapter Two, we explore the impact of diversification in conjunction with oil rents and institutional qualities, seeking possible approaches to the problems besetting the Nigerian economy. Significantly, diversification should not be limited to a single sector, as other economic sub-sectors like manufacturing

are also crucial. Given our aim to align the findings of the chapter with the economic policy direction of the present government in Nigeria, we focus our empirical searchlight on diversification primarily through the agricultural sector. The current government has given agriculture a special place in its economic policies, reflecting the sector's positive historical contribution to the Nigerian economy before the discovery of oil in 1956.

The consensus in the research community is that research is an ongoing process building sustained improvement. Therefore, we explore relevant theories and empirical studies in conducting a literature review. Economic literature underscores that there is no universally acceptable conclusion about the implications of oil rents for economic growth; nor indeed for the impact of institutional qualities on growth. Therefore, we shall consider a range of theoretical and empirical positions on the effects of oil rents and institutional qualities on Nigeria's growth. Given the subjectivity and problems associated with institutional qualities in the literature, we shall consider some of the limitations of institutional metrics. Substantial evidence in the literature demonstrates that institutional qualities and their assessment are likely to be controversial, but they are essential for long-term economic growth (Seale,2005; Stefan,2013). More importantly, in the context of Nigeria, institutional qualities are likely to be the determining factor for the country's low economic growth. Although there is extensive literature on the implications of oil rents for Nigeria's economic growth, gaps exist in the literature which our thesis seeks to fill. There is, for example, a lack of research into the impact of both institutional qualities and oil rents as co-determinants of economic growth. Chapter Two seeks to address such gaps. There is substantial evidence that the quality of institutions strongly impacts how oil-producing countries manage the rents from oil. Countries like Norway, for instance, have institutions specifically for the effective management of oil rents. The existence of a robust Sovereign Wealth Fund is likely to have made a difference for Norway as compared with Nigeria, and hence our intention to consider institutional qualities as co-determinants of economic growth.

For the analysis of the econometric work for Chapter Two, we begin with the application of an ordinary least squares regression as our preliminary estimation procedure, to guide the choice of explanatory variables and specification tests. The OLS procedure involves estimation of the effects of our explanatory variables, which include oil rents as a percentage of GDP, institutional qualities, a diversification proxy and an economic growth (lag one) proxy by per capita growth rate of real GDP. Economic literature demonstrates that the discussion of endogeneity concerns is imperative to drawing valid inferences from empirical work (Baltagi,2013). The OLS estimator is prone to endogeneity risks which could lead to biased estimates. In an attempt to address the challenges of endogeneity, we shall introduce a more sophisticated esti-

mator, specifically the instrumental variable approach (the consistent estimator). We identify potential endogenous variable(s), and determine the choice of instruments through statistical procedures and evaluation. Because of the importance of long-run equilibrium in economics, we derive a long-run equilibrium solution using the instrumental variable marginal or partial effects. The findings from our empirical work then determine a set of specific recommendations to the Nigerian government and other agencies on priority areas for the utilisation of rents from oil. The observed effects of oil rents on economic growth may be unclear, perhaps offering no precise conclusions about the relationship. To determine the efficacy of our proposition, we expand our research enquiry to the *loose cartel* formally known as OPEC, which comprises 14 oil-producing countries (in 2017): Algeria, Angola, Congo, Equatorial Guinea, Gabon, Qatar, Iran, Iraq, Kuwait, Libya, Nigeria, Saudi Arabia, United Arab Emirates and Venezuela.

In Chapter Three, we examine the effects of oil rents and institutions on the economic growth of OPEC economies. Economic scholars have posited that OPEC economies have disparate economies with varied economic history, political systems, foreign policies and domestic affairs. The combination of all of the above probably has implications for the impact of oil rents on economic growth. Evidence in the literature shows that whilst some OPEC economies have done well in using oil rents to promote economic growth, others have fared less well. OPEC controls about 41% of global oil production, and it could be argued that OPEC should have some form of control to stabilise prices in the international oil market. We review this question in Chapter Three, by modelling a proxy variable for OPEC oligopoly power. We seek to evaluate the strength of OPEC, given the evidence in the literature that OPEC is fast losing its control of the global crude oil market (Colgan,2014; Kaufmann et al.,2004). Amongst factors responsible for this erosion of OPEC power are the advent of shale oil, an increase in the supply of crude oil from non-OPEC members and perennial instabilities in the oil price regime. Furthermore, exogenous factors like the impact of the COVID-19 pandemic on the global economy and the gradual shift of the world to alternative sources of energy like renewables have led to myriad challenges to OPEC's economic growth.

To expand our assessment of the effects of institutional qualities in Chapter Three, we also incorporate legal and anti-corruption aspects of institutional qualities. Previous research on OPEC economies has mostly focused on political and economic institutions. This thesis aims to fill a research gap by expanding study of institutional qualities in OPEC into other segments so as to contribute new insights to the literature in this regard. There is a substantial body of literature which supports the proposition that democratic institutions foster economic growth. However, a new body of empirical work has emerged more recently demonstrating that democracy as practised in the newly democratised developing states is *elitist* in its approach. The

logic, by implication, is that while democratic government may be useful for economic growth, it does not necessarily follow that non-democratic states automatically lag in economic growth. To examine the validity of this position, we explore the trajectory of economic growth of the *rentier states* in OPEC, notably, Saudi Arabia and the United Arab Emirates. By international institutional standards, neither country has democratic institutions; yet the effectiveness of their government institutions may have played a significant role in their economic growth record. Both economies placed substantial emphasis on good oil rents management and the diversification of such rents into other sectors such as tourism. For instance, the tourism sector has continued to promote their economies in contrast to other *pseudo-democratic* states in OPEC, such as Nigeria, Venezuela, Angola, Libya, Congo and Iraq. Therefore, we plan to draw relevant support from the experience of the *rentier states* about the strengths of democratic institutions in an economy. There is substantial evidence in the literature that for oil-producing countries to realise maximum rents from the oil sector and safeguard private property rights, and thus laws that promote private enterprise and curb corrupt tendencies like rent-seeking are necessary (Ostrom,1990; Kaufmann et al.,2008; Voigt,2012; La Porta et al.,2008). One of the apparent gaps observed in the literature on OPEC economies is the near-absence of legal institutions as co-determinants of economic growth in OPEC. Hence, a proxy variable is developed to represent the quality of legal institutions in OPEC economies and observe its effects on the economic growth of OPEC.

Regarding theoretical literature, we review oligopoly theory and observe how OPEC operations fit into it. Oligopoly refers to a market wherein a few producers or sellers of similar products sometimes collude to fix or regulate prices to the advantage of members. Substantial empirical debate exists in the literature as to the oligopolistic behaviour of OPEC, and suggesting that Saudi-Arabia, the *de facto* leader of OPEC, is in effect the Stackelberg leader of OPEC, with other members playing the role of followers (Lewis and Schmalensee,1980; Huppmann,2013; Okullo and Reynès,2016). We also explore pricing theory, given that oil price instabilities constitute one of the most critical features of the history of OPEC. Empirical evidence in the literature suggests that OPEC is a *loose cartel* given its waning control of the global oil market. Therefore we examine pricing theory, because the fundamental cause of the decline in the OPEC control of the worldwide oil market is its inability to stabilise or influence oil prices. In the light of potent market forces occasioned by an excess supply of crude oil, together with exogenous factors such as the COVID-19 pandemic, exploration of pricing theory becomes a vital segment of OPEC economics theory. The determination of the oil price in OPEC goes beyond the market mechanism because of the influence of other extraneous factors that shape oil prices on the international market. Therefore, it is appropriate to include an exploration of price theory in Chapter Three.

Panel data on the 14 OPEC countries is used in the second half of the chapter to develop the econometric methods necessary for our empirical work. Empirical literature shows that the choice of relevant explanatory variables is crucial to the formulation of an econometric model. Therefore pooled OLS is used as a preliminary estimator to determine the choice of relevant explanatory variables and the required specification tests. OPEC's 14 member countries have various inter-country differences, formally known as the heterogeneity condition. Because of this, a fixed effects estimator or Random effect model (conditioned upon the Hausmann specification test) would be introduced since the pooled OLS does not account for the heterogeneity condition. Evidence in the literature shows that addressing endogeneity concerns is also vital to drawing a valid empirical conclusion. The fixed effect estimator addresses the shortcoming of the pooled OLS. However, with the potential for endogeneity bias, an advanced econometric method is required. The application of institutional qualities and disparities in the measurement of oil rents among the 14 OPEC economies could lead to an endogeneity problem. Therefore, a method such as the panel instrumental variable, otherwise known as the Anderson Hsiao Instrumental Variable, may be necessary. Findings are drawn from the consistent estimator applied, and then vital policy implications of such results are derived for OPEC and interested agencies, both public and private.

One of the underlying assumptions regarding OPEC is that demographic indicators are likely to have some influence on economic growth. However, such indicators influence both OPEC and non-OPEC economies. Therefore, our research enquiry is extended in Chapter Four, widening the scope of our coverage to include non-OPEC economies.

In Chapter Four, we pursue practical answers to the impact of demographic indicators, natural resources rents and political institutions on economic growth, with a panel data set of 216 countries. While Chapters Two and Three concern the oil sector (oil rents and economic growth with institutional qualities), we seek to extend our debate about the impact of natural resources like oil on economic growth to encompass all natural resources (solid and non-solid minerals), and perhaps all known resources. Not all countries in the world produce oil. However, each economy probably has one or more natural resource other than oil. Therefore, it is essential to observe the implications of other notable resources such as gold, diamond, cobalt, uranium, and copper. Evidence in the literature suggests that political institutions provide a superstructure for other institutional qualities in society. Therefore, Chapter Four focuses on the impact of political institutions on economic growth.

This thesis covers new ground in Chapter Four by examining two demographic indicators (population growth rate and population size) as co-determinants of economic growth, whereas past

work has focused principally on the population growth rate. Substantial empirical work asserts that size matters for economic growth in the long run. We frame the theoretical perspective of Chapter Four in terms of optimum population theory and a modified version of the demographic transition model. Population theories generate intense controversy. However, the consensus in the literature is that there must be a rate of population growth that maximises output within an economy. This is what the optimum population doctrine represents.

In the second part of Chapter Four, we present the econometric methods and explore the potential endogeneity problem with our regression model. The Hausmann specification test determines our choice between the fixed effect and random effect estimators and enhances the various specification tests for our model. In tackling the endogeneity problem, the focus is on the measurement and application of political institutions; and the estimation of natural resource rents which could be susceptible to measurement error and reverse causation. The application of a generalised method of moments is useful in this regard. The marginal coefficients of our parameters and the long-run equilibrium solution of the consistent estimator, such as the system GMM, are used to discuss our findings in Chapter Four. The results inform the policy implications of the chapter and shape our recommendations to national and international agencies and government. Chapter Five summarises the conclusions of the thesis and outlines potential avenues for future research .

Chapter Two: An Empirical Investigation of the Effects of Oil Rents, Institutions and Diversification as Determinants of Economic Growth in Nigeria

2.1   The background of the study and motivation

The debate about oil rents and economic growth is arguably the dominant economic question of Nigeria's history. Nigeria is the 13th largest oil producer in the world and the leading producer in Africa with an estimated output of 1.9 million barrels per day. Crude oil reserves in Nigeria are the 10th largest in the world and the 2nd largest in Africa (US Energy Information Administration, 2019). Nigeria is also a member of the Organisation of Petroleum Exporting Countries (OPEC), and a member of the Qatar-based Gas Exporting Forum. With a population of 201 million, it is the most populous country in Africa and the seventh most populous country in the world (IMF-World Economic Outlook, 2019). With a rebased [1] GDP value of $460.5 billion (constant 2010 US dollars) in 2017, it is the largest economy in Africa (World Bank's World Development Indicators, 2019). The oil sector employs less than 1% of Nigeria's labour force (Central Bank of Nigeria Statistical Bulletin, 2018).

The discovery of oil in 1956 marked a turning point in the Nigeria's economic history. The oil boom of the 1970s caused the neglect of the agriculture sector, the mainstay of the economy

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[1] The Nigerian government rebased GDP in 2014 with a significant change in the way that GDP is estimated. Before April 2014, there was an exclusion of specific economic subsectors or industries including telecoms, information technology, the music industry (Nollywood), online sales, airlines and film production companies in the computation of GDP. From April 2014, the National Bureau of Statistics as empowered by the Federal government included the industries mentioned above in the computation of the GDP figures. The change in GDP estimation gave birth to the concept of a rebased GDP figure which made the Nigerian economy to become the largest economy in Africa and displacing South Africa from number one position. Nigeria firstly computes GDP data through the National Bureau of Statistics. However, there are several secondary sources such as the Central Bank of Nigeria, World Bank, IMF and Penn World Tables to mention a few. The secondary GDP data for this study is sourced mainly from the World Bank Development Indicators (2019). The World Bank's GDP data set gives full coverage of our study period (1967-2017), unlike the IMF GDP data set which only has data beginning from 1980. To avoid data loss, we have employed the World Bank's GDP data for the practical tasks of this study.

in the pre-oil era (Odularu, 2010: 4). According to Chigbu (2005:1), the agriculture sector contributed over 80% of the export earnings before oil, about 65% of GDP and more than 50% of employment. Although oil rents have been a key determinant of the Nigerian economy following the discovery of oil, the average ratio of oil rents to GDP between 1967 and 2017 was less than 50% . Furthermore, the trends in the growth of the economy partly follow the trends in oil rents, which endorses the perception that the Nigerian economy is wholly an oil domi-nated economy. Oil production [2] has consistently increased (though with phases of instability). By 2017 Nigeria produced an average of 1.9 million barrels of crude oil daily (BP Statistical Review of World Energy, 2019) but the ratio of oil rents to GDP has fluctuated, reflecting the instabilities in the oil price regime on the international market.

The increase in the oil production created new wealth and the simultaneous decline in other economic sectors. It has fuelled unprecedented migration into the cities as people seek better opportunities, and consequently this has led to poverty occasioned by the mismanagement of oil rents and corruption, notably during the period of military government. Following the increase in oil production and the exposure to international pressures associated with oil, the Nigerian economy began to reflect the various phases of the international oil market.

FIGURE I: TIME SERIES CHART FOR NIGERIA REAL GDP PER CAPITA GROWTH & OIL RENTS SHARE OF GDP:1967-2017
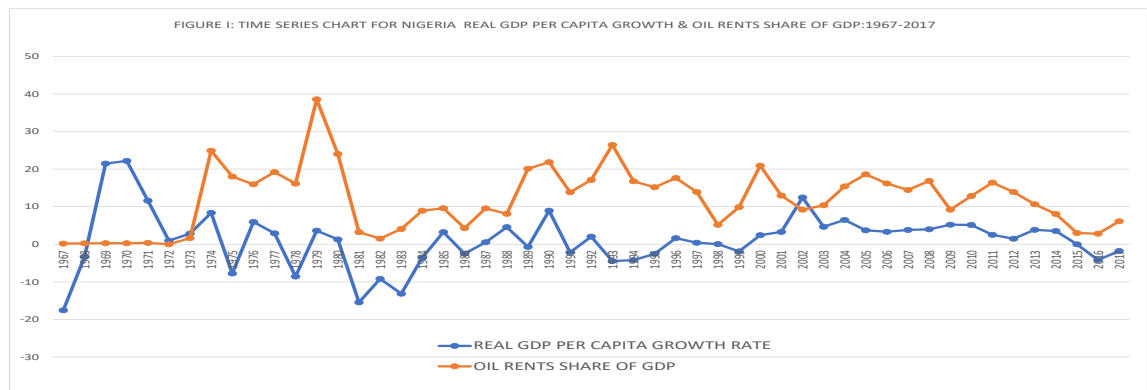
Source: Author's Computation with data from World Bank Development Indicators (2019).
*Real GDP per capita growth is the annual percentage change in the real GDP per capita of Nigeria.
*Oil Rents share of GDP is the percentage share of the contributions of oil rents in the Nigeria real GDP.

Figure 2.1:   Share of oil rents in GDP and Per Capita real GDP growth of Nigeria

A brief look at Figure 2.1 shows fluctuations in the trends of oil rents share of GDP, influ-enced primarily by external factors. For instance, the Arab-Israeli uprising between 1973 and 1974 contributed to a rapid increase in oil rents during the period. Demand and the price of

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[2]See Table 5.7 in the Appendix for the volume of daily crude oil produced from 1967 to 2017

crude oil rose to a new height following the oil embargo imposed on some economies. Nigeria's real GDP per capita grew by 0.9% in 1972, to 2.9% in 1973 to a new height of 8.4% in 1974 due to the unprecedented increase in oil rents of the period.

Another notable feature in the historical trends of Nigeria's real GDP per capita was the increase in the oil rents caused by the Iran-Iraq war of 1980. In Figure 2.1, we observe that the real GDP per capita growth rate was 3.6% in 1979 and declined to 1.3% in 1980, given the instability in oil rents as demonstrated in the chart. The Gulf war of the 1990s also had a dramatic impact on the country's oil rents, as reflected in the growth rate of the GDP per capita (see Figure 2.1).The global economic recession between 2007 and 2008 caused the last significant fluctuation in the contribution of oil rents to total government revenue. The recession, accompanied by the decline in the oil price, had a significant negative impact on the growth rate of real GDP per capita, as shown in Figure 2.1. While per capita GDP growth has shown a marginal improvement from 2010 with about 5.1% growth rate, unfortunately, the growth rate was negative from 2015 to 2017; with -0.03 for 2015, - 4.2 for 2016 and -1.8 for 2017 respectively. The growth rate of the Nigerian economy is probably a reflection of the level of oil rents.The sustained growth rate in the contribution of oil rents to the total government revenue has continued despite periods of oil price instability within the period of study. The transmission of oil rents to economic growth indices may not be entirely as suggested by empirical evidence.

Figure 2.2: Percentage contribution of oil rents to the Nigerian total government revenue
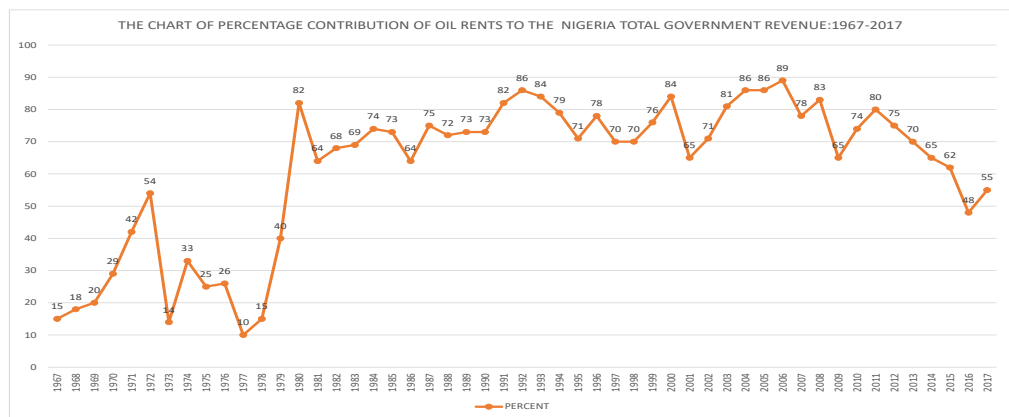
Source: Author's Computation with data from World Bank's World Development Indicators (2019).
*Percentage contribution of oil rents to the Nigeria total government revenue is the annual percentage share of oil rents in the government total revenue.

As observe in Figure 2.2, the huge impact of oil rents on government revenue supersedes other sources of government revenue. Also, the fragile nature of diversification of the economy

has proved to be a strong justification for the dominance of oil rents as a significant source of government revenue. Budgetary allocations are primarily dependent on oil rents. For instance, the contribution of oil rents to total government revenue in 1967 was 15% but by 1980 this had climbed to 82%, and in 1992 they accounted for 86%..

Whilst oil rents have continued to flow, that flow has not translated into economic growth. For example, the illiteracy[3] rate measured by the number of the population without secondary school attainment and the out-of-school population in Nigeria, is one of the highest in the world. Although oil rents have contributed substantially to total government revenue and GDP ratio within the period of study, the growth rate of the Nigerian economy has not fully reflected the impact of oil rents.

Fluctuations in the oil price have implications for the Nigerian economy, as observed from the trends in the ratio of oil rents to GDP. Figure 2.3 below shows the relationship between oil prices and real GDP per capita (at constant 2010 US dollars). An increase in the price of oil, holding all other factors constant, is likely to increase oil rents. Moreover, changes in oil prices impact the real GDP per capita (constant 2010 US$). The regulation of oil price is beyond the control of the Nigerian economy. For example, the price war between the *de facto* leader of OPEC, Saudi Arabia and Russia in March 2020 led to an immediate decline in the oil price to an average of $35.71 per barrel according to OPEC daily price watch of March 10th 2020. Variations in the price of oil are likely to have far-reaching effects on the volume of oil rents and on the Nigerian economy. According to Sala-i-Martin and Subramanian (2012: 570–615), natural resources like oil expose economies to various shocks such as oil price volatility and impacts commodity prices, which ultimately hinders economic growth.

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[3]The illiteracy rate measurement is derived from the index of the World Bank Development Indicators and UNESCO's guide for literacy campaign. Empirical evidence suggests that the number of out-of-school children in Nigeria, mostly in the northern part, is one of the highest in the world. Illiteracy, by definition, is simply the inability to read and write. The average number of pupils who can read and write in the public primary school is notably low, particularly in the northern part of Nigeria. Whilst there are other indicators of the literacy rate, this study assumes that the population without secondary school education and the number of out-of-school children better reflect the illiteracy rate in Nigeria. The challenge of the 'Almajiri' in the northern part of the country is one of the greatest threats to the literacy campaign. The 'Almajiri' system is part of the Islamic belief system, located predominantly in the northern part of Nigeria, whereby thousands of children of school age beg for alms in the streets and partake only in quranic recitation with no formal schooling.

Figure 2.3: Spot price of crude oil and Nigeria's real GDP per capital (Constant 2010 US$)
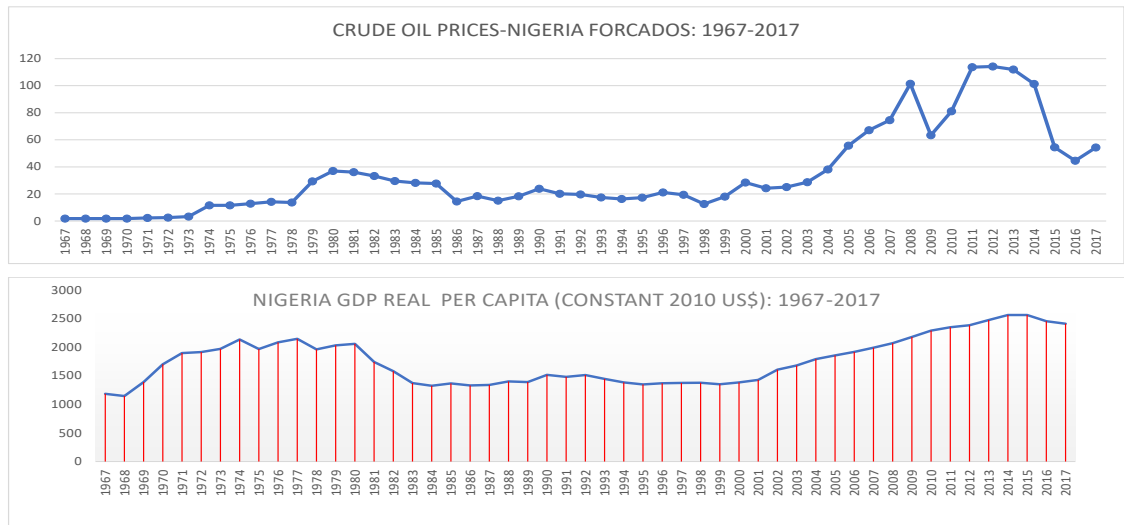
Given the cumulative effect of the economic challenges in Nigeria, evidence in the literature suggests that the determinants of economic growth in Nigeria extend beyond oil rents into other essential factors, especially the institutional framework. Because of the above, economic scholars have argued that oil rents are an essential segment of the Nigerian economy. However, whether oil rents are used effectively for economic growth depends in part on the existence of strong institutions. Therefore, a more in-depth investigation into the linkage between oil rents and economic growth is necessary, especially in the Nigerian context (Salai-i-Martin and Subramanian, 2013). Mehlum et al. (2006: 1–20) and Acemoglu (2015: 301–312) have argued that good institutions are growth drivers in an economy. Good institutions constitute some of the necessities for economic growth in the New Institutional Economics literature. Institutions such as good governance, economic freedom, ease of doing business, private property rights, and budgetary institutions with strong fiscal management are amongst the fundamentals for economic growth, according to the World Bank's World Development Report (2002: 1-12) titled *Building Institutions for Markets.*

Whilst there is a large body of empirical work concerning oil rents and economic growth in Nigeria (Iledare et al., 2018; Akinlo, 2012; Ogbonna and Ebimobowei, 2012), a notable gap in most of these previous works is the near-absence of the role of institutions as a critical deter-

minant of economic growth. The measurement of institutions poses tremendous challenges in economic research, as argued by Stefan (2019) and Searle (2005). Stefan (2019), for instance, contends that there is no universally accepted definition of an institution and that the economic literature has not been able to solve the difficulties associated with institutional measurement. These measurement problems have probably contributed to the scarcity of previous work on the impact of institutions and oil rents as co-determinants of economic growth in Nigeria. The IMF (2003) report on *Institutions and Economic Growth* underlined measurement challenges associated with institutions but concluded that, despite these problems, institutions are a crucial determinant of economic growth. Therefore, this thesis sets out to fill the gaps identified in the literature .

The motivation for the study : Oil is a global commodity: used in power generation, cooking, manufacturing, and aviation. Oil thus cuts across every stratum of society. The assumption is that an oil-producing country is likely to benefit from the vast returns from crude oil sales on the international market in the form of oil rents, technological innovation, the openness of the economy, transfer of knowledge and possibly economic growth. This chapter's primary concern is to consider the beneficial or adverse effect of oil rents on Nigeria economic growth. Subramanian and Sala-i Martin (2013: 570 - 615) contend that the Nigerian economy exhibits some characteristic features of a resource-curse economy and scholars have subjected this claim to empirical tests. However, the outcome remains a subject of debate in the literature. In order to validate the assertion, it is necessary to determine the effects of oil rents on growth while controlling for other relevant factors. The second focus of this chapter is to investigate the validity of the assertion that oil rents impede long-term economic growth.

In some ways, oil rents may have contributed to the growth of some other oil-producing economies, notably Norway, Saudi Arabia, United Arab Emirates, UK and the US. For Nigeria however, the available growth metrics indicate that the economy has not done as well as the above-mentioned economies and her poverty rates remain amongst the highest in the world. Some analysts have argued that weak institutions are partly responsible for the failure to use oil rents in a way that would foster long-term economic growth. If good institutions complement oil rents as determinants of economic growth, what constitutes such institutions and how are their qualities measured? This is another concern here, because addressing the problem of measurement associated with institutional quality may reveal the solution to Nigeria's growth challenges, *ceteris paribus*.

Finally, while the Nigerian economy has thrust sectors other than oil into the background, is there an alternative trajectory, given the uncertain future of oil in the global economy? This

chapter also seeks to determine whether diversification is possible, in the light of the instability of oil rents within the period of study. These are the primary reasons for our research interest, with the objectives of the thesis stated below.

The rest of the chapter is arranged as follows: Section 2.2 outlines the research objectives; Section 2.3 analyses the main contributions of the chapter to the literature; Section 2.4 pinpoints the conceptual meaning of economic growth; Section 2.5 discusses the institutions and the Nigerian economy; Section 2.6 reviews related literature; Section 2.7 concerns the nature and sources of data; Section 2.8 describes the research method, estimation techniques, discusses endogeneity issues, presents the empirical results and diagnostic tests; Section 2.9 contains the discussion of findings; Section 2.10 summarises the chapter, and policy recommendations are outlined in Section 2.11.

2.2 The research objectives

This study's broad objective is to empirically investigate the effects of oil rents, institutions, and diversification on Nigeria's economic growth. Specifically, the study seeks to answer the following research questions:

1. Empirical evidence suggests that oil rent has been the primary source of government revenue in Nigeria since the discovery of oil in 1956. Given this position, we seek to examine the long-term implications of oil rents for the growth of the Nigerian economy and determine whether the impact is positive.

2. That institutions matter for economic growth is a widely held belief in economic literature. This study seeks to determine the effects of institutional qualities on the growth of the Nigerian economy and explore the measurement of such institutions .

3. Faced with the potential implications of fluctuating oil rents for government revenue, diversification [4] is an alternative strategy for economic growth. Therefore, we seek to determine the impact of diversification on the growth of the Nigerian economy with specific emphasis on agriculture-led diversification.

The response to the above research questions constitute the basis of this study.

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[4] In pursuit of the third specific objective about the impact of diversification on the Nigerian economic growth, we published a paper showing the effects of diversification on the Nigerian economy (See Temitope Abraham Ajayi, 2020).

2.3 Main contributions of the chapter to the literature

This chapter addresses the gaps in the previous literature concerning the effects of oil rents on economic growth by investigating oil rents, institutions and diversification as determinants of economic growth in Nigeria. We contribute to the literature in the following ways:

[1] Many of the previous studies on the impact of institutional qualities (and oil rents) on economic growth (such as Acemoglu et al., 2019; Ha-Joon, 2011; Bhattcharyya, 2010; and Anotnakakis et al., 2017) used a system of panel data in their empirical work. This paper diverges from these previous studies. It focuses solely on the Nigerian economy with the application of time series data between 1967 and 2017 to examine the effect of oil rents, institutions and diversification on the growth rate. Nigeria is different from other developing oil-producing economies in many respects. With regard to population, it is the 7th most populous economy globally. Authors like Sachs and Warner (2001) refer to it as a classic example of a resource curse economy. Thus, it becomes crucial to fix the spotlight of the research questions on how institutions have impacted the growth of the Nigerian economy.

In responding to our empirical questions, a new dataset (1967 to 2017) is used which fills the vacuum in the previous research work on Nigeria's oil sector by Akinlo (2012) which spanned 1960 to 2009. Between 2009 and 2017, several economic and institutional changes have occurred in Nigeria. Such changes may require a revision to the data set utilised by Akinlo (2012) and may consequently challenge some of his findings.

[2] This thesis chapter expands the literature on the implications of qualities of institutions as co-determinants of economic growth in Nigeria, with the development of three distinct dimensions of institutions in Nigeria, namely, democratic institutions, budgetary institution and the political right institutions. Besides, we add to the existing body of knowledge be demonstrating how qualities of institutions can be measured in the context of Nigeria thereby overcoming one of the possible challenges of the utilisation of qualities of institution as growth drivers. Previous empirical works like Akinlo (2012), Oladipo and Fabayo (2012), Iledare et al. (2018) did not control for the role of institution as a co-determinant of economic growth in Nigeria. Recent studies like Raifu (2021), Raggl (2017); Olusegun and Kazeem (2017) did control for institutions in Nigeria, but the scope of this chapter on the implications of qualities of institutions as co-determinants of economic growth in Nigeria is more robust (1967-2017). For Raifu (2021), the scope of coverage is 1984-2014, Raggi (2017), 1970-2014; and Olusegun and Kazeem (2017) with 1984-2014. By tracing the implications of institutions into the 1960s, this chapter potentially illustrates the phases of institutional development, especially the democratic institution better. The merit of controlling for democratic institutions, for example, is enormous.

Empirical evidence suggests that there is a causal relationship between democratic institutions and economic growth (Acemoglu et al., 2019: 1). Specifically, they conclude that *'... evidence suggests that democracy does cause growth and its effect is significant and sizable'*. The Nigerian state returned to democracy in 1999, but until now, no study has controlled for democratic institutions when conducting oil sector research on Nigeria.

To reinforce the strength of the effects of institutional qualities on economic growth, we identify three institutional dimensions: democratic, budgetary and political rights. Acemoglu and Simon (2005) in their extension of the proposition of North (1990a) regarding institutions contend that *'the social, economic, legal and political organisation of a society, that is, its institutions is a primary determinant of economic performance'*, meaning that institutions are both political and economic. This proposition gives credence to the expansion of institutional qualities in this chapter into three segments. Whilst democracy and political rights fall under political institutions, budgetary institutions in this study come under economic institutions. We instrument for oil rent which is the endogenous variable in our empirical analysis with two instruments, namely the volume of daily crude oil produced in million barrels (in log form) and a proxy variable for the government's subsidy regime, the total volume of refined fuel imported into Nigeria.

[**3**] The third contribution of chapter 2 concerns the research method. Whilst Akinlo (2012) used the VAR model in his study of oil sector and the Nigerian economy, Fabayo and Oladipo (2012) employed the OLS approach. This study applies a dynamic instrumental variable approach which overcomes the perceived shortcomings in the work of Fabayo and Oladipo (2012) regarding bias of the OLS estimator occasioned by the endogeneity problem. The research focus of Akinlo (2012) was primarily on the notion of oil revenue and economic growth in Nigeria, using the VAR model. This thesis chapter uses oil rents which are the difference between the cost of production of crude oil and the general price level on the international market. The advantage of using oil rents is that it takes into consideration some of the extraneous costs of oil production which oil revenue would not include.

In a development related to the importance of institutions for economic growth, diversification has been described in the economic literature as one of the probable panaceas to the challenges associated with Nigeria's dependence on oil rents. In recognition of this, we develop a proxy variable for diversification in this chapter, called agriculture-led [5]-diversification, mea-

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[5]Agriculture-led diversification is the diversification of the Nigerian economy via the agriculture sector. This sector comprises food production, animal husbandry and fish processing (Nigeria Federal Ministry of Agriculture, 2019). Before the discovery of oil in 1956, agriculture was the primary contributor to growth. It accounted for over 50% of total government revenue and provided 65% employment (Central Bank of Nigeria Statistical

suring the share of food in the merchandise exports. The argument for diversification is based in part on the need to develop alternative economic sectors to offset volatile oil rents. The growth of a complementary sector like agriculture could reduce dependency on oil and increase total governmental revenue all the more. Empirical evidence suggests that the developed countries have diversified economies including strong and mechanised agriculture.

2.4 Economic growth in perspective

Economic growth is one of the most common terms used by economic scholars, political thinkers, sociologists, researchers and even laymen. In its simplest form, GDP is the gross domestic product of an economy, as calculated by the final value of all the goods and services produced in an economy within a specified period, usually one calendar year. According to the World Bank's World Development Indicators (2019) 'GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. The calculation is without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources'. Therefore, an economy is growing if there are positive and sustained changes in the growth of real output over time.

According to the Central Bank of Nigeria Annual Statistical Bulletin (2019), there are three approaches to the calculation of GDP: the expenditure approach , the income approach and the output approach. The expenditure approach aggregates the amount spent on goods and services produced in an economy within a given period. Symbolically, this is represented as: GDP = C + I + G + [X - M], where C is consumption, I is investment, G is government expenditure and X - M is the difference between exports and imports of goods and services, or the net income from abroad.The income approach, on the other hand, is the total of all the income earned by households, business, firms and government within a given period.

GDP per capita measures the health of an economy or the welfare of the population. The World Bank's World Development Indicators (2019) states that 'GDP per capita is gross domestic product divided by midyear population'. In other words, it measures GDP per head and as such, it reflects the individual level of well-being. The per capita GDP of Nigeria in

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Bulletin, 2019). The country's three regions had at least one essential food export product pre-1956 as a significant export earner: cocoa in the South West; peanuts and fish in the North; and palm oil seedlings in the South East. The decline in the contribution of agriculture to government revenue since the 1970s compelled the successive governments to emphasise diversification through the agriculture sector. Manufacturing and services were not sufficiently well developed to compete on the global stage. Therefore, it is appropriate to address the diversification of the Nigerian economy via agriculture, given its potential offered by the country's extensive arable land.

2017 was \$2,412.367, according to the World Bank's World Development Indicators (2020). It should be noted that per capita GDP fluctuates for various reasons. The growth rate of real GDP per capita is influenced by both economic and non-economic factors. In this regard, an oil-producing economy like Nigeria is heavily reliant on the rents from oil as the chief determinant of GDP growth.

2.5 Institutions and the Nigerian economy

According to North (1990: 3),*'institutions are the rule of the game in a society, or more formally, the humanly devised constraints that shape human interactions'*. Good institutions promote economic growth and create an enabling environment for development to flourish. Many authors and scholars have argued that weak institutions are among the leading growth challenges confronting Nigeria. Midgal (1988) contends that weak states can be strengthened conditional upon the government building healthy and sustainable institutions, with the capacity to curb conflict and promote productivity.

The identification of an economic problem such as the challenge of weak institutions is the first step towards finding a solution. There is considerable debate among scholars as to what constitutes an institution. Scholars such as Gerring et al. (2005: 323) in their empirical work showed that the impact of political institutions on economic growth is indeterminate. To these categories of theorists, measurement of institutions is not realistic and therefore using institutions, particularly qualities of institutions like good governance, the rule of law and/or democratic institutions as variables determining economic growth is challenging. Whilst the debate rages on, the New Institutional Economics literature shows that although there is no consensus about the definition of an institution, institutions matter for economic growth. The World Bank Development Report (2002) titled *Building institutions for markets* corroborated the view of the New Institutional Economics literature, arguing that good institutions advance market operations, reduce poverty and promote economic growth.

The IMF (2003), in its report on institutions and economic growth, argued that institutional changes and economic development are correlated. The report indicated that increased market competition, an open economy and the coming together of economies to promote common/ shared economic policies as through the World Trade Organization are essential economic institutions. The report further argued that:

'One can stipulate that institutional changes have occurred slowly but surely over the past in accordance with the economic development of a particular country. The developed countries

now stand in positions of power based upon their concrete institutional development, whereas developing nations have a reflection of inherently weak institutions in almost every aspect of their economies. The distinction between bad and good institutions can be signified by considering the type of policies that each enacts' (IMF Report on Institutions and Growth, 2003: 1).

From the above positions on institutions, the assessment of institutional qualities in this study is a dynamic approach to addressing the impact of institutions on economic growth from diverse perspectives. Some of the known indices of institutional quality in the literature concern democratic institutions, the rule of law, press freedom, budgetary and financial management, the corruption index and ease of doing business. In addition, there are some specific Nigerian institutions including the Economic and Financial Crime Commission (EFCC) which was established in 1999 mainly to curtail economic corruption and ensure financial discipline in Nigeria; the Independent Corrupt Practices Commission (ICPC) established in the year 2000 to receive reports on corruption and investigate such reports, especially among the public office holders; and the Independent National Electoral Commission (INEC) which was established in 1998 as an 'independent' electoral umpire to conduct and oversee election activities.

Empirical evidence suggests that political institutions such as democratic institutions are essential for economic growth. Acemoglu and Robinson (2006:33) in their book titled *Economic Origin of Dictatorship and Democracy* explored the mechanism of transmission of a democratic institution to economic prosperity, examining why some economies democratise while others have fully embraced nor developed democratic institutions. Political literature shows that good governance is the foundation for all other institutions and of society as a whole. Robert (2004) stated that *'governance refers to the conscious regimes aimed at enhancing the effectiveness of political authority'*. Political institutions are vital for economic growth because they involve both formal and informal institutions and create an enabling environment to foster economic growth.

Measurement of political institutions includes indices of government effectiveness, of the rule of law, regulatory quality and the political rights of the population. Transparency International - TI (2016) said in its report that institutions in Nigeria have been fragile and ineffective. From the data available from TI (2016), the average government effectiveness in Nigeria was -1.02 on an upper limit scale of 2.5, and the average rule of law was -1.21 points out of 2.5 as the higher bound. The average voice and accountability index was -0.8, and the average regulatory quality index was -0.87, with 2.5 as the higher bound. In the words of Gbandi and Amissah (2014), 'informal institutions in Nigeria are more than 90 per cent of Nigeria's business are poorly organised, no good record keeping and do not pay taxes'. It is clear from Gbandi and Amissah's (2014) argument that institutional measurement is not limited to political institutions or good

governance. Economic institutions in the form of the tax system, the quality of budgetary and financial management and effective monetary policy are all aspects of institutions. Table 2.1 below provides a summary of the institutional qualities considered in this chapter.

TABLE 2.1: THE MEASUREMENT AND TYPE OF INSTITUTIONAL QUALITIES IN NIGERIA.			
Type of Institution Qualities	Sub-categories of Institution Qualities	Measurement and Derivation	Source
Political Institutions Qualities	Democratic Institution Quality	Polity IV Index of government represents measurement of varying types of governance from autocracy to full democratic governance. The polity IV governance score ranges from -10 as the lower bound to +10 as the higher bound. The polity IV governance score ranges from -10 as the lower bound to +10 as the higher bound. +10 measures a fully democratic state, 6 to 9 represents democracy,1 to 5 is for Open Anocracy. In open anocracy, democratic elections take place, but such elections are not free, and some rights denied for the population. 0 to -5 represents Closed Anocracy. Closed Anocracy is mixture of some features of democracy and part of dictatorship or autocratic rule. -6 to -10 denotes Autocracy, it implies government in which single person, the autocrat has supreme an absolute power. The political trajectory of Nigerian involves some periods of military rule and democratic government. In our own view, the Polity IV index of government possibly fit into the Nigeria political history.	Polity IV Index Project- Marshall and Jaggers (2019)
	Political Right Institution Quality	Political right implies the freedom through franchise and the right of the population to partake in the electoral process, contest for elective positions and partake in governance within the state. It is measured within the lower bound of a score of 1 which represents strong governance and 7 which implies a weak governance.	The Quality of Government Institute, Teorell et al (2019)
Economic Institutions Qualities	Budgetary* Institution Quality	The budgetary institution is an assessment by the World Bank on the policy priorities of the government, effective management systems and accurate financial/accounting reporting with 1 as lower bound and 6 as the higher bound. We used it to analyse budgetary system of the Nigerian state as measurement of an economic institution in Nigeria.	The World Bank Development Indicator, (2019).
* Author's contributions to the literature on the conceptual meaning, measurement and derivation of an institutional qualities in Nigeria.			

Table 2.1: The nature and type of institutional qualities

There are several indicators to measure institutions in Nigeria, as explained above. To simplify our analysis, we have confined the application of institutional variables into two, as shown in Table 2.1: political[6] institutions incorporating democratic institutions and political rights; and economic institutions with budgetary institution as a sub-group. These are explored in detail below:

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[6]See appendices section for a comprehensive analysis of the measurement of the political institutional qualities.

2.6 Democratic institution quality and the Nigerian economy

The literature of political economy shows that democratic institutions [7] are one of the determinants of economic growth. The impact of democratic institutions is a subject of intense debate in the literature. For instance, Acemoglu and Robinson (2006) showed that whilst democracy has fostered economic growth for the advanced and developed economies, developing economies, like Nigeria, have not fully realised the democratic dividend. Developed economies probably have strong incentives for the advancement of democratic institutions which, in turn, facilitate economic growth. Scholars conclude that despite the variations in the dividends from democratic institutions, they remain one of the best options to ensure an equitable distribution of income. Authors like Ross (2001) showed that the incentives that oil rents provide, especially in developing economies, hinder the growth of democratic institutions. This study proposes that democratic institutions are a pragmatic indicator of political institutions, and considers the likelihood of an association with economic growth.

Determining what constitutes a strong political institution is one of the known challenges of institutional measurement in economic literature. In taking cognisance of this measurement issue, we propose using a democratic system as a proxy variable for the political-institutional quality in this study. Acemoglu et al. (2019) underline the vital role of good governance in the form of democratic institutions by arguing that democratic economies probably grow better compared to non-democratic states. They carried out an extensive empirical comparison between democratic and non-democratic economies. They further argued that democracy has inhibiting factors especially in developing economies, chief among which is the availability of natural resources such as oil. While democracy may not be a sufficient condition for economic growth, they conclude that it tends to promote growth and ensure an equitable distribution of income among the populace.

2.6.1 Measurement of democratic institution quality in Nigeria

Nigeria has witnessed intermittent military incursions into her governance for decades. However, since 1999, there has been relative stability in the form of a democracy. Whilst the democratic dividend has not been fully realised in Nigeria, records exist on some form of democratic gain over this period. Using a democratic institutional quality requires us to apply a widely acceptable metric as a quality. Among the known variables used by scholars to measure democratic institutions is the Polity IV regime characteristics data from the US Centre for Systemic Peace.

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[7]Correlation exists between democratic institutions and good governance in terms of ability to redistribute income among the populace, as espoused in the literature

Unlike other indicators such as the Transparency International global corruption perception index with data from 1990, the Polity IV regime characteristics data predates 1960, and its index for political institutions therefore covers the period of this study from 1967-2017.

Figure 2.4: The democratic institution quality of Nigeria
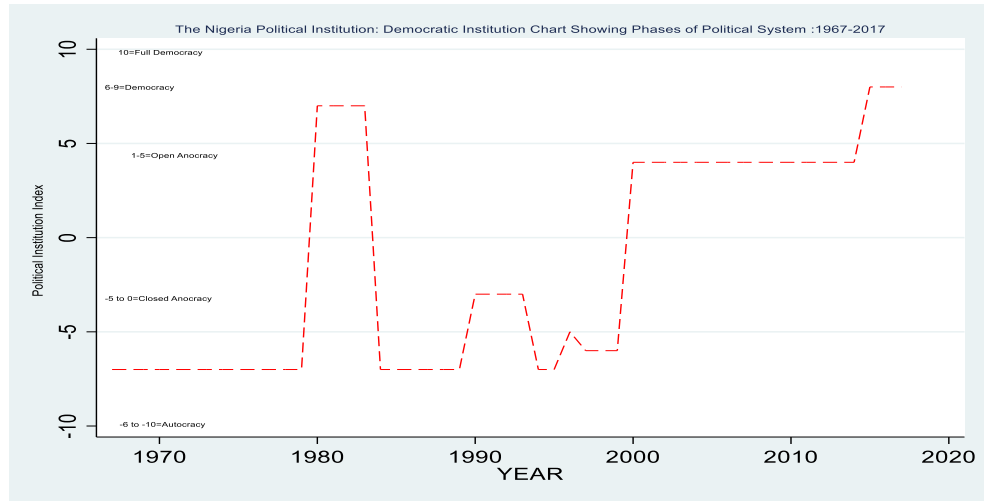
Source: Author's Computation with data sourced from Polity IV system of regime characteristics (2019).*Democratic institution quality of Nigeria compares democratic phases of the Nigerian political system with non-democratic phases, particularly the military regime dispensation.

The second advantage of the Polity IV index of regime characteristics is that it measures democratic institutions in a range, from the lower bound of -10 to the upper bound of +10. According to the Polity IV regime characteristics index, +10 measures a fully democratic state, 6 to 9 captures democracy, 1 to 5 is for Open Anocracy[8], 0 to -5 represents Closed Anocracy[9], and -6 to -10 denotes Autocracy[10]. Anocracy is an ambiguous term which has no clear definition, but experts from Polity IV project (US) categorise it as 'in-between democracy and autocracy'. For the political-institutional history of Nigeria which revolves around military dictatorship and democracy, it can be argued that the Polity IV index of regime characteristics better represents the phases of the democratic institutions (see Figure 2.4).

From Figure 2.4, we observe different types of the political system: from full democracy denoted by +10 to an autocratic regime with a numerical value of -10. Nigeria experienced the first military incursion into her governance in 1966, a period denoted by -7. A brief term of democracy followed between 1979 and 1984 with an approximate score of +7 in Figure 2.4.

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[8]Having democratic elections, although elections are not free, and some rights are denied for the population.
[9]System of governance with a mixture of democracy and part of dictatorship or autocratic rule
[10]Governance in which a single person, the autocrat has supreme and absolute power

From 1985 until early 1999, there was military rule (albeit a period of an interim national government, a mixture of military and civilian government in 1993), and then from May 27th 1999 until 2017, there have been relatively democratic institutions as seen in Figure 2.4 at around +4 from the year 2000 which progressed into +8 from year 2015 to 2017. It is interesting to note that with the index of democracy used by the US Centre for Systemic Peace, Nigeria is within the bounds of open anocracy and democracy from 1999 until 2017, meaning that democracy, as defined by political-economic scholars, is still evolving. That assertion is probably justified given the magnitude of the effect of democratic institutions on economic growth in our empirical work as we shall see.

Whilst the democratic system is not the only variable to denote political institutions in an economy, the Polity IV index of regime characteristics in our view represents one of the widely accepted methods of measuring political institutions in economic literature. Secondly, in the context of Nigeria which has experienced both a military regime and democratic institutions, the application of an index like the Polity IV arguably represents the political history of Nigeria better.

2.7 Political rights institution quality and the Nigerian economy

Studies of political rights and economic growth abound, with conflicting hypotheses. Political rights, in the political economy lexicon, refer to the right and freedom to freely participate in the administration and establishment of government which involves franchise and the tendency to occupy public offices, with the hope of advancing the cause of change through the implementation of public policies that aim to engender growth. The theoretical model used in this study follows Teorell et al.'s (2020) assumptions regarding the quality of governance. The political rights prevailing in an economy like Nigeria are related to the development of the political space. An economy with full participation of the population in electoral and democratic institutions is likely to nurture strong leaders capable of implementing positive growth strategies.Therefore, we consider below how the political right quality in Nigeria is determined in this chapter.

2.7.1 Measurement of political rights institution quality in Nigeria

Given Nigeria's political history, with experience of both democratic and military government, the Nigerian population has witnessed varying levels of political rights, as shown in Figure 2.5 below. According to Teorell et al. (2020), the measurement of the quality of political rights

in the economy is within the thresholds of 1 as a very free political rights to 7 as a not free political rights.

Figure 2.5: Political rights institution quality of Nigeria
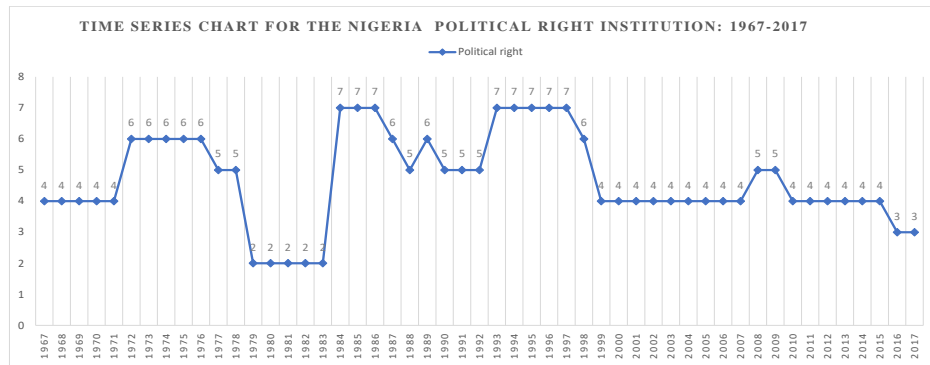
Source: Author's computation with data sourced from Quality of Government Institute, Teorell et al. (2020).

*Political right institution quality measures the freedom to participate in electoral process, to vote and be voted for in an election (franchise characteristics)

Figure 2.5 shows the extent of political rights from 1967 to 1972 to be 4. This period in Nigeria represents the aftermath of the first military incursion into the Nigerian democratic space and an antecedent civil war between 1967 to 1970. From 1973 to 1979, there was a sharp increase in the level of political intolerance in the government of Nigeria. A total ban on political activities and freedom of speech prevailed during the period, indicated by a score of 6. Between 1979 and early 1983, there was a short-lived period of democratic government which reflects in the scale of political right as 2. However, beginning from 1985 till 1999, there were systemic military regimes with various draconian laws like the famous Decree 4, otherwise known as detention without trial and a total ban on political activities. The ill-fated transition programme of former military President, General Ibrahim Babangida (retired) occurred during this period. Nigeria launched a new democratic government in 1999 with some level of political rights and participation in the electoral system, as shown in Figure 2.5.

A critical observation of the trends in Figure 2.5 shows marginal and consistent gains in the political rights of the Nigerian population. However, more efforts are probably needed to fully realise the benefits of political participation, according to the literature of political economy and, to this end, it is necessary to examine empirically how the political rights have impacted economic growth in Nigeria.

2.8 Budgetary institution quality and the Nigerian economy

Economic literature demonstrates that the quality of budgetary allocation and planning, together with the fiscal responsibilities of the government can make or mar an economy. In its simplest form, the budget is a statement of planned expenditure and expected revenue over some time, usually one year. There are several stages in budgetary allocation and planning, beginning from the draft and submission of budgetary (bill) proposals by various government agencies and departments.

In Nigeria, the Directorate of the Budget coordinates these estimates or drafts. All ministries draft estimates and then a cumulative/ aggregate draft copy is sent to the Directorate of Budget in the Presidency. The budget bill is then presented to the joint section of the National Assembly by the President. From this point, the budget is passed to the various committees in the National Assembly for scrutiny and defence by agencies of government. Some modifications may occur during this process. The revised/modified or approved version of the budget is then passed by the joint Houses of Assembly and sent for Presidential approval.

Figure 2.6: Budgetary institution quality of Nigeria
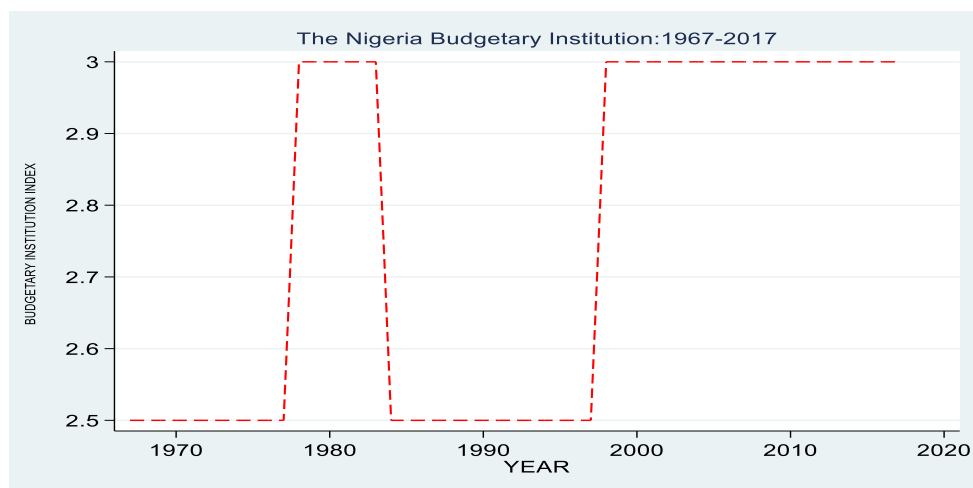
Source: Author's Computation with data sourced from World Bank's World Development Indicators (2018).

*Budgetary institution quality determines the quality of budgetary system of an economy base on the World Bank standard.

The President reserves the right to either assent to the budget bill or withhold assent to the modification(s) introduced to the budgetary bill by the National Assembly. An example of this

scenario arose in the 2017 and 2018 national budget when a new term, called 'budget padding' was introduced into the fiscal policy lexicon by the National Assembly. Budget padding, according to the National Assembly members, is the allocation or inclusion of a constituency development fund for each member of the two Houses, which the executive arm of the government considered to be 'ultra vires' or an extra-budgetary expenditure.

Politicking is one of the likely challenges to the smooth passage or prompt processing of the national budget of Nigeria as empirical evidence from the recent past suggests. The delay or revision in the passage of budgetary allocations usually reflects political differences among the lawmakers. The Nigeria national budget experienced a delayed passage until the second quarter of the year or even later between 2016 and 2019. The delay caused policy inconsistencies for the government, which sometimes led to extra-budgetary spending or allocations by the government. Thus, effective budgetary planning and passage, as shown by the International Monetary Fund (IMF) in its report of 2003, is a co-determinant of economic growth.

The traditional time to pass a budget in many advanced economies is the beginning of each calendar year, and delays in its passage could signal a negative impact on the economy. We proceed below to discuss the measurement of budgetary institutional quality for Nigeria.

2.8.1 Measurement of budgetary institution quality in Nigeria

The World Bank assesses budgetary institutions on a range of values from 1 to 6. A score of 6 represents 'the best' quality of budgetary and financial management, while 1 is the weakest (see Figure 2.6 above). Within the period of study and based on the available data, Nigeria's budgetary rating has remained slightly below 3, indicating a below-average performance for the country's budgetary institutions.

The impact of democratic institutions is also partly evidenced in the chart of budgetary institutions in Figure 2.6. The military dictatorship periods reveal striking neglect of good budgetary and sound financial management. We observe marginal improvements in budgetary institution in contrast to pre-1999 Nigeria, though things can be further improved.

The significance of the budgetary institutions justifies the development of a proxy variable for it as an economic institution in this study. Our empirical findings endorse the relative importance of the budgetary institutions for an economy, as asserted by the World Bank, although not significantly.

2.9 Related literature - A Theoretical Perspective

According to Solow (1987), [11] in his Nobel lecture of December 8th, 1987, *'Growth models did not begin with my articles of 1956 and 1957, and certainly did not end there. Maybe it began with The Wealth of Nations: and probably even Adam Smith had predecessors'.* In economic literature, there are several growth theories and models, but most are rooted in neoclassical theory and endogenous growth theory. These two models support this chapter on oil rents, institutions and diversification as determinants of economic growth in Nigeria.

Swan and Solow (1956) developed the neo-classical model, premised on the assumption that the accumulation of capital and technological progress constitute the most important drivers of growth in an economy. The model explored the transmission mechanism of capital stock and the total employment of labour with technology into economic growth. It demonstrates the impact of knowledge or human capital in the economy.

Solow (1956) further argued that the growth of an economy and its well-being is dependent on the level of saving and investment. The more people save from their income in an economy, the higher the investment which leads to economic growth and improved standards of living in the future. Solow contends that when the rate of depreciation is below the increase in per capita investment, all workers benefit from the introduction of improved equipment or production processes and production rises. The model assumes that increases in savings, reduction in the population growth rate and limiting depreciation in an economy are short-run strategies for increasing economic growth. Once the economy gets to a steady state, no change will occur.

Above all, growth in the long run occurs via technological progress according to the Solow model. This implies that efforts must be made to transform raw materials into finished and semi-finished goods to generate economic growth. A conditional convergence proposition exists in the model .

The next growth model is the endogenous growth model which focuses on technological change. The tenets of the endogenous growth model are derived from the modified R and D growth model and theories proposed by Romer (1990), Grossman and Helpman (1991a) and Aghion and Howitt (1992). It expands the horizon of antitrust, competition and intellectual property rights. By implication, the model promotes the free market mechanism and an economy open to innovation. It explores the role of research and development in the growth process and how economies can benefit from diverse innovation. In the new age economics, the emphasis is on technology as a determinant of economic growth. The model proposes an increase in

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[11]See Growth theory: An exposition. Robert M.Solow, 2000

both capital and labour efficiency. Labour output according to the endogenous growth model does not have consistent losses, but rather, might generate increasing returns. From the theoretical perspective of related literature, we proceed below to review related empirical literature.

2.9.1 Related literature - An empirical perspective

Oil rents and economic growth

There is a large body of empirical literature on the effects of oil rents on economic growth. Most of these past works focused attention on developing oil-producing economies with the application of panel data. None of the previous work in the context of Nigeria has focused on the subject of institutions vis-a-vis oil rents as we have in this study. The narrative concerning the determinants of economic growth is flawed if it ignores the significant influence of natural resources like oil . Rosser (2006) affirmed this position by arguing that efficient utilisation of the income from natural resources could spur economic growth.

The Nigerian economy represents an 'oil-based economy' because of the substantial contribution of oil, which is the mainstay of the Nigerian economy. Oil rents account for more than 80% of the total government revenue and contributed less than 50% to the real GDP between 1967 and 2017 (Central Bank of Nigeria Statistical Bulletin, 2018). Akinlo (2012) using the multi-variate VAR model, examined the importance of oil to the growth of the Nigerian economy using a data set from 1960 to 2009. He concluded that oil had driven growth in non-oil sectors and that five sub-sectors in Nigeria were cointegrated. Although his paper did not control for the role of institutions, his work indicated that the Nigerian economy is heavily dependent on oil rents. Unlike Akinlo (2012), we control for institutions in this study - particularly political and economic institutions - through the application of a new data set to investigate empirically the role of oil rents, institutions and diversification as determinants of economic growth in Nigeria. Furthermore, within political institutions we distinguish two inter-related categories: democratic institutions and political rights. We also consider economic institutions, including budgetary institution.

Sevil (2017:1), in his contribution titled *The Curse of Natural Resources*, argued that '....Although natural resources are crucial for a country's development, it does not mean that they automatically benefit economies that are gifted with them'. For most developing economies, oil rents are 'a cheap source of income'. Empirical literature in economics reveals that developing oil producing states possibly neglect innovation and the critical role of technology via research and development in promoting a diversified economic base. For instance, Nigeria has probably neglected the agricultural sector which provided more than 80% of export earnings in 1960,

65% of total GDP and an estimated 50% of government revenue (Chigbu, 2005). The effect of such neglect of other economic sectors has probably contributed to poverty. For instance, the Nigeria National Bureau of Statistics (2010: 15) special report titled *Nigeria Poverty Profile 2010* opined that about 60.9% of Nigerians in 2010 were living in 'absolute poverty'.

Similarly, the World Bank (2019) special report *Understanding Poverty* further contends that '*of the 736 million people living in extreme poverty worldwide, half live in just five countries: India, Nigeria, Democratic Republic of Congo, Ethiopia and Bangladesh*'. These assertions show the endemic nature of poverty in Nigeria over the years, despite the phases of boom in the crude oil industry. Regarding the breakdown of poverty among the six federal units of Nigeria, the North West poverty rate is almost 80%, compared with less than 16% in the South West, the lowest among the six federal units (Molini et al., 2014). Scholars like Mehlum et al. (2006:16), Collier and Hoeffler (2005), and Humphreys (2005) have reaffirmed these observations.

Sachs and Warner (1999), using GDP in 1970 as the base year, argued that an economy endowed with a high ratio of natural resources exports to GDP, like Nigeria, experienced slow growth between 1970 and 1990 and that an inverse relationship existed between natural resources and economic growth. Contrary to this position, Nigeria's growth rate over that period showed fluctuations, but not slow growth. We control for institutions, as in this chapter, natural resources like oil in Nigeria have a positive association with economic growth.

Oladipo and Fabayo (2012), using the OLS technique, explored the effect of the global decline in the oil sector on Nigeria's economic growth. They used a 1990 to 2006 dataset to investigate the impact of oil production on GDP. The paper identified a negative association between GDP and oil production. Similarly, Afolabi (2011) in his investigation of the effect of oil exports, with real GDP as the dependent variable, and oil exports, labour, and domestic capital consumption as explanatory variables, using data from 1970 to 2006, showed that oil exports have a significant effect on Nigerian economic growth.

Oyeleke (2015) in his empirical work *Reassessing Oil Curse Syndrome in Sub-Saharan Oil Countries* affirmed that the oil sector has improved government revenues. However, he argued that GDP per capita has dropped in the long run, which attests to the existence of a resource curse syndrome within the sampled countries. The study also indicated that GDP per capita rose at some intervals but fell on average during the review period. In our view, the fluctuation in the per capita GDP trends is a reflection of oil price instability . Specifically, there are about three distinct historical periods in the contributions of oil rents to the Nigerian economy. The

first period, 1967-1988, represents a period of instability in the contributions of oil rents to real GDP. The second period (1988 to 1997), though short-lived, saw a systematic increase in the ratio of oil rents to real GDP. The latter period post-1998 saw a consistent drop in the share of oil rents to GDP. The aggregate share of oil rents is a reflection of the shape of Nigeria's GDP per capita, such that in terms of the growth index, the Nigerian per capita real GDP growth rate was 22.2% in 1970; by 1980 it fell to 1.3%; by 1990 it was 9.9%; by 2000 it was 2.7%; by the year 2010 it was 4.9% and in the year 2017 it was -1.8% (World Bank Development Indicator, 2018). The perception that oil matters to the growth of the Nigerian economy is probably rooted in this observation.

The related literature above regarding oil rents and economic growth in Nigeria demonstrates a conflicting position regarding the effects of oil rents on the country's economic growth, which aligns with the established positions on the impact of natural resources like oil on economic growth in the energy economics literature. Arguably two schools of thought exist concerning the implications of oil rents. According to Akinlo (2012), the first one is a 'benign school of thought' asserting that oil rents have a positive correlation with economic growth. The second is a 'malign school of thought' which represents the neo-Sachs and Warner theorists. Our empirical work for this chapter falls under the benign school of thought, based on our findings that oil rents have direct effects on the growth of the Nigerian economy. Institutions play a significant role in our empirical work which leads us to the review of existing literature on institutions and economic growth.

Institutions and economic growth

The relationship between institutions and economic growth is one of the most contentious debates in the literature. The failure of natural resources like oil to advance the cause of growth in some developing economies has partly contributed to the emergence of institutional determinants of economic growth. This study considers both political and economic institutions.

Acemoglu et al. (2015, 2019) in their empirical work showed that institutions have a significant impact on economic growth. The empirical results of this study are consistent with this proposition. Although Nigeria's democratic institutions may be fragile, coupled with its recent political history, we have observed some form of gains in Nigeria since 1999 in particular. Ross (2001) posited that natural resource endowed economies are less democratic, primarily because of the rent-seeking behaviour which natural resources promote. This assertion is partly true for Nigeria pre-1999, during the dispensation of the military government which was characterised by corruption and rent-seeking behaviour.

In the literature of political economics, democratic institutions are held to be a better form of political institution and a strong governance indicator (Acemoglu et al, 2004). The nature of democracy as practised in the Sub-Saharan African states is likely to be deficient in the basic tenets of good governance. The cost of democracy, especially the salary of the political office holders in Nigeria, has been described as astronomically high. Ejuvbekpokpo (2012), examined the effect of the cost of governance on the Nigerian economy using data from 1970 to 2010, with the application of the OLS approach. The study concludes that the cost of governance in Nigeria inhibits economic growth by limiting the availability of tax revenues for industrialisation and the per capita output growth.

Pel (1999) in a study of 115 countries and Plungis (2014) in a study of 23 OECD countries contend that the political institutions that are vital for economic and industrial development operate well under democratic governance. Chauvet and Collier (2009) argue that good institutions are vital for the effective management of oil rents in developing economies. However, Nigeria's industrial and institutional profile has been described as weak by Afangideh and Obiora (2004), Ubi and Effiom (2013), Adeoti et al. (2014) and Transparency International (2016). Weak institutions are partly responsible for the failure of the Nigerian economy to achieve sustainable development according to Obadan (2004). Isham et al. (2003) examined the assumption that natural resources impact economic growth by hindering the growth of economic institutions. This study hypothesised that economic institutions such as the budgetary institution had been adversely affected by oil rents because of the effect on incentives that oil rents provide. The incremental proportion of oil rents in total government revenue has probably contributed to the challenges associated with the proper budgetary institutions and quality tax reforms which could expand the country's tax base . Oil rents have been described by Sala-i-Martin and Subramanian (2012) as *manna from heaven* for the Nigerian government. This assertion implies that the Nigerian government may have regarded oil rents as free money, with no need for robust institutional arrangements and accountability.

Luo and Wen (2015) examined whether institutions drive economic development by applying cross-country data and using an instrumental variable approach. The study demonstrated that institutions like property rights and the rule of law do not determine the state of industrialisation in an economy. Instead, the study suggested that industrialisation and economic development drive institutions, indicating the existence of reverse causation. Contrary to the conclusive evidence of Luo and Wen (2015) above, Angeles (2011) argued that institutions and private property right, in particular, have become amongst the most important determinants of long-run economic development.

Collier and Hoeffler (2005, 2007) demonstrated in their empirical findings that an association exists between the reliance on oil rents , civil war and social unrest. The assertion is partly plausible for Nigeria, especially given the unrest in the Niger Delta oil-producing regions. Stijns (2005) and Brunnschweiler (2009), in their empirical analysis, concurred that natural resources like oil promote rent-seeking behaviour and associated corruption. Despite the massive contribution of the oil rents to Nigeria's total government revenue, the critical institutions and infrastructure of the state remain fragile, with social and political fragmentation, civil war between 1967 and 1970, constant ethnic conflict over resource control, rent-seeking behaviour and periods of economic recession. The failure of the government to provide strong institutions is partly responsible for the country's political fragmentation.

Sachs and Warner (1999a), in their empirical examination of the economic performance of natural resource-exporting countries, showed that the typical outcome was a persistent decline or poor economic performance. The magnitude of the negative impacts of mismanagement of oil rents in developing economies is enormous, according to their findings. While the political class appropriates the oil wealth and abandons its core responsibilities of building vital institutions in the economy, the majority of the population live in abject poverty.

Baghegbo and Atima (2013) investigated the effects of petroleum on economic growth in Nigeria using time series data for the period 1980 to 2011. They demonstrated that oil revenue and the corruption index are negatively correlated to real GDP, while foreign direct investment and external debt have positive correlations with economic growth. The International Energy Agency (IEA, 2013) contends that Nigeria is one of the top 20 economies that subsidise the consumption of petrochemical products. In 2010, subsidies stood at $3.76 billion, with the largest percentage of these subsidies ending up in the private pocket of politicians and oil marketers.

According to the late Dr Maikanto Baru (former Managing Director of the Nigerian National Petroleum Corporation-NNPC), *'Nigeria through the NNPC spends about 774million naira daily as a subsidy and 23.99 billion naira monthly as a subsidy'* (Punch Nigeria Newspaper, March 5th, 2018). In an economic sense, this government action constitutes price-fixing, reducing the domestic oil price below the equilibrium price, through subsidies. The rising fuel subsidy regime of the Nigerian government is a barrier to fiscal health (Rice, 2012) and has negative implications for the total public budget (Ehigiamusoe and Umar, 2013). The subsidy regime of the Nigerian state is a drain on the tax income of the government which negatively affects economic institutions intrinsic to the Nigerian economy. Furthermore, the drive towards the liberalisation and privatisation of the oil industry is being affected by the subsidy regime,

because investment by the private sector is not lucrative in the absence of government subsidy. The combination of all of this has far-reaching implications for the economic institutions of Nigeria.

The government's policy target to use the petroleum subsidy to assist indigent households is misplaced, because the bulk of the subsidy goes to the oil marketers who sometimes fail to deliver, and to the political class. The World Bank observe that *'untargeted energy subsidies reduce the amount of money that can be spent on programs that benefit the poor'* (World Bank Report, 2009: 60). Several attempts have been made in the past to remove oil subsidies, but resistance confronts every attempt from civil society groups, labour unions, the general public and the beneficiaries of the subsidy regime (Adenikinju, 2009).

From another perspective, the 'grabber friendly' economic environment is another impediment to the growth of the Nigerian economy via oil rents. Whether oil rents promote growth is largely dependent on whether an economy is 'grabber friendly' or 'producer friendly'. Poor institutions promote leakages in the form of rent to grabbers, while strong institutions, according to Mehlum et al. (2006:1-20), facilitate a producer-friendly environment, which in turn grows the economy. Several leakages exist from Nigeria's oil rents, such as petroleum subsidies, corruption and conflicts in the oil-producing areas.

In light of the above, we group the challenges to the utilisation of oil rents for economic growth in Nigeria into two categories. The first is associated with the instability of the oil price regime and the susceptibility to oil price shocks. The second concerns the quality of institutions. The distinction between the Nigerian economy and the developed oil-producing economies is largely about differences in institutions. For example, Norway, an oil-producing economy in Europe with a population of 5.4 million, (IMF World Economic Review, 2019) is one of the most developed economies, according to World Bank Development Indicators. The World Bank's Human Development Index metrics of 2016, classified Norway as a very high-income country with a GDP per capita of $74,930. Norway has an institution for oil rents management, the Government Pension Fund Global[12], established to save the excess of oil rents and to cater for the needs of future generations.

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[12]Norway's oil fund otherwise known as the Government Pension Fund Global Norway, was established in 1990 after the discovery of oil in the North Sea. The primary goal for establishing the fund was to serve as stabilisation fund for the shocks occasioned by unstable oil prices, which might constrain the budget. Secondly, the fund serves as a 'financial reserve and long- term savings plan so that both current and future generations get to benefit from our oil wealth'

Interaction of oil rents and Institution as a composite variable in the literature

The literature on the political resource curse shows some recent empirical work on the interaction of qualities of institution and oil rents. Specifically, Acemoglu et al. (2019), Bhattacharyya and Hodler (2010) amongst others in their various expositions about the impact of resource rents and institutions on economic growth. The consensus in the literature is that weak institutions characterise a developing economy like Nigeria. Because of this, we aim to observe the independent effect of qualities of institutions in Nigeria on its economic growth vis-à-vis oil rents. Some scholars have posited that institutions' impacts on economic growth are indeterminate or blur because of the associated challenges with institution measurement. This chapter is determined to empirically investigate that position by separating the implication of an institution on Nigerian economic growth while assessing the effect of oil rents on its economic growth. Our target is to avoid mistaken the potential impact of oil rents with the likely implications of an institution on development in this chapter, all thing the same.

Therefore, in controlling for the effects of the qualities of institutions in Nigeria on growth, we would treat the two critical growth drivers as a separate entity in our model development. That is, oil rents and institution and observe their effects by drawing a distinct line of thought in contrast to the presumption in some segment of the literature that the two variables can be fused to become a composite variable. Some theorists have argued that strong political institutions are not necessary for economic growth in a resource-producing economy. A piece of empirical evidence with the political institutions in rentier states like Saudi Arabia and the United Arab Emirates underscores that presumption (chapter three of this thesis suggests that notion at the later part of this thesis). We aim to observe a distinct effect of an institution in this chapter, albeit with oil rents as co-determinants of growth in Nigeria.

Above all, this chapter's central ideas are to determine how qualities of institutions are measured in Nigeria, but not on the fusion of oil rents with an institution in our empirical work. Measurement of an institution is prone to an enormous challenge; perhaps an appropriate measure of qualities of institutions in Nigeria, in our view, is likely to be a precondition to solving the growth challenges of the Nigerian economy. Empirical evidence shows a limited scope of coverage for the previous work with an interaction term between the institutions and oil rents, mainly from the early 1980s. This chapter assesses and measures institutions' qualities in Nigeria, beginning from 1967 to 2017, using three institutional measurements: democratic, budgetary and political right institutions.

From the review of literature about institutions and economic growth above, the synergy between institutions and oil rents is arguably crucial for the growth of the Nigerian economy

and the long-term realisation of the government's policy objectives, which lead us into a review of the literature on diversification and the Nigerian economy, as explored below.

Diversification and economic growth

One of the principal strategies for the growth of an economy is diversification. Olayiwola and Okodua (2013) argued that the Nigeria's dependence on oil rents as the primary source of government revenue poses challenges to economic growth, especially in the long run. There are enormous oil price instabilities which cannot be addressed by domestic policy. A critical observation of the trends in the Nigerian economy shows a consistent alignment with the trend in oil prices. In the light of this, scholars have argued for the development of other viable sectors like manufacturing, agriculture and services to partner with the oil sector. The contribution of manufacturing and services to the growth of the economies of advanced countries is enormous. However, in Nigeria, the contribution of manufacturing and services sector is minimal.

The Prebisch-Singer model demonstrated that diversification of the export base of an economy could prevent weakening of the exchange rate in developing economies. Arip et al. (2010) in their empirical investigation of the relationship between export diversification and economic growth in Malaysia between 1980 and 2007 showed that export diversification had a positive and statistically significant effect on the country's economic growth. Similarly, using Johansen cointegration and a VEC model, Sanjay et al. (2015), in their study on the impact of export diversification and economic growth in Mauritius between 1980 to 2008, concluded that there was a positive correlation between export diversification and economic growth.

The primary focus of the Nigerian government's diversification strategy, especially since the return of democracy, has been on agricultural exports, which were the mainstay of the economy before the discovery of oil. The economics literature demonstrates that diversification through manufacturing and services offers long term returns in contrast to diversification via the primary sector like agricultural export. In the light of this, Godwin and Ubong (2015) in their study of the impact of export diversification on the growth of the Nigerian economy demonstrated that diversification via industrialisation of the non-oil sector, and trade and investment in the agricultural sub-sector would promote growth of the Nigerian economy . This implies that the drive towards diversification of the Nigerian economy should be multifaceted. Establishment of a diversified economy was one of the drivers of changes in the computation of GDP by the government, which led to the famous rebased GDP of 2014.

Past literature on diversification suggests that the pursuit of diversification policy should

be pluralistic. Empirical literature endorses a multi-sector diversification strategy to realise the inherent benefits. We focus on agricultural diversification in this chapter to align our position with the diversification policy of the current government in Nigeria.

Savings and economic growth

One of the preconditions for investment is savings. For investment to thrive, there must be an increase in the level of savings. There is a large body of literature on the effects of saving as a determinant of economic growth. As Solow (1956) argued, savings are a prerequisite for capital accumulation and investment. Long-term saving is likely to be relevant for an oil-producing economy like Nigeria. For instance, the Norwegian model of the Sovereign Wealth Fund is a crucial mechanism for the long-run growth of the Norwegian economy, and provides insurance against potential global oil shocks. The World Bank's special report on savings (2014) asserted a relationship between the long-run growth of an economy and factors including both private domestic savings and public saving of a proportion of governmental income for development purposes and future needs.

Agrawwal (2005), in his use of panel data to investigate the correlation among saving, investment and economic growth in five South Asian economies, demonstrated that an increase in the rate of savings is associated with a rising growth rate of real GDP in two of the economies, and that increasing growth rate Granger causes a higher level of saving in the other three economies. This finding indicates that there is a causal relationship between the rate of savings and economic growth.

Kriechatus (2002) in his empirical work on the impact of savings on economic growth contends that an increase in savings leads to higher investment, and this in turn promotes economic growth. Anoruo and Robert (2001) using the vector error correction model to investigate the causal association between economic growth and the domestic savings in seven African economies including Nigeria between 1970 and 1997, demonstrated that in the instance of the Nigerian economy, there was no co-integration and hence no positive long-run relationship.

Adelaja (2003) in his study on the effect of savings on the growth of the Nigerian economy, using a VAR estimates approach, showed that savings and economic growth have a uni-directional association, which implies that the level of income or disposable income influences savings in Nigeria. For Mohan and Remesh (2006) in their empirical investigation of savings and economic growth in a cross-country study with Nigeria as part of the focus group, demonstrated that there was no co-integration, nor any long-run association between economic growth and

the level of gross domestic savings in Nigeria.

The conclusion from the review of literature on the association between savings and economic growth is that Solow's assertion regarding the vital role of savings as growth facilitator in an economy may be valid from an empirical perspective.

Exchange rate determination and economic growth

Exchange rate policy is a tool of macroeconomic management whereby the monetary authorities regulate and stabilise the exchange rate so as to achieve an optimum equilibrium level (Obadan, 1996). Given this, exchange rate policy is one of the critical determinants of economic growth in an oil-producing economy like Nigeria. The US dollar, to a large extent, is the transactional currency for international oil business. Therefore, the rate of exchange of the US dollar and other international currencies has an impact on Nigeria's economy.

The exchange rate by definition is the rate at which the Naira (Nigeria official currency) is exchanged for another currency, say the US dollar. Over time, fluctuations in the exchange rate have caused the government of Nigeria to intervene in the economy to regulate the exchange rate. Such interventions imply a fixed exchange rate policy, whereby the federal government pegs the exchange rate at certain thresholds in the official exchange rate market, in contrast to the exchange rate obtainable in the parallel market, that is, the floating exchange rate which is market-determined (Eze and Okpala, 2014; Dada and Oyeranti, 2012). The choice between a floating (flexible) exchange rate policy and a fixed exchange rate policy can have a considerable impact on an economy. Economic literature shows that a market-determined exchange rate, otherwise known as a flexible exchange rate, better promotes growth in the long run. Adelowokan (2012) contends that the fixed exchange rate policy of the Nigerian government is susceptible to varying degrees of abuse by importers of goods and commodities who get a licence from the government to purchase foreign currencies from the central bank and then re-sell at bidding prices in the parallel market or via illicit trade of such currencies for private gain.

Health of the population and economic growth

The literature on health economics shows that there is a strong correlation between population health and economic growth. Some scholars have argued that a healthy population is likely to be a productive workforce. In this respect, the association between the health of the population - in terms of mortality rate, life expectancy at birth, healthcare expenditure as a share of GDP and the prevailing health insurance system or healthcare policy - is likely to determine the growth rate of such an economy. Odubunmi et al. (2012) examined the association between healthcare

expenditure and economic growth in Nigeria using a multivariate cointegration approach; they identified one co-integration among economic growth, foreign aid, health expenditure, total saving and population.

As for metrics of the health of the population, using the life expectancy of the Nigerian population as a proxy, it has remained at 54 years since 2015 (World Bank's World Development Indicators, 2018). This suggests that the health of the Nigerian population is probably amongst the poorest, given an international standard of 72.0 years, according to the World Health Organization -WHO [13] (2016).

In contrast to the Nigerian economy, the healthcare sector in the US contributes about 20% to aggregate GDP. In terms of health finance, the healthcare cost of the US is one the biggest across the globe and empirical literature shows that the sector contributes substantially to US employment. Therefore, the contribution of healthcare to the economy is one of the determinants of economic growth. Taking into account life expectancy at birth, the fertility rate, capital and recurrent expenditure on healthcare in Nigeria between 1985 and 2009, Adeniyi and Abiodun (2011) concluded that the healthcare sector had the potential to contribute positively to the Nigerian economy, with adequate management and development. Healthcare is a critical component of the Nigerian economy in this respect.

In addition to the above, the COVID-19 pandemic, which is an acute respiratory virus originating in Wuhan, in the Hubei province of China, has negatively impacted the global economy. Businesses have been shut down and many airlines have suspended operations, leading to substantial losses. Moreover, it has had negative implications for the global oil business, especially due to the rapid reduction in the consumption of aviation fuel by airline operators. This has led to a dramatic decline in the oil price, in the face of the price war between Saudi Arabia and Russia over the policy to stabilise the oil price in early 2020. Because of this, the health of the population probably has a significant association with economic growth. The findings in this chapter support this position, as is evident later in this paper.

From the review of existing literature above, it is clear that Nigeria's economic growth is dependent on several factors including oil rents, institutions, agriculture- led diversification, gross savings, the exchange rate and population health. It should be noted that there is no consensus about the impact of oil rents on the growth rate of the economy. Whether institutions, in particular, drive the growth of the Nigerian economy is a subject of considerable debate in economic literature. Whilst political institutions might have been a factor complementing

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[13]The World Health Organization in 2016 set the international standard or benchmark for life expectancy at birth at 72.0 years. This reflects the average life expectancy at birth of the advanced and developed economies which is over 70 years on average. Most of the developing economies, Nigeria included, have a life expectancy at birth which falls below this international standard.

economic growth in Nigeria via the allocation of oil rents, the literature supporting this position is sparse, and hence our objective interest in this research area. The lacuna in the literature on the oil sector is the near-absence of institutional effects on the growth rate of the Nigerian economy. New Institutional Economics literature identifies institutions as a growth driver, and empirical investigation of oil rents in Nigeria is fundamentally inadequate if it fails to address the role of institutions. Therefore , this thesis chapter is designed to contribute to the literature and fill the identified gaps.

2.10 The nature and sources of data

The dataset for this chapter is derive mainly from secondary sources. We utilise annual time series data from 1967 to 2017. There are several indices of economic growth, but for this study, we use the real GDP per capita growth rate as our dependent variable to measure the growth of the Nigerian economy. We present a detailed explanation of the measurement and sources of the data in Table 2.2.

Per capita real GDP growth of Nigeria [GRO]

The real GDP per capita [14] growth data is taken from the World Bank's World Development Indicators (2019), and is fully described below with a concise summary of description in Table 2.2.

Oil rents as a share of Nigeria's GDP[REN]

Using the World Bank's World Development Indicators data of 2019, we took the share of oil rents in Nigeria's GDP as one of the explanatory variables for this study. Oil rents according to the World Bank's World Development Indicators (2019) are the 'difference between the value of crude oil produced at the world prices[15] and the total cost of production'.

Democratic institutions quality [DEM]

For this study, the Polity IV index of regime characteristics by Centre for systemic Peace, USA (Jagger and Marshal, 2019) is use as the variable to represent democratic institutions quality

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[14] We sourced the real GDP per capita data, 1967-2017, from the World Bank's World Development Indicators (2018) for purposes of consistency. The IMF data for the real GDP per capita growth rate began in 1980, so the usage of the IMF series would have led to severe data loss for our empirical work. According to the IMF's World Economic Outlook (2019) 'Data are available from 1980 to present,....'. Secondly, the IMF series differs from those of the World Bank's World Development Indicators. Empirical evidence strongly supports the use of data from the World Development Indicators, primarily because the scope of empirical work pre-dates 1980. To enhance the robustness of our empirical work and compare trends in the IMF real GDP per capita growth rate from 1980 with that of the World Bank's World Development Indicators, a graphical overview is presented in the appendices subsection 5.3.1 - Figure 5.1.

[15] Oil rents include the component of the crude oil price, which implies that there is a correlation between oil rents and the oil price level. Therefore it is necessary to exclude the oil price from our explanatory variables to avoid a collinearity problem. Some scholars have argued that the volatility of oil prices is likely to be significant in determining Nigeria's economic growth, which is one of our main arguments for the using oil rents, which entail a derivative of oil price as our explanatory variable for this study

Table 2.2: The General Description of Variable and Notation with Source.

Notation	Variable	Description and Measurement	Source
GRO	Per capita real GDP growth Rate	Gross domestic product divided by midyear population. Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2010 US dollar	World Bank Development Indicator,2019
REN	Share of oil Rents in GDP	It is measured as the difference between the value of crude oil production at the world prices (constant price) and the total costs of production	World Bank Development Indicator,2019
DEM	Democratic Institution Quality.	Institutionalised democracy indicator which differentiate among varying system of governance with -10 as the lower bound and +10 as the upper bound & Polity IV Index (US)-2019	Polity IV Index (US)-2019
*BGT**	Budgetary* Institution Quality.	The budgetary institution is an assessment by the World Bank on the policy priorities of the government, effective management systems and accurate financial/accounting reporting with 1 as lower bound and 6 as the higher bound. I used it to analyse budgetary system of the Nigerian state as measurement of an economic institution in Nigeria	The World Bank Development Indicator, (2019)
POI	Political Right Institution Quality.	Political right is the freedom and right of the population to participate in governance and electoral activities through franchise and contesting for elective positions as elected representative of the people. According to Quality of Governance Institute, political right is measured within the range of values from 1 which is the most free state for political right of the citizen to 7 which is the highest bound and not free state for political right.	The Quality of Governance Institute, Teorell et al (2019).
ADV	Diversification Proxy by Agriculture Food Export (Agro-Diversification)	Food Exports share of merchandise export which consists of live animals and food, beverages and tobacco, vegetable oils and fats, oil seeds and nuts with numerical values 0 to 22.	The World Bank Development Indicator, (2019)
HEA	Health of the population Proxy	Life expectancy at birth proxy for Health of the population which is the number of years an infant born is supposed to live other things remain the same.	The World Bank Development Indicator, (2019)
EXR	Official Real Exchange Rate of the US dollar to Nigerian currency, dollar	It represents the fixed exchange rate of one US dollar to one Nigerian currency, naira. This official exchange rate of the US dollar is different from the rate available in the parallel market of foreign currency. The parallel market are not regulated, therefore; only the government fixed rate can be used as a mean of determining the prevailing exchange rate Nigeria.	The World Bank Development Indicator, (2019)
VGS	Share of Gross Savings in GDP	Gross Savings calculated as gross national income of GDP less total consumption plus net transfers.	The World Bank Development Indicator, (2019)
CPL	Volume of Daily Crude Oil Produced in log form.	Total daily crude oil produced in Nigeria in million barrels. The values are log to normalise the distributions.	BP Statistical Bulletin (2019)
FUE	Subsidy Regime of the government proxy by the Total Volume of fuel import into Nigeria as a percentage of merchandise export.	Total volume of refine fuel imported into Nigeria which the government base which represent the average values of subsidies to be paid out by the government to fuel importers in Nigeria. The exact value of subsidy by the Nigerian government is difficult to measure as such the volume of furl import into the country determine the subsidy payment of the government to importers of fuel.	The World Bank Development Indicator, (2019)

* Author's Contribution to the literature on Measurement of Institutional Quality in Nigeria.

Table 2.2: General description of variable and notation with sources.

in Nigeria. One of the key advantages of the Polity IV data is that it covers the entire period of this study, pre-dating 1967. Thus the challenges associated with data loss or omission of series in the period studied did not arise.

The political-economic history of Nigeria has encompassed both military and democratic systems of government. Data from Polity IV has the benefit of measuring political institutions, including the variants found in Nigeria within the period of study, in a range of numbers from -10 as the lower bound to + 10 as the high bound.

Budgetary institutions quality[BGT]

One of the initiatives of this study is the application of budgetary and financial management data from the World Bank's World Development Indicators (2019) to measuring the impact of such economic institutions in Nigeria. The indices for the quality of budgetary management range from 1 to 6 as the highest score.

Political rights of the population[POI]

The political literature has documented an extensive range of factors militating against strong democratic institution in Nigeria. Building on this previous literature, we use the data on political rights from the Quality of Governance Institute (Teorell et al., 2020) to analyse the likely impact of political rights, as one of the co-determinants of political institutions, on economic growth.

Diversification proxy by agriculture food export [ADV]

The are several indices of diversification in economic literature. In the context of Nigeria, the focus of diversification has been through the agricultural sector. This is partly because of the fragile nature of the manufacturing and services sectors which could have served as alternatives to agriculture. The volume of food crops produced in Nigeria, including cocoa, cashews and oil palm is huge. Before the discovery of oil in 1956, agriculture was the primary driver of the economy , accounting for over 50% of the total government revenue. Therefore, there is keen interest in the possibility of diversifying the economy via the agriculture sector. To explore this area, we used data on the share of food exports in total merchandise exports from the World Bank's World Development Indicators (2019) as a proxy for agriculture diversification.

Official real exchange rate of the Nigerian Naira to US Dollar[EXR]

The 'dollarisation' of the global oil sector has had a major impact on exchange rate determination, whether under a flexible or fixed exchange rate policy. The exchange rate, therefore, is an important variable of interest in oil sector research. Changes in the Naira/ US dollar exchange

rate have contributed to the fluctuations in oil rents. Because of this, we use data on the official exchange rate from the World Bank's World Development Indicators (2019).

Share of gross saving in GDP[VGS]

Data on gross savings as a share of GDP were sourced from the World Bank's World Development Indicators (2019). The inclusion of the savings component followed the theoretical model development of Robert Solow (1956), which emphasised the significant role of savings in the growth process.

Health of the population proxy[HEA]

In this study, we use the mortality rate per 1000 live births from the World Bank's World Development Indicators (2019) as a proxy for the health of the population. Expenditure on health by the government or private healthcare spending is likely to be a better proxy, but such data is not available for a developing economy like Nigeria. Table 2.2 presents full explanation of the data.

Our application of explanatory variables in this study differs in two significant ways from previous studies. Unlike Akinlo (2012), in his empirical work *How important is Oil in Nigeria's Economic Growth?* who used oil revenue, we applied oil rents because this includes associated extraneous production costs of oil which the oil revenue metric may not fully capture. We also use more recent data by expanding coverage to 2017. Many changes have occurred in the global oil sector between 2009 and 2017, which our study has examined, in contrast to Akinlo (2012). Also, unlike Sachs and Warner's oil variable - the share of exports of natural resources in GDP in 1970 - which is prone to selection error and illogical generalisation, we confine the application of the oil variable to oil rents and solely on the Nigerian economy. The specific focus on the oil sector guarantees validity of our focus on the implication of the Nigerian oil sector on economic growth. Combining the rents from all the available resources in Nigeria together is likely to hinders the determination of the actual effects of oil rents and quality of institutions on economic growth of Nigeria. Perhaps, given the potential similarity between the rents from oil and other minerals like solid minerals, and gas in the context of the Nigerian economy; the combination of all the natural resources rents in Nigeria may lead to an autocorrelation.

2.10.1 The descriptive statistics

Table 2.3 provides a summary of relevant statistical information on the variables concerned. For instance, the growth rate of real GDP per capita as depicted by GRO shows that on average, real GDP per capita growth in Nigeria within the period under review is 1.28 with a standard

deviation of 7.32, a minimum growth rate of -17.55 and a maximum growth rate of 22.18.

Table 2.3: The descriptive statistics

VARIABLES (Unit Of Measurement) [NOTATION]	(1) MEAN	(2) SD	(3) MIN	(4) MAX	(5) N
Per Capita Real GDP Growth Rate (Annual Percentage)[GRO]	1.28	7.32	-17.55	22.18	51
Share of Oil Rents in GDP (Percentage Value)[REN]	11.79	8.32	1.11	38.55	51
Democratic Institution Quality (Numerical Value) [DEM]	-1.373	5.882	-7	8	51
Political Right Institution Quality (Numerical Value) [POI]	4.84	1.49	2	7	51
Budgetary Institution Quality (Numerical Value) [BGT]	2.755	0.252	2.500	3	51
Diversification Proxy by Agriculture Export (Numerical Value)[ADV]	6.542	12.862	-1.001	63.30	51
Official Real Exchange Rate (US Dollar)[EXR]	60.15	77.54	0.55	305.8	51
Health of the population proxy (Numerical Value) [HEA]	119.3	27.62	2.5	3	51
Share of Gross Savings in GDP (Percentage Value) [VGS]	59.375	33.59	15.72	123.6	51
Subsidy Regime on Fuel Import Proxy (Percentage Value) [FUE]	4.77	7.16	0.4	28.6	51
Daily Crude Oil Produced in log form (Million Barrels) [CPL]	7.427	0.503	4.95	7.84	51

2.11   The research method and estimation technique

In this section, we estimate a dynamic model of economic growth to determine the effects of oil rents, institutions and diversification on the growth of the Nigerian economy. This research work closely follows the empirical endogenous growth literature, which assumes an association of growth with both economic and non-economic variables, using time series data from 1967 to 2017. Our model development began with consideration of all the known essential variables linked with our research questions using the OLS estimator as preliminary estimator. That technique aligns with the proposition of Hendry and Krolzig (2005) regarding the model selection procedure. To avert potential endogeneity bias, after our preliminary estimation with the OLS approach, the study uses a dynamic instrumental variable (IV) estimator (the consistent estimator) .

Given the output of our VAR lag selection output in Table 2.4 below which dictates one lag for all the variables in our model, we began the empirical work using the General-To-Specific model selection with an OLS approach with the general model for this study given as:

$\text{GRO}_t = \beta_0 + \beta_1 \text{REN}_t + \beta_2 \text{REN}_{t-1} + \beta_3 DEM_t + \beta_4 DEM\text{t-1} + \beta_5 \text{POI}_t + \beta_6 POI_{t-1} + \beta_7 \text{BGT}_t + \beta_8 BGT_{t-1} + \beta_9 \text{AGV}_t + \beta_{10} AGV_{t-1} + \beta_{11} \text{EXR}_t + \beta_{12} EXR_{t-1} + \beta_{13} \text{VGS}_t + \beta_{14} VGS_{t-1} + \beta_{15} HEA_t + \beta_{16} HEA_{t-1} + \beta_{17} \text{GRO}_{t-1} + \mu_t \ldots \ldots \ldots (1)$

Equation (1) above is the general model for this study and the output of its regression equation via the OLS is presented below in Table 2.5:

2.11.1 The optimal lag selection

One of the vital pre-estimation procedures in econometric literature is the determination of the optimal choice of lagged variable to be used for the estimation procedure. In a dynamic autoregressive model like ours, it is necessary to ensure that the variable of interest is lagged accordingly to avert the challenges associated with loss of efficiency and inconsistent estimates. As shown in Table 2.4, the vector autoregressive lag order selection procedure is apply to determine the optimal lag procedure for our variables. The optimal criterion are with * in the Table 2.4. Any of the criterion can be used since one lag is the optimal level. For this study, we use the AIC criterion with lowest value which is the optimal value option of 23.4015*.

Table 2.4: VAR lag selection criterion result

LAG	LL	LR	FPE	AIC	HQIC	SBIC
0	-518.511	NA	9.5337	28.2979	28.3746	28.5156
1	-402.928	231.17	10163.6*	23.4015*	23.862*	24.7077*
2	-380.68	44.496	12751.9	23.5503	24.3945	25.9449
3	-359.492	42.376	19369.5	23.7563	24.9843	27.2394
4	-339.348	40.288*	39855.4	24.0188	25.6305	28.5903

Endogenous Variables: Gro, Ren, Dem , Poi , Bgt, Exr, Adv , Vgs, Hea.
Exogenous : Constant
*Indicates Lag Order Selected by the Criterion. (Each test at 5% level)
Source : Author's computation.

The output of the regression equation (1), our General model for this chapter through the OLS is presented below in Table 2.5:

Table 2.5: The General-To- Specific Model using the dynamic OLS
Dependent Variable : Real GDP per capita Growth Rate [GRO]

VARIABLES (Unit Of Measurement) [NOTATION]	(1) Dynamic Ordinary Least Square Model
Oil Rents as a Percentage of GDP (Percentage Value)[REN]	0.0979
	(0.249)
Oil Rents as a Percentage of GDP (Percentage Value)[REN](-1)	-0.403*
	(0.209)
Democratic Institution Quality (Numerical Value)[DEM]	2.150**
	(0.876)
Democratic Institution Quality (Numerical Value)[DEM](-1)	0.894
	(0.537)
Political Rights Institution Quality(Numerical Value)[POI]	-3.240
	(1.905)
Political Rights Institution Quality (Numerical Value)[POI](-1)	3.109
	(2.265)
Budgetary Institution Quality (Numerical Value)[BGT]	-14.23
	(9.686)
Budgetary Institution Quality (Numerical Value)[BGT](-1)	-12.50
	(15.90)
Diversification Proxy by Agriculture Exports (Numerical Value) [ADV]	0.0529
	(0.782)
Diversification Proxy by Agriculture Exports (Numerical Value) [ADV](-1)	0.151
	(0.609)
Official Real Exchange Rate (US Dollar)[EXR]	-0.0716
	(0.0747)
Official Real Exchange Rate (US Dollar)[EXR](-1)	-0.126
	(0.149)
Gross Savings as a Percentage of GDP (Percentage)[VGS]	-0.0342
	(0.195)
Gross Savings as a Percentage of GDP (Percentage)[VGS](-1)	-0.0488
	(0.129)
Health of the Population proxy (Numerical Value)[HEA]	-2.685*
	(1.347)
Health of the Population proxy (Numerical Value)[HEA](-1)	2.451
	(1.265)
Per Capita Real GDP Growth (Annual Percentage)[GRO](-1)	-0.471**
	(0.205)
Constant	124.1
	(98.81)
Observations	27
R-squared	0.809

Note: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Source: Author's Computation

Given that only the lagged share of oil rents in GDP and per capita real GDP growth rate are statistically significant in Table 2.5, therefore,in order to derive our specific model, we introduce the restriction procedure to equation (i) above by *'eliminating the irrelevant variables'* as proposed by Hendry and Krolzig (2005). Table 2.6 below shows the output of the restriction procedure using the elimination procedure of the General-To-Specific-[GETS] model selection as exemplified by Hendry and Nielsen[16] (2007:291-292) which states that *'.... there are two*

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[16]See David F. Hendry and Bent Nielsen: Econometric modelling-A likelihood approach, chapter 19.

aspects to keep in mind: the elimination of irrelevant variables and the retention of relevant variables. The cost of eliminating the irrelevant variables, which could be called the cost of the search is low, whereas the cost of retaining relevant variables is high, associated with the cost of making inference....... General-to-specific(Gets) searches from a congruent initial model are successful'. By implication, the exclusion of the statistically insignificant variables from our regression model is the aim of the restriction procedure in Table 2.6 below:

Table 2.6: Restrictions output: General-To-Specific Model selection(GETS)

Lag Variable[NOTATION]	Ho	Ha	Prob > F value	Outcome
Share of Oil Rents in GDP[REN]	$\beta_2 = 0$	$\beta_2 \neq 0$	0.0031	Reject the Null
Democratic Institution Quality [DEM]	$\beta_4 = 0$	$\beta_4 \neq 0$	0.1305	Not reject the Null
Political Rights Institution Quality [POI]	$\beta_6 = 0$	$\beta_6 \neq 0$	0.2031	Not reject the Null
Budgetary Institution Quality[BGT]	$\beta_8 = 0$	$\beta_8 \neq 0$	0.4522	Not reject the Null
Diversification Proxy by Agriculture Exports [ADV]	$\beta_{10} = 0$	$\beta_{10} \neq 0$	0.8092	Not reject the Null
Official Real Exchange Rate[EXR]	$\beta_{12} = 0$	$\beta_{12} \neq 0$	0.4211	Not reject the Null
Share of Gross Savings in GDP[VGS]	$\beta_{14} = 0$	$\beta_{14} \neq 0$	0.7141	Not reject the null
Health of the Population[HEA]	$\beta_{16} = 0$	$\beta_{16} \neq 0$	0.0846	Not reject the null

Source: Author's Computation

From Table 2.6, we can observe the exclusion of lag one of the following explanatory variables from our model, based on the outcome of the restriction test results which indicated that estimated parameters of the variables in question are equal to zero: lag one of democratic institution quality, lag one of the political rights institution quality, lag one of budgetary institution quality, lag one of agriculture-led diversification, lag one of the official exchange rate, lag one of gross saving in GDP and lag one of the health of the population. Therefore, we proceed below to provide a brief justification for the inclusion and or exclusion of lagged and level variables through the General-to-specific model development above:

The Justification For the Inclusion and Exclusion of Lagged and Level Variables with General-to-Specific Technique

One of the underlying assumptions about the development of economic models is that the event of previous periods potentially has implications on the current year's events. Precisely, the GDP growth rate in the preceding year or quarter may determine the nature of the GDP growth rate in the current period. In taking cognisance of these crucial growth mechanics, economists strategically determine the optimal lag procedure to be utilised in an economic model. One of the essential techniques to determine the lag structure to be used in model development is the VAR selection procedure that adopts one or more of information criterion like AIC, HQIC and SBIC.

In this chapter, the primary interest is on the oil sector of the Nigerian economy and its implication on economic growth vis-à-vis institutions and economic diversification. Economic literature shows that oil rents account for over 80% of the Nigerian federally collected total revenue and more than 60% of foreign exchange earnings (Central Bank of Nigeria statistical bulletin, 2019). By implication, oil matters to the aggregate growth rate of the Nigerian economy. Because of the reliance of the Nigerian economy on the oil sector, the events in the previous fiscal year about the trend in the global oil business or price potentially determine the oil forecast for the current year and perhaps the oil rents for the current or succeeding year. Whilst this is a truism for the Nigerian economy, no other economic indicator potentially determines the growth of the Nigerian economy, like oil rents. Because of that position, the focus of our lag structure would have been confined to the oil rents alone, but to align our model development with theory, we decide to perform the VAR lag procedure for all our variables of interest. Besides, our intuition for applying the general- to -specific model development is to begin our econometric work with all the variables that may or may not impact the Nigerian economic growth, apart from oil rents. By implication, our explanatory variables can be divided into two categories: our primary regressor, the oil rents and other potential explanatory variables.

Given the intuition above about our model development procedure and the output of our restriction procedure in Table 2.6, we can safely conclude that the exclusion lag one component for other explanatory variables apart from oil rents and per capita GDP growth rate is justified. To reinforce our baseline argument supporting the theoretical exclusion of the lag one components of other explanatory variables from our model development, we perform some robustness checks using the general model with our instrumental variable approach. However, it turns out that our instruments became weak, which invalidates the satisfaction of the crucial assumptions of an IV approach. However, our terminal IV results as we shall see in Table 2.7 satisfies all the primary conditions for an IV.Because of the outcome of our restriction procedure for the general model in Table 2.6 and the above justifications of lagged variables, we proceed to implement our specific model for this chapter.

2.11.2 The model specification

Our specific model for this study is expressed as:

$\text{GRO}_t = \alpha + \beta_1 \text{REN}_t + \beta_2 \text{REN}_{t-1} + \beta_3 DEM\text{t} + \beta_4 BGT_t + \beta_5 POI_t + \beta_6 \text{ADV}_t + \beta_7 \text{EXR}_t + \beta_8 \text{VGS}_t + \beta_9 \text{HEA}_t + \beta_{10} \text{GRO}_{t-1} + \mu\text{t}.................................(2)$

From the model above in equation (2) , REN_t is the share of oil rents in GDP, DEM$_t$

is democratic institution quality, BGT_t is budgetary institution quality, POI_t is the political rights institution quality, HEA_t represents the health of the population proxy, EXR_t is the official exchange rate of the Nigerian Naira to the US dollar. ADV_t is the diversification proxy, VGS_t is the share of gross savings in GDP and GRO_{t-1} is the lag one of the dependent variable, the per capita growth rate of real GDP. μ_t is the stochastic error component. To derive the parameter estimates of our explanatory variables, we proceed below to implement our regression estimation procedure :

2.11.3 The regression analysis: ordinary least square (OLS) - preliminary estimator

Our estimation method for the empirical work of this chapter begins with the application of an ordinary least squares (OLS) approach. The objective of an OLS approach is to minimise the residual sum of the squares. This means fitting the regression line of our sample population as close as possible to the true value of the dependent variable, real per GDP growth rate of Nigeria. If the five basic assumptions of OLS [17] hold, then our OLS approach will produce Best Linear Unbiased Estimates (BLUE). In this chapter, we use the General-To-Specific variable selection technique; the regression analysis begins with the OLS estimator as the preliminary estimation procedure before the introduction of an IV, the consistent[18] estimator.

Although, a simple OLS can be used to estimate the regression model, because the application of an OLS estimator may be efficient, the likelihood of an omitted variable bias and/or endogeneity risks in a regression model necessitates the application of an alternative estimator, such as the IV approach. The OLS has various shortcomings, including omitted variable bias, reverse causation or simultaneity, error-in-variable or measurement error, all of which lead into endogeneity problem. Consequently the application of an OLS with these shortcomings would lead to bias and perhaps inconsistent estimates for our regression model. We recommend an instrumental variable regression to address endogeneity risks because this has in-built instruments to correct the potential for bias and inconsistent estimates in our sample. A full description of the endogeneity problem for our empirical work is given below:

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[17] The assumptions of the OLS are that: the functional form is linear, β_s. that is, $E(Y/X)$ is a linear function of β_s;. the error term has zero mean, E μ_i/x_i =0 and $E(\mu_i)$=0; error term average to 0 in our population sample; the violation of the assumption of zero mean for μ_i according to Wooldridge (2016) leads to omission variable bias, sample selection error and measurement error in our explanatory variable; thirdly, that the error term is uncorrelated with the regressors, Covμ_i, x_i=0, that is μ_i and x_i are independent; also, the homoskedasticity assumption, means a constant variance assumption and lastly that error terms are independent; no autocorrelation or the Cov μ_i, μ_j /Cov $(x_i, x_j) = 0$. In essence, the OLS estimator is an efficient estimator when explanatory variables are exogenous, but because of the endogeneity problem of the institution index, the IV estimator, which is the consistent estimator, is better for our study.

[18] The consistent estimator would have a smaller bias than the inconsistent OLS estimator in any finite sample.

2.11.4 The endogeneity issues

In econometric literature, an endogenous variable is a variable that correlates with the error term. A variable determined by factors outside the model or formally speaking not associated with the error term within the model is an exogenous variable. According to Wooldridge (2016:461-482), '..... *IV methods can be used to obtain consistent estimators in the presence of omitted variables. IV can also be used to solve the errors-in variable problem, at least under certain conditions'*. A consistent estimator like an IV is often used in economics literature when faced with the likely difficulty of omitted variable bias. With an OLS estimator, it is possible to neglect an omitted variable, leading to bias and inconsistent estimates. Wooldridge (2016:80) posited that the associated bias with the OLS could be divided into two groups: an upward bias and the downward bias. An upward OLS bias occurs whenever the expected value of an estimator is greater than the population parameter value. The downward bias arises if the expected value of an estimator is lower than the population parameter value. There are two crucial ways in which the issue of endogeneity arises in this study. The first is the impact of oil rents estimation on the economic growth of Nigeria and second is the potential less severe endogeneity factor of institutional factors on economic growth. We proceed below to discuss the two possibilities:

[a] **Measurement Error with Oil Rents and Economic Growth in Nigeria**

Empirical evidence shows that Nigeria's estimation of oil rents is prone to measurement error for various computational reasons and flaws in accounting procedures. One of the practical pieces of evidence concerning the measure of oil rents in Nigeria is that the actual production cost of crude oil is probably known only to the government of oil-producing economies because of the politics surrounding crude oil extraction. In Nigeria, only the federal government and the supervisory oil regulator, the Nigeria National Petroleum Corporation (NNPC), understand the actual cost of crude oil production. Nigeria's Minister of State for Petroleum, Mr Timipreye Sylva, in an interview in the Premium Times newspaper on 18th May 2020, posited that the production costs of crude oil in Nigeria were around $30 per barrel. The Nigerian National Petroleum Corporation (NNPC) managing director, Mr Mele Kyari, corroborated the above claim, stating that the production costs hover above $20 per barrel. The implication is that Nigeria's crude oil production costs are a subject of controversy. Statistical facts from the Central Bank of Nigeria in 2018 shows that oil rents account for over 80% of the aggregate federally collected government revenue and more than 50% of foreign exchange earnings. Specifically, a potential bias in the measurement and estimation of oil rents would be correlated with the error term; such anomalies in the analysis of oil rents would likely impact the Nigerian economic growth, given the dependency of the growth of the Nigerian economy on the volume of oil rents.

Besides, there are other extraneous costs associated with crude oil production in Nigeria,

such as rent-seeking costs or the funding of amnesty programmes for repentant rebels in the oil-producing host communities, which might not be included in the formal accounting process of oil rents. Another important variable that is likely to be omitted in the estimation of the Nigerian oil rents is the Niger Delta Development Corporation (NNDC) effect on the Nigerian economy's growth. NNDC is an intervention or palliative agency of the Nigerian government in the oil sector with extrabudgetary funds to finance direct developmental projects in Nigeria's oil-producing states. A previous government in Nigeria has described it as *"a government within the government"*. Therefore, we can regard its effect as a potential omitted variable. Some of the extrabudgetary funds allocated to the NNDC would have been used to grow the Nigerian economy. The implication of the above loopholes in cost estimation is the potential error in the accurate measurement of oil production in Nigeria, which affects the total volume of oil rents on the one hand and the Nigerian economic growth on the other hand. Essentially, all these issues sum up to potential endogeneity bias in our model development. In this regard, investigating the impact of oil rents on growth must entail endogeneity discussion in our empirical model, as it concerns oil rents as a percentage of GDP.

In essence, we identify oil rents as a percentage of GDP to be endogenous in this chapter with support from our Wu-Hausmann test procedure. Oil rents, by definition, are the difference between the value of crude oil production at world prices and the cost of production. By definition, the determination of the value of crude oil production at world prices is beyond the dictate of Nigeria's domestic oil policies and or actions of the Nigerian government. It is the objectives and policies of the international players in the oil industry and the international economic conditions that largely determine the pricing and the value of crude oil. In this instance, we could represent the associated factors that determine the growth of the Nigerian economy via the oil sector with the application of oil rents. Other extraneous factors with linkages with the oil rents are likely to be captured within the stochastic error component.

[b] Measurement Error with Institutions and Economic Growth in Nigeria

One of the features of developing oil-producing economies like Nigeria is the existence of weak institutions. Poor institutions hamper economic growth and preclude the business environment from developing. The measurement of institutions probably constitutes another instance of endogeneity, given its subjective nature. There are no exact measurement criteria in economic literature to precisely addressing an institution's impact on an economy. The definition of what constitutes an institution is a subject of debate among scholars, as argued by Stefan (2019). Loosely defined, an institution is the 'rule' or 'how things should be done'. The 'best' parameter to define, measure or access institutions often poses challenges to scholars, primarily due to subjectivity.

In this chapter, we observe that although weak institutions characterise the Nigerian economy, endogeneity challenges do not meaningfully impact institutions in Nigeria for the following reasons. The qualities of institutions utilised for this chapter are derived from well-established and authoritative sources like the World Bank, Polity IV index of regime characteristics, and Quality of Governance indicators. Given the strength of the institutional metrics for Nigeria from many of the listed sources, empirical evidence suggests that the grading or scores for the quality of institutions in Nigeria better reflect the institutional realities in Nigeria. One of the likely sources that may breed potential measurement error is the usage of the corruption perception index from Transparency International, which we did not utilise as sources of qualities of institutions for this chapter. The institutional rating of Nigeria by Transparency International has come under severe empirical attack given the perceived bias of prominent Nigerians among the directors of Transparency International. To avoid potential bias or error-in-variables, which leads to correlation with the error terms- the manifestation of the endogeneity problem in our model, we step down the application of institution quality from Transparency International for this chapter. By implication, an institution is not being treated as an endogenous variable for this chapter, and our formal statistical test, the Wu-Hausmann test, confirmed that the institution is not endogenous for this chapter.

Choice of Instruments: log of daily crude oil produced and government subsidies
The choice of an instrument for 2SLS, otherwise known as the instrumental variable estimator, is primarily dependent on the satisfaction of two crucial conditions: instrument relevance and instrument exogeneity as proposed by Greene (2008) and Wooldridge (2016). For an instrument to be relevant, it has to be correlated with the endogenous variable. In this chapter, our instruments must be correlated with the Nigeria oil rents as a percentage of GDP. In the context of instrument exogeneity, the instrument must not be correlated with the error term. The Stock and Yogo (2005) rule of thumb for checking instrument relevance is that an F statistic (Minimum Eigenvalue) of less than 10 potentially indicates a weak instrument. For instruments exogeneity, we use Sargan and Basman test with the null hypothesis that instruments are exogenous, while the alternative says otherwise.

In this chapter, our instruments are the log of daily crude oil produced in Nigeria and the proxy variable for the government subsidy regime. The estimation of oil rents in Nigeria is partly a function of the daily crude oil produced. Specifically, oil rents are the difference between the volume of daily crude oil produced in a million barrel and the price of oil at the international market. By implication, the volume of crude oil produced in Nigeria is correlated with the oil rents. However, empirical evidence suggests that Nigeria's volume of crude oil is not associated with other factors. For instance, the primary reasons for drilling oil rigs in

Nigeria are extracting oil from the rigs and selling the commodity in exchange for rents in the form of a capita or petroleum profit tax to the government. Therefore, given the dependence of the Nigerian economy on oil rents as drivers of growth, an increase in the volume of crude oil produced, other things the same, would improve the growth of the Nigerian economy. Assumptions hold that volume of crude oil produced in the Nigerian state is not correlated with any other mechanism in our error term. To normalise the quantity of daily crude oil produced in Nigeria in a million barrels, we transform it into log form.

Secondly, our proxy variable for the subsidy regime of the Nigerian government is the volume of refined fuel imported into Nigeria through which the government plan subsidy payments to oil importers. In a way, the magnitude of oil rents accruable to the Nigerian government partially depends on the extent of subsidy payout to the fuel importers. The amount of money that government utilises as subsidy payment is taken out from the oil rents. By implication, the subsidy regime of the Nigerian state is like a leakage or withdrawal from oil rents on the one hand and government treasury on the other hand. The implication of this oil subsidy policy of the Nigerian government is that subsidy payments negatively correlate with oil rents and economic growth in Nigeria. Therefore, it follows logically that government subsidy is correlated with oil rents and has implications for Nigeria's economic growth. However, this subsidy regime of the Nigerian government does not have a meaningful association with other growth channels in Nigeria.

The combinations of the above justifications are the basis of our choice of the log of daily crude oil produced in Nigeria and the government subsidy regime as our instruments for our empirical work for this chapter. Above all, the two instruments satisfy the crucial assumptions of instrument relevance and instrument exogeneity, as we shall see under the empirical result. To avert the problem of endogeneity in this chapter, we apply the IV estimator as explained below.

2.11.5 Regression analysis:instrumental variable technique (IV) - the consistent estimator

We apply the instrumental variable estimator to correct the potential problem of endogeneity in our model. The description of an instrumental variable below involves two stages of regression. The share of oil rents in GDP, (REN_t) is our endogenous variable from the options considered. The following variables are our exogenous explanatory variables: REN_{t-1} , DEM_t , POI_t, BGT_t, ADV_t , EXR_t, VGS_t, HEA_t, and GRO_{t-1}.

We use two instruments: the log of daily crude oil production in million barrels and a proxy variable on government subsidy regime. The variable used as a proxy is the volume of refined

fuel imported by fuel importers which the Nigerian government used in planning subsidy payments. The instruments are denoted as $lnCPL_t$ and FUE_t. Both variables were confirmed to be valid instrumental variables based on the results of instrument relevance and instrument exogeneity performed in this study. Our dynamic IV regression model above involves the following two stages:

Stage 1: We regress REN_t which is the endogenous explanatory variable on the instruments $lnCPL_t$, FUE_t and REN_{t-1}, DEM_t, POI$_t$, BGT$_t$, ADV_t, EXR_t, VGS_t, HEA_t, and GRO_{t-1} which are the exogenous explanatory variables by using the OLS estimator and we save the predicted value of REN_t.

Stage 2: We regress the dependent variable GRO_t on the predicted value variable REN_t and the exogenous variables REN_{t-1}, DEM_t, POI$_t$, BGT$_t$, ADV_t, EXR_t, VGS_t, HEA_t, and GRO_{t-1} using the OLS estimator.

A valid instrumental variable has two properties: instrument relevance and instrument exogeneity. If the instrumental variables above are relevant and exogenous, and the exogenous variable is exogenous, then the specialised type of two-stage least square estimator above is consistent in large samples. We then proceed to check for the validity of our instrumental variable, whether weak or strong. By instrument relevance, the instrumental variables $lnCPL_t$ and FUE_t are relevant if they are correlated with the endogenous variable REN_t that is, Corr($lnCPL_t$ and FUE_t, $REN_t) \neq 0$. Instrument exogeneity, on the other hand, implies that our instrumental variables $lnCPL_t$ and FUE_t are uncorrelated with the stochastic error component μ_t, which denotes that, Corr(μ_t, $REN_t) \neq 0$.

According to Stock and Yogo (2005), the rule of thumb for checking instrument relevance is that an F statistic (minimum Eigenvalue) of less than 10 indicates possible weak instruments. Checking for instrument exogeneity pertains to having more than one instrument. If the instrument used is one, the regression coefficients are exactly identified. In this study, we use two instruments, so we check for instrument exogeneity. The null hypothesis is that all instrumental variables are exogenous. The alternative hypothesis is that correlation with the error term exists for at least one of the instrumental variables. We apply the output of our consistent estimator (IV) in the discussion of our findings in this chapter.

2.11.6 The empirical results

Table 2.7 below presents our empirical output for this chapter. The Table consist of output of two estimators, the OLS in column 1 which is our preliminary estimation procedure and the output of our consistent estimator, the IV in column 2. Because the instrumental variable approach is more consistent and overcome the potential endogeneity bias associated with the

OLS,the findings of this chapter is base on it-the IV estimator. The essence of reporting the OLS is to aid visual comparison or differences prevailing among our parameter estimates with the application of the two estimation procedures. In effect, column 1 and 2 contain all the relevant explanatory variables utilised in our model development, but the findings of the chapter is extracted from column 2 with the IV approach.

Table 2.7: The Empirical Results : OLS Estimator and Consistent Estimator-IV Output
Dependent Variable : Real GDP per capita Growth Rate [GRO]

VARIABLES(Unit Of Measurement) [NOTATION]	(1) OLS Estimator	(2) IV Estimator
Oil Rents as a Percentage of GDP (Percentage)[REN]	0.555***	1.010***
	(0.154)	(0.218)
Oil Rents as a Percentage of GDP (Percentage)[REN](-1)	-0.176	-0.264*
	(0.163)	(0.161)
Democratic Institution Quality (Numerical Value)[DEM]	0.246	0.780**
	(0.362)	(0.396)
Political Rights Institution Quality (Numerical Value)[POI]	1.864	2.497*
	(1.324)	(1.299)
Budgetary Institution Quality (Numerical Value)[BGT]	3.401	4.122
	(7.225)	(6.987)
Diversification Proxy by Agriculture Exports (Numerical Value) [ADV]	0.520	1.132**
	(0.497)	(0.525)
Official Real Exchange Rate (US Dollar)[EXR]	0.0297	0.0252
	(0.0264)	(0.0255)
Gross Savings as a Percentage of GDP (Percentage)[VGS]	-0.158	-0.288**
	(0.107)	(0.113)
Health of the Population proxy (Numerical Value)[HEA]	0.199	0.374**
	(0.165)	(0.171)
Per Capita Real GDP Growth (Annual Percentage)[GRO](-1)	0.157	0.144
	(0.176)	(0.170)
Constant	-40.08	-63.44*
	(33.16)	(33.07)
Observations	34	34
R-squared	0.528	0.349
Jarque-Bera Normality Test	0.264	0.7564
Endogenous Test-Wu-Hausmann Pvalue		0.0032
Min. Eigenvalue F Stat		10.1
Jarque-Bera Normality Test		0.7564
Overidentification Test-Sargan Chi2 Pvalue		0.5860
Overidentification Test-Basman Chi2 Pvalue		0.6599

Note: Standard errors in parentheses.** p<0.01, ** p<0.05, * p<0.1.
Diagnostic tests are in probability values

2.11.7 Diagnostic tests for the instrumental variable (IV) estimator

Central to the IV estimator are three specific diagnostic tests: the test of endogeneity, the weak instruments test and the overidentification test. We perform each of these tests as reported in Table 2.7, and the outcome of each of these tests is discussed below[19]:

Endogeneity test

The null hypothesis at 5% critical value of the Wu-Hausmann test is that our variables are exogenous, and the alternative hypothesis is that variables are endogenous. The P-value from Table 2.7 for the Wu Hausmann test is 0.0032. In this case, we reject the null hypothesis and conclude that our variable is endogenous.

Weak instruments test-Stock and Yogo (2005) Minimum Eigenvalue F stat

Another vital test under the IV regression model is the test of the strength of the instruments used. With the minimum Eigenvalue F statistics, the rule of thumb according to Stock and Yogo (2005) is that once the F statistic is greater or equal to 10, it implies that instruments used are strong. Our minimum Eigenvalue F statistic for the IV is 10.1 as shown in Table 2.7, which indicates that our instruments, the log of daily crude oil produced in Nigeria in a million barrels and the proxy variable for government subsidy (the volume of fuel imported into the Nigerian economy) are strong instruments for our endogenous variable (oil rents as a share of GDP).

Overidentification tests (Sagan and Basman tests)

Econometric literature shows that once there is more than one instrument used for an IV regression model, there is a need to perform an overidentification test. The regression coefficients can be underidentified, exactly identified or overidentified. Our Sargan Chi-square probability value for IV model is 0.5860; the Basman Chi-square P-value for our IV model is 0.6599; both at 5% critical values. The decision rule for the null hypothesis is that instruments are valid and correctly specified, while the alternative hypothesis says otherwise. From our two P values above, we cannot reject the null hypothesis, meaning that our two instruments (the log of daily crude oil produced in a million barrels and the proxy subsidy variable, which is the volume of fuel imported into the Nigerian economy) are valid and correctly specified. The above diagnostic tests indicate that our model is valid, robust and responds coherently to our research questions, indicating that the model is suitable for this study.

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[19]Some other diagnostic tests for an OLS like Heteroskedasticity test, Ramsey RESET test and Breusch Godfrey LM test for serial autocorrelation were performed for our OLS estimator-the preliminary estimation technique above. The output and discussion of such diagnostic tests can be found in the appendices subsection 5.3.5. Besides, in Table 2.7, we conduct the t-test procedure to determine whether the two statistically insignificant variables in our IV estimator could be excluded from the regression model. However regarding the interdependence of explanatory variables, the test results show that such variables are significant. The outcome further impacts our diagnostic test results, which implies that our regression model in Table 2.7 is the terminal regression model equation for this study.

2.11.8 Long-run equilibrium solution for the instrumental variable estimator

The parameter estimates of our instrumental variable (IV) technique in column 2 of Table 2.7 are the marginal or partial estimates. Formally speaking, these parameter estimates are the short-run estimates of our betas. The long run equilibrium solution for our regression equation, the IV is given below showing primarily the variables that are statistically significant, except for the quality of budgetary institution :

GRO = 0.87[REN] + 0.91[DEM] + 4.82[POI]+ 2.92[BGT] + 1.32[AGV] + - 0.34[VGS] + 0.44[HEA].

The long run equilibrium solution above indicates a positive long run relationship between oil rents and economic growth in Nigeria with a magnitude of 0.87, and a direct long run association of qualities of institutions (democratic, political right and budgetary institutions) with the Nigeria economic growth and a corresponding magnitude of effect of 0.91, 4.82 and 2.92 respectively. However, the long run effect of the budgetary institution is statistically insignificant. Moreover, there exists positive long run effect of diversification on the Nigerian economic growth, ditto for the health of the Nigerian population. Conversely, our long run equilibrium solution suggests an inverse relationship between the share of savings in GDP and the Nigerian economic growth.

2.12 Discussion of findings

2.12.1 Oil rents and economic growth

In column 1 of Table 2.7 , our OLS parameter estimate for oil rents as a share of GDP is 0.555*** with its lag one being -0.176. For column 2 of Table 2.7 with an IV estimator, the marginal estimated coefficient of oil rents as a share of GDP is 1.010***, with the lag one estimated coefficient as -0.264* (0.746 in aggregate). It indicates that holding all other factors constant, a unit change in the share of oil rents in GDP increases the Nigerian economy by approximately 1.010*** percentage points in the short run at 1% significant level and decreases in the previous year with -0.264* percentage points at 10% significant level. By implication, the point estimate of the IV is higher than the OLS point estimate by about 0.45% and about 34% with lag one. However, the long-run equilibrium value, using the IV estimator is 0.87, indicating a positive effect of oil rents on the growth of the Nigerian economy in the long run.

An important implication of our result is that a positive statistically significant effect exists between economic growth in Nigeria and the share of oil rents in GDP both in the short run and in the long run. This result is consistent with our a priori expectations and with empirical studies such as Rosser (2006) and Akinlo (2012). The methodology of our paper is different from the previous work of Oladipo and Fabayo (2012) which demonstrated a negative statistically significant association between oil rents and economic growth in Nigeria between 1990 and 2006, using the OLS approach. We use a dynamic instrumental variable with an expanded scope of 1967 to 2017, which addresses the potential endogeneity problem with the research work of Oladipo and Fabayo (2012).

Statistical evidence from the Central Bank of Nigeria (2018) indicates that about 80% of the federally collected revenue in Nigeria emanates from the oil sector, the sector contributes more than 50% to the Nigeria export earning within our study period. The combination of the piece of evidence is that, the impact of oil rents within the Nigerian economy is significant. Besides, the budgetary allocations of all the states in Nigeria are dependent on the oil rents, meaning that potential increase in oil rents would contribute meaningfully to the economic activities of the 36 states of Nigeria. Given the size of the Nigeria population (over 200 million), an increase in the oil rents improves the magnitude of productivity in the economy, an increase in productivity elevates the number of jobs available for the population and improvement in employment level leads to mechanical increase in the GDP growth. For instance, most of the infrastructural development and capital projects in Nigeria have been financed by the oil rents.

2.12.2 Political institutions qualities and economic growth: Democratic and political rights institutions

For the democratic institution quality's parameter coefficient, while the OLS marginal effect in column 1 of Table 2.7 is 0.246, although positive but is statistically insignificant. The point estimate of our IV as shown in column 2 of Table 2.7 is 0.780**, be default, it is higher than the point estimate of OLS by about 68%. Further, the IV marginal effect shows a positive and statistically significant effect between democratic institution quality and economic growth in Nigeria. The statistical interpretation is that a percentage point change in democratic institution quality increases economic growth on average by 0.780 percentage points in the short run at 5% level of significance, holding other things equal. The long-run equilibrium value for democratic institution quality is 0.91, which is positive. Therefore, there exists a positive and statistically significant effect of democratic institution quality in the short run and in the long run, on the growth of the Nigerian economy. The result is consistent with the conclusions of scholars such as Acemoglu et al. (2015, 2019) and demonstrates that democratic institution

quality have promoted economic growth in Nigeria during the period of study. For instance, empirical evidence suggests that democratic institution quality have had a marginal but consistently positive impact on economic growth since 1999.

The parameter estimate of political rights institution quality in column 1 with the OLS is 1.864, positive sign but statistically insignificant. In column 2 of Table 2.7 with an IV, our point estimate is about 25% greater than the parameter estimate of the OLS , that is, 2.477*, meaning that, ceteris paribus, a percentage point increase in political rights quality increases the economy by 2.497 percentage points in the short run at 10% level of significance. In the long run, the equilibrium value is 4.82. In effect, there exists a positive association between political rights institution quality in the short run and the long run. The literature of political economy shows that citizen participation in electoral and political activities is crucial for the advance of the economy through the choice of political office holders who are growth driven.

2.12.3   Budgetary (Economic) institution quality and economic growth

The empirical literature suggests a correlation between budgetary institution quality and economic growth. In the context of Nigeria, there are challenges regarding the budgetary priorities and policies of the government, especially during the drafting stage. In column 1 of Table 2.7, the estimated parameter using the OLS is 3.401, with a positive sign but statistically insignificant. From column 2 of Table 2.7 with an IV estimator, the parameter estimate for a budgetary institution quality is 4.122, which is higher than that of the OLS, but the estimate is statistically insignificant too. The long-run coefficient is 2.92, also statistically insignificant. The 2013 IMF report on budgetary planning and passage underscored the importance of budgetary institutions as one of the essential determinants of economic growth. Empirical evidence shows that the Nigerian economy is beset by inadequate policy formulation and implementation through the budgetary institutions and by lack of transparency. Budget padding, a term coined in Nigeria by the legislators, inflates budgetary bills sent by the executive to the two Houses of Assembly for passage, a practice conducted within the last two decades.

Nigeria's budgetary institutions qualities are rated by the World Bank's World Development Indicators with a score of below 3, in a range of 1 as the lower bound to 6 as the upper bound. Our findings regarding Nigeria's budgetary institutions partly align with this World Bank scorecard. Essentially, the introduction of budgetary institutions as one of the institutional qualities in Nigeria is one of a key contribution of this study to the literature .

2.12.4 Diversification proxy: agricultural food exports and economic growth

Previous empirical work on diversification has demonstrated a negative relationship between the diversification efforts of the government and economic growth, especially where agriculture is concerned. Our coefficient for agricultural food exports as a share of merchandise exports as a proxy for diversification showed a positive association with economic growth in the short run, as seen in Table 2.7, column 1 with OLS estimator (0.520) but statistically insignificant and column 2 with an IV approach (1.132**) which is statistically significant. Our point estimate for the IV is much more greater than by about 54%. Interpreting the IV estimate- a percentage point increase in agriculture diversification raises economic growth by 1.132 percentage points in the short run at 5% level of significance. Also, there exists a positive long-run effect (1.32) between the diversification proxy and economic growth. Our result implies that agriculture diversification has the potential to promote the Nigerian economic growth both in the short run and in the long run, if the sector is well developed. The agriculture sector was the primary driver of the Nigerian economy before the advent of oil. Our finding concurs with the diversification policy of the present government with a focus on the agriculture sector.

2.12.5 The official real exchange rate and economic growth

The parameter estimate of the real exchange rate using the OLS in column 1 of Table 2.7 is 0.0297, which is positive, but statistically insignificant. In column 2 of Table 2.7 using the IV, the point estimate is 0.0252, positive but statistically insignificant too. We observe that our IV point estimate is less than the OLS estimate for the official real exchange rate, although both estimates are statistically insignificant. In the long run, the point estimate is 0.03 using the IV. Contrary to the assertion in some literature that exchange rate appreciation is likely to drive down the growth of an economy, this study identified a positive statistically insignificant association between the official real exchange rate and economic growth in Nigeria. The remittance of foreign currency into the economy by Nigerians living abroad is likely to be playing some role here. Statistical investigation shows that the value of remittances from abroad has been rising, and contributing to the growth of the Nigerian economy.

2.12.6 Gross savings as a share of GDP and economic growth

Theoretical literature, with specific reference to the Solow model, contends that saving is a precondition for investment and is a strong determinant of economic growth. Our estimated coefficient for gross savings as provided in column 1 with the OLS approach is -0.158, showing

a negative sign but statistically insignificant. In column 2 of Table 2.7 with an IV estimator, our point estimate is -0.228** indicating a negative and statistically significant short-run effect with economic growth. Our IV parameter estimate is higher than the OLS point estimate by about 45%, although both of the estimates have negative signs. By implication, we interpret the IV estimate as, a percentage point increase in the level of gross savings as a share of GDP decreases economic growth by -0.228 percentage points in the short run at 5% level of significance. The long-run equilibrium coefficient is -0.34, indicating a negative long-run effect on the growth rate of the Nigerian economy. This long-run equilibrium coefficient runs contrary to our a priori assumption, and likewise the short-run estimate. In the context of Nigeria, political office holders hold the bulk of savings, often outside the country. It could be this factor that our empirical work is picking up.

2.12.7 Health of the population proxy: mortality rate per 1000 population

In column 1 of Table 2.7 with an OLS, the parameter estimate is positive, but statistically insignificant (0.199). However, our IV point estimate is statistically significant and higher than the positive magnitude of the OLS estimator by about 47%. Specifically in column 2 of Table 2.7 with an IV approach, and contrary to our a priori expectation, the mortality rate per 1000 live births, a proxy for the health of the population in our study shows a positive and statistically significant relationship with the economic growth rate . The partial effect is 0.374** , meaning that a percentage point change in the mortality rate population health proxy is associated with an increase in economic growth of 0.374 percentage points in the short run at 5% level of significance, ceteris paribus. In the long run the coefficient has a positive sign (0.44) implying a positive long-run equilibrium value of the population health proxy and economic growth in Nigeria. The presumption from our finding about direct relationship between mortality rate and economic growth in Nigeria is that, given the large size of the Nigeria population vis-a-vis an increasing rate of population growth, a decrease in the Nigeria population potentially lead to an increase in the GDP per capita,ceteris paribus. In a way, this finding aligns with the proposition of the Neo-Malthusian theorists that a decrease in population growth improves economic growth. Besides, the empirical work of chapter four of this thesis underscores the Neo-Malthusian hypothesis which our finding about population health and economic growth is picking up as we shall see later. That is another significant support for our finding herein.

One of the observable evidences from Table 2.7 is that there is a large disparities among the point estimates of our preliminary estimator, the OLS and our consistent estimator, the IV. In particular, only the parameter estimate of oil rents share in GDP is statistically significant

among the point estimates of all our explanatory variables with the OLS. In the context of our IV estimates, virtually all our explanatory variables are statistically significant, apart from the budgetary institution quality, the official real exchange rate and the lag one of per capita real GDP growth as shown in Table 2.7. Furthermore, the point estimates of those three explanatory variables are the only ones with higher magnitude above the point estimates of an IV; the rest of the point estimates of other remaining explanatory variables are lower than that of the IV as demonstrated in Table 2.7.

The R squared for our consistent estimator, IV model is 0.35, representing the proportion of variation in Nigeria's economic growth, as explained by our explanatory variables. If the target is a high R squared, the OLS method would be used since the R squared of an OLS estimate is expected to be higher than an IV model, as seen with 0.53 in Table 2.7 above. The primary motivation for an IV estimator according to Wooldridge (2016: 471) in his book titled *Introductory Econometrics- A Modern Approach* is *'to provide better estimates of the ceteris paribus effect'* of our explanatory variable on the dependent variable, when correlation exists between the stochastic error component and the explanatory variable.

2.13   Summary of Chapter Two

Chapter Two of this thesis investigates empirically whether oil rents, institutions and diversification determine economic growth in Nigeria, using time series data from 1967 to 2017. The study identifies that there is a positive short-run and long-run relationship between oil rents and economic growth in Nigeria, which is consistent with previous research (Rosser, 2006). Contrary to the conclusions of Spatafora and Warner (1995) and Mehlum et al. (2006) that natural resources such as oil have a negative correlation with economic growth and that the existence of such natural resources is a curse to an economy, this study joins the school of thought that refutes such a proposition, especially in the context of Nigeria.

The study also demonstrates that political institutions in the form of democratic institutions have a positive relationship with the economic growth of Nigeria in the short run and the long run. Democracy in Nigeria has continued to evolve since 1999, after a period of prolonged military rule. The political economy literature shows that democracy is a process or, at best, a work in progress. Our empirical evidence shows a positive, statistically significant association between political institutions and economic growth in Nigeria. This outcome is consistent with the New Institutional Economics literature and also the conclusions on the correlation between democracy and economic growth in Acemoglu et al.'s *Democracy does cause growth* (2019), Mehlum, et al. (2006), Collier and Hoeffler (2005) and Gylfason (2001).

In line with assertions in the political-economic literature that political rights are essential for the advancement of economic growth, our study identify a positive and statistically significant association between political rights and economic growth. Political participation, franchise and equal participatory government are amongst the determinants of economic growth, as argued by Acemoglu et al. (2019). The significant implication of our findings on the effect of institutions on Nigeria's economic growth is that '.... *The only remaining plausible explanation is that the great differences in the wealth of nations are mainly due to differences in the quality of their institutions and their economic policies'* Olson (1996: 19).

A budgetary institution is a strong growth driver, as endorsed in economic literature. The use of the Nigerian government budget as one of the institutional qualities is a critical contribution of this chapter to the literature. Whilst the study identify a positive association of budgetary institutions with the Nigerian economy, the estimate is statistically insignificant. This finding partly concurs with scholars who noted that due to the lack of a proper budgetary policy framework, the practice of 'budget padding' and the absence of effective implementation of budgetary allocations, the correlation between economic growth and the Nigerian budget is probably weak (see Transparency International, 2016).

This chapter identifies a positive long-run relationship between diversification via the agriculture sector and economic growth in Nigeria. This finding is consistent with the present federal government's goals of domestic food sufficiency, employment generation in the agriculture sector, and the rapid increase in agriculture contributions to GDP. To sustain the implementation of diversification via the agriculture sector, the Nigerian government closed her land borders with neighbouring Ghana, Benin and Togo since August 2019 till early 2021, partly to curtail the smuggling of food items, notably rice and poultry, into Nigeria, which the government considered as inimical towards the realisation of its diversification objectives.

According to the Central Bank of Nigeria (2016), agriculture was contributing over 80% of foreign exchange earnings before the discovery of oil, more than 60% to the aggregate GDP and 65% to total employment generation. Therefore, we could address some of the challenges facing the Nigerian economy with the application of our findings regarding the implications of agriculture diversification for economic growth. Abayomi (1997) argued that the stagnation of the agriculture sector is a critical factor in Nigeria's unimpressive economic performance.

Theoretical and empirical evidence suggests that saving is vital for economic growth. Drawing from evidence in the Solow model, the findings in this study run contrary to a priori

expectations regarding the association between gross savings and economic growth. The negative relationship between gross savings and the growth rate is a pointer to dissaving inherent in Nigeria. The bulk of savings, especially by the political office holders, are not held domestically. Operation of foreign accounts, money laundering and capital flight by public officers all have negative implications for the Nigerian economy. The combination of these factors might be responsible for the adverse feedback effects of gross savings on the Nigerian economy, noted earlier.

In this chapter, we use the mortality rate per 1000 live births as as a proxy variable for the health of the Nigerian population. With this proxy, we found a positive association between the health of the population and economic growth. Several variables could proxy for the health of the population, notably the healthcare expenditure ratio of GDP or private spending on healthcare. In the context of Nigeria, the dearth of such relevant data made such options impossible. The likely computational issue regarding the mortality rate could be responsible for our outcome. Furthermore, the Nigerian population has crossed the threshold of over 200 millions as of December 2019, according to the IMF World Economic Outlook (2020). In this regard, some scholars have argued that the rising population growth rate is a challenge to economic growth in Nigeria, which could be another factor in our study.

Above all, examining the three hypotheses under our research objectives has shown the following: Firstly, oil rents affect the growth rate of the Nigerian economy, and the effect is positive and statistically significant at 1% level of significance. Secondly, we show that both democratic institutions and political rights in this chapter have a positive and statistically significant effect on Nigeria's economic growth. Thirdly, we identify a positive and statistically significant effect of diversification on the economic growth rate of the Nigerian economy.

In essence, this chapter identifies the positive long-run relationship between oil rents, political institutions, diversification and economic growth in Nigeria. Contrary to the conclusions of Manzano and Rigobon (2006) and Ross (2001) that natural resources such as oil expose economies to a resource curse, this research work establishes that such resources are a blessing to the Nigerian economy because there is a long-run positive association between oil rents and economic growth when we control for institutional qualities.

2.14   Policy recommendations

Having empirically examined in this chapter the impacts of oil rents, institutions, and diversification on economic growth in Nigeria, the following are recommendations for public authorities and policymakers:

[1] Oil rents are not a curse on the Nigerian economy, as there exists a positive long-run association between oil rents and economic growth. The judicious use of oil rents is crucial if the Nigerian economy is to grow like other developed oil-producing economies. This study recommends that oil rents should be used for the development of critical infrastructure, and leakages should be blocked, to safeguard oil rents from corruption. Removal of oil subsidies within the domestic economy may be necessary to prevent the wastage of oil rents and the allocation of scarce resources into the hands of the elite or privileged members of society. Subsidising petroleum products is tantamount to price-fixing and selling petroleum products below the market price hampers growth in the long run.

[2] That good institutions promote economic growth is widely accepted in economic literature. Democratic institutions appear to have promoted economic growth in the Nigerian context from 1999 to date. The effect of the institution of political rights as determined by the relative franchise and marginal improvement in participatory government in Nigeria is another pointer to the fact that political institutions matter for economic growth. Therefore, the government should implement far-reaching institutional reform that will enable citizens to participate fully in political institutions. Evidence suggests that fewer than 50% of Nigerians of voting age participate in elections. The implication is that the people elected into public offices(s) may not be dedicated representative(s) of the people. Good governance is vital and high levels of participation are necessary to sustain and nurture democratic institutions. Principles of democracy should perhaps be taught in schools to create a pool of young Nigerians who value political institutions and good governance.

[3] The Nigerian government should put a firm policy in place to correct all the known anomalies in budget drafting procedures and implementation. Nigeria is supposedly the only oil-producing economy in OPEC that practises 'budget padding'. This impedes economic growth. Members of the legislative houses divert money that ought to go into developmental projects, infrastructural growth and social services into their own private pockets. Sound budget planning and implementation will complement the fiscal policy of the government to stimulate growth. The executive branch of the government should make sure that the Budgetary Bill is sent to the National Assembly four months before the end of the year, to enable the legislators to discuss, review and pass the Bill into law on time. Politicking concerning the Budgetary Bill in the National Assembly must be erased in the overall interest of Nigeria, to enhance the effectiveness of budgetary institutions and to improve their ratings within the multilateral and non-governmental agencies such as the World Bank, IMF and Transparency International.

[**4**] The Nigerian government must adopt a new growth strategy with strong policy guidelines for the long-term development of the agriculture sector. This study shows that agriculture can complement oil rents as a co-determinant of economic growth. Mechanised farming, improved seedlings through technology and innovation in agricultural practice are some of the strategies to develop the agricultural sector fully. Moreover, the government should adopt a multi-sectoral diversification policy. Although agriculture has the potential to improve GDP, especially given its historical contribution, pre-dating oil, it is, nonetheless a primary sector. Growth strategies in many advanced economies are based on the development of manufacturing and services sectors, which expand productivity beyond the capacity of the agriculture sector. Therefore, for the realisation of long term growth, efforts must also be put in place to develop the secondary and tertiary sectors, in the forms of manufacturing and services.

Chapter Three: The Effects of Oil Rents and Institutions on Economic Growth of OPEC Economies

3.1 The background of the study and motivation

The second chapter of this thesis investigates the effects of oil rents, institutions and diversification on the growth of the Nigerian economy. In this third chapter, we are extending the empirical investigation of the impact of oil rents on economic growth to the group of oil-producing and exporting countries known as OPEC[1], to expand our findings beyond Nigeria and enrich our investigation.

The presumption that oil rents drive economic growth in the OPEC economies has continued to generate debate in economic literature (Gylfason, 2004; Antonakis et al., 2017; Alexeev and Conrad, 2009). Therefore, it is important to determine whether oil rents contribute to the growth of OPEC economies. There has been no universally accepted conclusion regarding the relationship between oil rents and economic growth.

Scholars have argued that the impact of oil rents on economic growth is inverse, aligning with the conclusion of Sachs and Warner (1999). In support of their findings, economic history shows that Juan Pablo Perez Alfonso (1976), the founder of OPEC, had expressed concerns about the future of the oil business in Venezuela (an OPEC member) in the past. In his words, *'Ten years from now, twenty years from now, you will see, the oil will bring us to ruin'*. That assertion underscored some of the sizeable challenges confronting OPEC economies, particularly the perennial instability of oil price. However, Mehlum et al. (2006) contend that we should not jump to the conclusion that *all resource-rich countries are cursed.* Observable evidence suggests that Saudi Arabia and the United Arab Emirates lend credence to Mehlum et al.'s (2006) assertion.

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[1]Subsection 5.2.3 in the appendices contains the synopsis of all the 14 OPEC economies as of 2017.

To examine the above position further, it is likely that the diverse economies of OPEC will manifest disparate effects of oil rents on growth. A number of factors could be responsible for such differences, prominent amongst them being the existence of good institutions. Substantial empirical work in the literature demonstrates that strong institutions are essential co-determinants of economic growth in oil-producing states (Mehlum et al.; 2006a; Acemoglu et al., 2008; Collier and Goderis, 2012).

The existence of good institutions is likely to have played a significant role in the trajectory of those resource-rich countries that achieve economic growth using oil rents. The possible influence of institutional qualities in an economy has led to a relatively new model of economic growth within the last decades, (Acemoglu et al.,2005, 2019; Mehlum et al., 2006; Esfahani and Ramirez, 2003; and Antonakis et al., 2017) suggesting that the quality of institutions represent an essential condition for economic growth. Although this has been debated over several decades, the seeming failure of resource-producing developing countries, notably among OPEC economies, has compelled scholars to increase empirical focus on the role of institutions in an economy. An institution in itself is not free from controversy ranging across issues of measurement and subjectivity of the concept. For example, what constitutes a vital political institution in Saudi Arabia is not the same as an excellent political institution in Ecuador. Economic institutions, or freedom in Iran, differ from economic institutions in Nigeria. Regulatory institutions in Equatorial Guinea differ from those in Iraq. In the light of this, there is a need for a holistic evaluation of the effects of institutional quality as co-determinants of OPEC's economic growth. Specifically, the narrative about oil rents and economic growth is likely to be empirically inadequate without a full grasp of the implications of institutional quality in OPEC as a co-determinant.

We have been looking at the drivers of economic growth in OPEC economies. Another potential driver of economic growth in OPEC economies is the oligopoly power of OPEC or the strength of OPEC in the international oil market. Amongst the challenges confronting OPEC is an increase in the share of oil rents received by non-OPEC producers. The 14 OPEC economies account for about 41% of the total world supply of crude oil in 2017 (BP Statistical bulletin, 2019) which should represent some form of control of the international oil market. OPEC consists of few producers and suppliers of crude oil, consistent with an oligopolistic market structure as described in some segments of the literature (Smith, 2005). Thus, modelling the strength or oligopoly power of OPEC using its share of oil production as a proportion of total world crude oil production is crucial for this study.

To contribute meaningfully to the literature, we examine several scholarly works on the impacts of oil rents, institutions and economic growth in oil-producing countries (Alexeev and Conrad, 2009; Brunnschweiler and Bulte, 2008; Ross, 2001; Mehlum et al., 2006; Knack and Keefer, 1997; Barro and Salai-i-Martin, 2004). One of the standard inferences from these scholars is that institutions matter for economic growth. Although empirical evidence suggests that resources like oil can foster economic growth with the existence of vital institutions, some scholars contend that such resources impede institutional growth and indirectly hamper economic growth. For example, Ross (2001) in *Does oil hinder Democracy?* demonstrated that oil inhibits growth, with empirical evidence from economies in the Middle East and Nigeria in particular. Despite the perceived shortcomings of the Ross (2001) study, some valid propositions arguably exist within the paper. Firstly, the economic conditions of some OPEC economies, notably Venezuela, Nigeria, Angola, Iraq, Gabon, and Libya challenge the role of natural resources like oil in an economy, as we shall see in this study. Secondly, measurement of the quality of a democratic institution is subject to intense debate, with the possibility of controversial effects on economic growth.

One of the unique traits of OPEC[2] is that it consists of a mixture of diverse economies like the rentier states, developing economies, developed economies, and inter-continental economies. The natural inclination is that such conglomerates of oil-producing economies would have the capacity to promote a shared economic idea and foster common growth strategies to develop. Observable evidence from OPEC suggests that although some member states like Saudi Arabia and the United Arab Emirates are likely to have earned and sustained positive impacts of oil rents on their respective economic growth. Other OPEC economies, notably Venezuela, Nigeria, Iraq, Libya, Guinea and Angola appears to have growing economic challenges despite the large magnitude of oil rents share in there total government revenue. Evidence suggests that the existence of a vital institution is crucial for an oil-producing economy to achieve the goal of economic growth. We are curious about the nature of institutions in OPEC economies. Our primary inspiration for this chapter is to determine the relevance of strong institutions in a group of oil-producing economies like OPEC.

Furthermore, a common characteristics of developing states is the likelihood of weak institutions which possibly impedes economic growth despite the resource abundance. Another inspiration for this study is to evaluate if the economic and institutional challenges in the Nigerian economy as a developing country is familiar to OPEC. The aggregate of the above conditions are the motivations for this study as captioned in our research objectives below. Given the above discussion about OPEC, we structure this chapter to empirically investigates

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[2]See subsection 5.2.2 in the appendices for the brief history of OPEC

the effects of oil rents and qualities of institutions on the economic growth of OPEC economies.

The rest of the chapter is organised as follows: Section 3.2 outlines the research objectives. Section 3.3 demonstrates the main contributions of the thesis chapter to the literature. Section 3.4 shows the evolution of institutions in OPEC economies, and a review of related literature is in Section 3.5, which is followed by the nature and sources of data in Section 3.6. The discussion of endogeneity issues, the research method and estimation technique are in Section 3.7. Section 3.8 consists of the empirical results and the analysis of diagnostic tests with the long-run equilibrium solution. Section 3.9 entails our findings and Section 3.10 summarises the chapter with an outline of policy recommendations in Section 3.11.

3.2 The research objectives

The broad theme of this chapter is to examine the effects of oil rents and institutions as determinants of economic growth in OPEC economies. The specific objectives or our research questions for the chapter are as follow:

1. To determine the drivers of economic growth in OPEC economies.

2. Given that several potential variables exist that drive growth in OPEC economies like oil rents, qualities of institutions, official real exchange rate to the US dollar, and the level of savings amongst others. We would examine using the regression analysis whether they drive OPEC economic growth.

3. Institutions matter for economic growth. We plan to develop a set of institutional qualities in this chapter and examine the impact of such qualities of institutions on OPEC economic growth.

4. Using the share of crude oil produced in a million barrels between 1967 and 2017 by OPEC as a proportion of total world crude oil produced to proxy OPEC oligopoly power, we seek to determine the impact of OPEC oligopoly power on the growth rate of the OPEC economies.

The response to the above research questions constitutes the basis of this study. Below are the main contributions of the chapter to the literature below.

3.3   Main contributions of the chapter to the literature

This thesis chapter contributes to the literature in the following ways:

[**1**] Challenging existing literature (Ross, 2001). This thesis chapter challenges the work and findings of Ross (2001) regarding the impact of political institutions on economic growth in oil-producing economies, by applying a new dataset with panel data from 1967 to 2017, compared with Ross's 1971 to 1997 data. The expansion of the scope of coverage gives further scope for observation of trends in the impacts of oil rents on OPEC economies. Interestingly, between 1997 and 2017, the OPEC economies have witnessed various changes ranging from the period of oil boom which guaranteed incremental oil rents, to periods of glut and global recession, when crude oil prices have dropped sharply. A combination of all of these factors plays a fair role in determining the effects of oil rents on OPEC economies.

Furthermore, there appears to be a proposition that most of the resource-rich economies are prone to the resource curse. Ross (2001), in particular, seems to suggest that any economy bestowed with natural resources like oil, will face economic challenges. His empirical work on the oil sector in our view is a neo-Sachs and Warner model that does not adequately take cognisance of the role of institutions. Secondly, Ross (2006) affirmed that there could be some validity in the widespread assertion that democratic institutions better enhance economic growth, through their ability to redistribute income and promote adequate social programmes equitably. He wondered why countries that transitioned from autocratic regimes to democratic institutions failed to fully harness the dividend of democratic institutions, implying the existence of loopholes in democratic institutions. Ross (2006) further opined, *If democracies spend more money on public services than non-democracies, why do they fail to achieve better results?*. We question this assertion, because empirical evidence shows that political-institutional changes are not always instantaneous. Time lags could be responsible for the slow pace of change in newly democratised states.

[**2**] Expansion of institutional qualities. Institutional qualities within OPEC are classified into four categories for the first time (to the best of our knowledge), to determine their effects, together with oil rents, on the economic growth of OPEC. The four categories are: democratic institution, legal institution, anti-corruption institution, and government effectiveness institution qualities. This chapter expands the scope of institutions, contrary to Ross (2001), whose focus is solely on democratic institutions. Empirical literature shows that democratic institutional quality is not the only institutional co-determinant of economic growth (Barro, 1999; Acemoglu et al., 2005, 2019; Papyrakis and Gerlagh, 2004; Hodler, 2006; Andersen and Aslaksen, 2008). The foundation of this chapter is on a combination of the above and expands

the scope of institutions in OPEC beyond the political. Moreover, little or no study has been conducted on the impact of legal institutions in OPEC on economic growth. In particular, the identification of legal institutions as a co-determinant of OPEC economies' growth is new, as no known past work has done this.

[**3**]Empirical utilisation of OPEC oligopoly power as driver of OPEC growth - Economic literature suggests a decline in the strength of OPEC's control of crude oil supply for the following reasons: the rise in the supply of crude oil from non-OPEC members like the US, consequent on the production of shale oil (in North Dakota and Montana in the US); the future possibility of shale oil production in the UK (though it is currently suspended due to the actions of environmentalists); and the discovery of oil in countries hitherto without oil; for instance, in Ghana. The aggregate of the above has led to an unprecedented competition in the global oil industry. The potential outcome of such an effect is the loss of market share to competition occasioned by the availability of oil from other non -OPEC suppliers. Two, there is an antecedent loss of crude oil sales to countries like the USA which hitherto was importing crude oil from Nigeria, an OPEC member to augment domestic consumption. Because of the surge in the Shale oil production for instance, the USA had stopped importing oil from Nigeria; given the availability of oil in commercial quantities in the USA. The direct implication of such a move is the decline in the flow of oil rents to Nigeria, as a member of OPEC. This economic scenario is also true for other OPEC economies in some respect. In our view, if the oligopoly power of OPEC is strengthening, perhaps there might be some limit to the production of Shale oil which has altered the dynamics of oil business.

The above listed conditions notwithstanding, OPEC with about 41% share of the total world crude oil produced is likely to have some form of influence on the global oil sector. To determine the impact of OPEC control over crude oil supply on its economic growth, we empirically utilise a model of OPEC oligopoly power by creating a proxy variable with OPEC's share of total world crude oil production, to determine whether such oligopoly power affects the growth of OPEC economies. This is another significant contribution to the literature.

3.4 The evolution of institution and OPEC economies

Central to the question of growth in OPEC economies via the use of oil rents, is the evolution of institutions. Quality of institutions matter is one of the prominent propositions in the New Institutional Economics literature. Having explored the concept of an institution in Nigeria in the second chapter of this thesis, it seems appropriate to increase the robustness of our essay on institutions within OPEC, by expanding the scope. According to Voigt (2019), 'institution

is commonly known rules used to structure recurrent interaction situations, such rules being endowed with a sanctioning mechanism in case of noncompliance'. One of the assumptions of the definition of institution above is that institutions can serve as a constraint to limit human conduct or actions. Specifically, the constraints that some institutions represent also serve as regulatory mechanisms. Another aspect of the definition of an institution above is that it entails the enforcement of penalties for violations of such regulation. For example, OPEC has production quotas for members to regulate the supply of crude oil to the international market. Energy economics literature suggests that violation of production quotas is responsible for the 'cheat' attitude of some OPEC members. Saudi Arabia, as the swing producer, enforces discipline in the form of a price war to curtail the excesses of other OPEC members. This methodology of enforcement by OPEC constitutes a technique for penalising erring members who violate the code of operations. Acemoglu et al. (2005a) showed that economic institutions and political institutions should be differentiated and that economic institutions 'determine the incentives of and the constraints on economic actors'. In another strand, 'political institutions determine the constraints on and the incentives of the key actors, but this time in the political sphere' (Acemoglu et al., 2005a: p 390).

Regarding the political and foreign policies of OPEC economies, member states could alter the prevailing economic institutions in OPEC, as in 1973 during the Arab- Israel war which led to an oil embargo for some economies. In this sense, OPEC's political institutions may influence its economic institutions. Greif (2006:30) contends that the definition of an institution must be broad and illustrate many aspects of institutions. He defined an institution as 'a system of rules, beliefs, norms, and organisations that together generate regularity of (social) behaviour'. As a corollary of this definition, Voigt (2019) held that the classification of an institution is two-fold: the first is an internal institution with no enforcement from the state; the second is an external institutions, which has state enforcement tools. Ostrom (1990: 51) defined the institution as: 'sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions'.

In the words of North (1993), an institution is defined as 'the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights)'. He further explained that an institution is not wholly an organisation, individual, firms, or social construct. From an economic perspective, this definition of an institution is deficient because it fails to distinguish diverse institutions such as

the political and the economic institution, each playing different but complementary roles in enhancing growth. Other notable agencies that have attempted to define institutions include the Global Competitiveness Report of the World Economic Forum (Salai Martin et al., 2013), the Quality of Government Institute, University of Gothenburg (Teorell et al., 2011), CESifo Group in Germany, the International Country Risk Group (ICRG) and the Fraser Institute. The common feature in all of the institutional constructs and definitions above is that institutions entail complex, social, economic and political dynamism. The full grasp of such definitions goes beyond a narrow perspective or a single construct. Table 3.1 below shows the summary and concise measurement of institutional qualities for OPEC.

Table 3.1: The measurement and type of institutional qualities in OPEC

TABLE 3.1:	**THE MEASUREMNT AND TYPE OF INSTITUTIONAL QUALITIES IN OPEC**		
Type of Institution Quality	Sub-categories of Institution Quality	Measurement and Derivation	Source
Political Institution Qualities	Democratic Institution Quality	Polity IV Index of good governance represents measurement of varying types of governance from autocracy to full democratic governance. The polity IV governance score ranges from -10 as the lower bound to +10 as the higher bound. +10 measures a fully democratic state, 6 to 9 represents democracy,1 to 5 is for Open Anocracy. In open anocracy, democratic elections take place, but such elections are not free, and some rights denied for the population. 0 to -5 represents Closed Anocracy. Closed Anocracy is mixture of some features of democracy and part of dictatorship or autocratic rule. -6 to -10 denotes Autocracy, it implies government in which single person, the autocrat has supreme and absolute power. For the political history of some OPEC economies with military regime and democratic governance, it is probably a better measurement of political institution for its ability to contain diverse system of government.	Polity V Index Project of Regime characteristics by Marshall and Jaggers (2019). Available at INSCR Data Page (systemicpeace.org)
	Government Effectiveness Quality	The variable is called EXREC which implies executive recruitment, that is, the technique through which states adopt in the selection or election of the people in the executive arm of government. Given that the policy implementation of the state rest in the hand of the executive, in this study, we presumed that the efficiency level of the executive in policy implementation possibly have linkage with economic growth. The lower bound is 0 for a state with poor quality of executive recruitment and 1 as the higher bound for state with high quality of executive recruitment. The range can also be converted to percentage values, from 0 to 100.	Centre for systemic Peace (2020) and POLCON dataset (2017), available at: The Political Constraint Index (POLCON) Dataset - Management Department (upenn.edu)
Regulatory Institution Qualities	Legal* Institution Quality	The legal institution quality is generated from the interaction of the institutionalised index from Political constraint index (POLCON). The two interacted variables are: alignment between the executive and the upper legislative chamber index and the quality of law-and-order index. The POLCON variables are measure of political constraint, and determine the underlying political structure to be able to assess credible policy formulation. The lower bound for each of the two variable is 0 and the higher bound is 1. Score of 1 is assigned when the party controlling the executive branch is either the largest party in the upper legislative chamber or is a member of a ruling coalition in that chamber, otherwise 0. A country with high degree of law and order is assigned 1, otherwise zero. We combine the two variables to form a composite variable called the Legal institution in OPEC economies.	Centre for systemic Peace (2020) and POLCON dataset (2017), available at: The Political Constraint Index (POLCON) Dataset - Management Department (upenn.edu)
	Anti-Corruption Institution Quality	The anti-corruption institution quality is derived from the application of the executive constraints' variables from the POLCON dataset (2017). The variable is called the XCONST by POLCON, which is an institutionalised constraint on the decision power of the executives in government with a view to promote accountability. Given the prevalence of corruption in the developing oil producing states, we utilised it to determine the measure of corruption among the executives in government. It ranges from the lower score of 1 being a state with no accountable government and 7, a state with highly accountable government.	Centre for systemic Peace (2020) and POLCON dataset (2017), available at: The Political Constraint Index (POLCON) Dataset - Management Department (upenn.edu)
* Author's contributions to the literature on the conceptual meaning, measurement and derivation of an institutional qualities in OPEC which consist of the Composite institutional qualities developed by the author.			

Given the multiple meanings of the concept of institution, in this chapter four categories are distinguish, namely: political – with democratic institutional quality as a proxy-, government effectiveness, legal institutions, and anti-corruption institutional quality, with a comprehensive analysis of each of the four institutional qualities. To align this chapter with the proposition of Stefan (2013:1-26) that '..... to measure institutions in the first place. Only if institutions can be measured with a minimum degree of confidence are empirical statements such as institutions matter for y credible'. Therefore, we briefly outline how each of the institutional qualities utilise in this chapter is developed and measured, to justify there respective implications for OPEC economies.

3.5   Democratic institution quality and OPEC economies

Democratic institutional quality in this chapter concerns the democratisation process in the OPEC economies. It encompasses the size and nature of government, electoral freedom, participatory democracy, the extent of voters' education and many other factors. Nonetheless, measurement of these democratic qualities is difficult given its subjective nature and the scarcity of reliable indicators.

Substantial evidence in the literature suggests that strong democratic institutional qualities enhance economic growth. However, a closer observation of OPEC economies demonstrates that many of them arguably lack strong democratic qualities to facilitate economic growth. The determination of such qualities is somewhat challenging, given that several forms exist, such as the UK's parliamentary institutions, the US federal system, the monarchy which exists in the Gulf states within OPEC and others. Given these examples, there is a need to quantify democratic institutional qualities and assess the implications for economic growth.

3.5.1   Measurement of democratic institutional quality in OPEC

Several attempts have been made in the past to measure democratic institutions, particularly in established sources such as the Canadian Fraser Institute, the Polity IV Index of regime characteristics, the International Country Risk Guide, Governance Indicators from the World Bank (Kaufmann et al., 2003) and Worldwide Governance Indicators amongst others. Each of these listed sources of quantifiable democratic qualities have advantages and limitations. This chapter uses data from the Polity IV Index of regime characteristics -Centre for Systemic Peace (US) to analyse political institutional quality within the OPEC countries, with their varying economies and political institutions. The index of institutionalised democracy from the Polity

IV ranges from a lower bound of -10 to an upper bound of +10. Each number denotes distinct, but possibly related systems of government, with +10 being the best or full democracy (see Table 3.1). The numbers in the range can also be converted into percentages from 0 to 100. Institutional policies or prevailing conditions have a lot to do with the growth of such an economy.

Our discussion of political institution qualities is based on a comparative analysis of democratisation[3] and non-democratisation. Virtually none of the Gulf members of OPEC are democratised. Therefore, it is necessary to test the assertion in the literature that democracy promotes economic growth (Acemoglu et al., 2019).

Figure 3.1: Democratic institution quality of OPEC Economies: 1967-2017
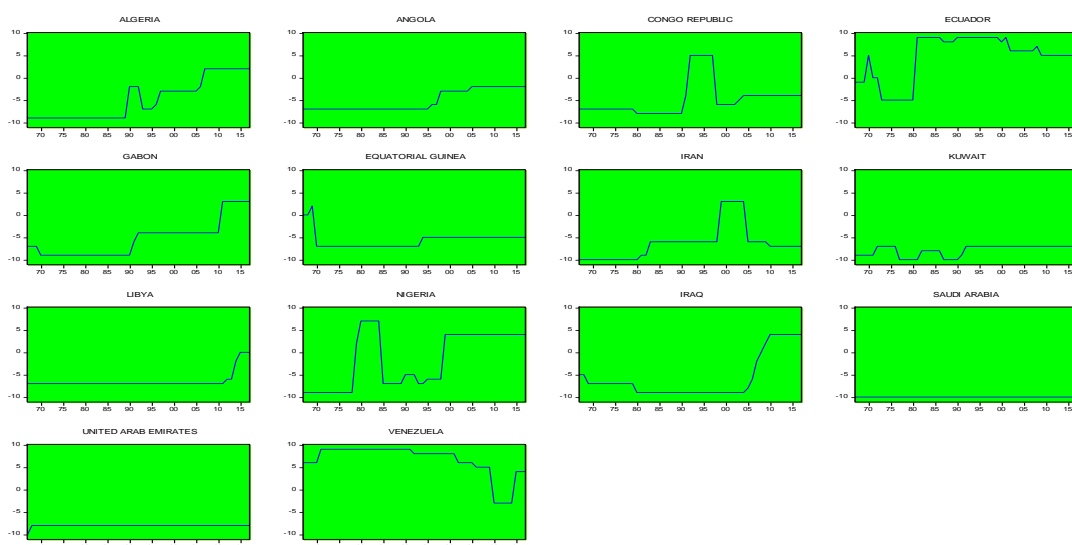
Source: Author's Computation with data sourced from Polity IV index of regime characteristics (2019).

*Democratic institution qualities illustrates the distinctions between democratic and non-democratic states (especially forms of autocratic government).

The summary and background information about the conceptual definitions of institutional qualities for this chapter are provided in the appendices subsection 5.2.4 (as it concerns Figure 3.1). Observable evidence shows that Saudi Arabia practises a hereditary monarchy system of government, but based on the theoretical categorisation from the Polity IV index, the country has a -10 score (as indicated in Figure 3.1), which falls under autocratic governance [4] . This is characterised by restricted press freedom, over-regulated polity and lifestyles in Saudi Arabia, and the presence of other autocratic tendencies. However, in terms of growth, her economy is

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[3]'Democratisation is a way of transferring political power to the majority of citizens. If the citizens can secure democracy today, they will increase their de jure political power in the future because as long as democracy survives, they will have more say in the determination of economic and social policies'- Acemoglu and Robinson (2012:174): Economic Origins of Dictatorship and Democracy.

[4]See Michael L Ross (2012: pp 62-109) in The Oil Curse-How Petroleum Wealth Shapes the Development of Nations.

one of the best performing in OPEC. If democracy drives economic growth, it could also be that a few exceptions exist where autocracy drives growth, as argued by the scholars. From this standpoint, the political institution in the form of a democratic system is arguably neither a necessary nor sufficient condition for economic growth. While democratic institutions might have engendered growth in some economies, this is not the case in others. By implication, the generalisation that democratic institutions are a likely driver of economic growth is logically inconsistent. In essence, virtually all the Middle East economies among OPEC followed a similar pattern to Saudi Arabia. For Nigeria, however, we could observe some form of consistent but marginal improvement since the advent of democracy in 1999, as seen in Figure 3.1.

Venezuela appears to be losing the gains from democratic institutional quality, which is consistent with the political realities in Venezuela as of 2019. Ecuador is probably the best-performing economy in terms of the political institution quality among the OPEC economies, with a Polity IV indicator on the thresholds of between +6 to +9, as seen in Figure 3.1. Algeria's political institution quality appears to have been unstable since the early 1990s. Congo, Equatorial Guinea, and Gabon have relatively low (weak) democratic institution quality, as observed in Figure 3.1.

A noticeable implication of the political institution quality in figure 3.1 is that OPEC economies appear to be composed of four groups of economies within the framework of political institution. One; *'the defective political institution economies'*, notably Saudi Arabia, United Arab Emirates, Kuwait, Venezuela, Libya and (Equatorial Guinea to some extent), two, the *'marginal increase political institution economies'* consists of Nigeria, Gabon; (Angola and Iraq to some extent since 1995), and three , *'sustained improvement in political institution economies'* consisting of Ecuador and Algeria. Four, *'Highly Unstable Political institution economies'* includes Iran and Congo as demonstrated in Figure 3.1.

3.6 The legal institution quality and OPEC economies

The quality of legal institutions is crucial because the legal framework of a country is arguably a significant determinant of its growth rate. The implementation of the rule of law, property rights, and accountability are some of the essentials for economic growth. Economics has a strong relationship with the law, dating back to the propositions of the classical and neoclassical economists regarding free markets and property rights. Bingyuan (2004) stated that 'the traditional intersection between economics and law has been mainly restricted to topics such as tax laws and antitrust regulations'. We contend in this chapter that in the context of OPEC, the efficacy of oil and gas (petroleum) law is very important for securing the rewards from oil

investment in the form of oil rents.

Oil-induced conflict has occurred in many regions around the globe, requiring the institution of an enabling legal framework to protect the interests of the oil-producing economies and curtail losses from conflict. One of the primary distinguishing features between advanced and developing oil-producing economies is the existence of strong legal institutions and accountability. For instance, the Petroleum Industry Governance Bill, introduced in Nigeria in 2017, was put in place to introduce full legal regulation of the country's oil and gas business. Without such legal institutions, OPEC economies might not realise optimal returns on oil investment. Another example is the Norwegian Sovereign Wealth Fund, which has the full backing of legal institutions in Norway, as a way of safekeeping excess oil rents in a separate account for future use. How far the legal institutions have complemented oil rents as determinants of economic growth in OPEC economies is a subject of considerable debate. There is a large body of literature arguing that the rentier states among OPEC or the Middle East members have not fully institutionalised a strong legal and constitutional framework for effective growth. For example, virtually all the Middle East members of OPEC have strong restrictions on press freedom and gender freedom. Some of these practices run contrary to constitutionalism and the institutionalisation of the rule of law. For an economy to grow, freedom must not only be allowed, but it must also manifest across the spectrum of society with the full backing of the rule of law. Given the need to quantify the quality of legal institutions, how this is done in this chapter is explained briefly below.

3.6.1 Measurement of legal institutional quality in OPEC

The measurement of legal institutional quality in this chapter follows the concept of 'leximetrics' proposed by Cooter and Ginsberg (2003), which involves quantitative measurement of legal institutions. It focuses on the legal rules protecting the rights of shareholders, creditors and employees. The quality of legal institutions is developed in this chapter with the application of a composite variable. We interact two variables from the institutionalised index within the Political constraint index (POLCON). The two interacted variables are: alignment between the executive and the upper legislative chamber index and the quality of law-and-order index. The POLCON variables are measure of political constraint, and determine the underlying political structure to be able to assess credible policy formulation. The lower bound for each of the two variable is 0 and the higher bound is 1. Score of 1 is assigned when the party controlling the executive branch is either the largest party in the upper legislative chamber or is a member of a ruling coalition in that chamber, otherwise 0. A country with high degree of law and order is assigned 1, otherwise zero.

Empirical evidence suggests that investors are likely to favour economies characterised by the rule of law, in contrast to those with restrictions on the rule of law, violation of human rights, and unconstitutional practice. Investors assume that money and capital investment are more likely to be secure in an environment with the rule of law, devoid of stereotypes and archaic practices. In a way, the rentier states among OPEC, given their belief system and penal codes, have had to respond to allegations concerning human rights in the past, relating for example to the existence of capital punishment in Saudi Arabia which runs contrary to some international laws. This could be responsible for the weak legal institutional quality rating for Saudi Arabia during the period of our study. As regards the African members of OPEC, violations of rule of law are also common, with some weak private property laws. For instance, the current government under President Mohammed Buhari in Nigeria has made moves in recent times to curtail the freedom of information and expression, which runs contrary to international standards and the rule of law. The above aggregates suggest that the quality of legal institutions in Nigeria may be weak, which potentially impacts the business operating environment and therefore economic growth. Given the fundamental importance of legal institution quality, as explored above, we use it in our empirical work as one of the qualities of institutions in OPEC economies.

3.7   The anti-corruption institution quality and OPEC economies

The control of corruption in an economy takes the form of regulatory policies of the state to advance economic growth. One of the most controversial institutional qualities in the literature is the measurement of corruption. The controversy surrounding corruption as an index of institutions stems from two fronts: the first is the subjective nature of the concept, given that what constitutes corruption in one country may not be corruption in another. The second is that allegations of bias surround the assessment processes of some of the agencies compiling data and investigating corruption. It is argued that some have a predetermined agenda with motives that are at variance with logic.

Anti-corruption agencies like the Transparency International are not free from controversy. Using the Transparency International as an example, allegations abound that the actions of two prominent Nigerians who are senior members of the organisation in the recent past contributed to the organisation's dismal rating of Nigeria regarding its fight against corruption. The two Nigerians are ex-President Olusegun Obasanjo and Dr Oby Ezekwezile, a former Vice President of the World Bank Group and former Minister of Education and Solid Minerals in

Nigeria. Despite the public offices previously held by these two figures, both of them are vocal opponents of any sitting government in Nigeria, with some of their positions and arguments at variance with the economic and political realities.

The controversy over the application of corruption index by Transparency International notwithstanding, there is a consensus that corruption impedes economic growth. In the words of Transparency International (2019), corruption is the 'abuse of entrusted power for private gain. It can be classified as grand, petty and political, depending on the amounts of money lost and the sector where it occurs' According to Jim Yong Kim (ex-President of the World Bank) during the anti-corruption summit of 2016 in the UK, 'corruption is, quite simply, stealing from the poor'. He further argued that corruption retards growth and hinders prosperity. That position is reinforced by the World Bank (2018), stating that corruption is 'an impediment to its goal of ending extreme poverty by the year 2030; and increasing the shared prosperity for the poorest 40% population mostly in developing economies'. For the IMF, in its Annual Report (2018), good governance entails 'reduction in the systemic corruption which is an important determinant of macroeconomic stability, sustainable and inclusive growth'. The combination of all of the above underpins the special place of an anti-corruption institution in this study.

3.7.1 Measurement of anti-corruption institutional quality in OPEC

In this study, we develop the anti-corruption institution quality for OPEC using the application of the executive constraints' variables from the POLCON dataset (2017). The variable is called the XCONST by POLCON, which is an institutionalised constraint on the decision power of the executives in government with a view to promote accountability. Certain assumptions guide the measurement of anti-corruption quality in this study. Corruption varies from one OPEC economy to another. Given the variation, there should be a quantitative technique to denote the control of corruption and thereby validate conclusions. Institutions are supposed to constrain actors and participants in the economy. In light of this, the regulations against corruption are meant to serve as a rule or to limit the actions of people in OPEC that are corrupt or unlawful economic practices. An increase in the quality of anti-corruption institutions, ceteris paribus, will promote economic growth in OPEC, given the perception amongst oil-investors and business leaders that such a country would be safe for investment. Therefore, the quality of anti-corruption institutions in OPEC is used in this chapter to observe the likelihood of its relationship with economic growth among the oil-producing economies.

3.8 Government effectiveness institution quality and OPEC economies

Evidence in the economic literature suggests that the effectiveness of the government in performing its duties to the population is a possible determinant of economic growth. In a market system, the government is the creator of an enabling environment for business and productivity to thrive. Therefore a key indicator of sound political institutions is likely to be the effectiveness of government, irrespective of whether the government is democratic or non-democratic. Acemoglu et al., (2019) argued that although democracy is likely to benefit a significant number of the population, democracy itself is elitist in approach, especially for the vast majority of the population in developing economies that have not fully earned the dividend of the democratic institutions. Furthermore, democratic institutions have been alleged to promote class economies that pauperise the majority of the population. This gave credence to the view that countries with a hereditary monarchy (coupled with an abridged parliamentary system) like the UK and Saudi Arabia are likely to have an effective government, unlike many developing states with democratic institutions. Therefore, there is a need to further investigate the impact of government effectiveness on the growth of OPEC economies, because within OPEC a range of different government policies and systems are represented. The measurement of the effectiveness of government is crucial in this regard as explained below.

3.8.1 Measurement of government effectiveness quality in OPEC

Government effectiveness is closely related to the quality of democratic institutions. However, there exists some form of demarcation between the two institutional qualities. Whilst democratic quality is attached to democracy or the democratisation process, this study observes that the effectiveness of government in the experience of the developing economies within OPEC is not limited to democratic government. The abridged monarchy or parliamentary system in the UK, and the monarchy in some of the rentier states arguably has linkages with economic growth. Because of this, the effectiveness of government quality in this study is called EXREC which implies executive recruitment, that is, the technique which the states apply in the selection or election of the people in the executive arm of government. Given that the policy implementation of the state rest in the hand of the executive, in this study, we presume that the efficiency level of the executive in policy implementation possibly have linkage with economic growth. The lower bound is 0 for a state with poor quality of executive recruitment and 1 as the higher bound for state with high quality of executive recruitment. We source the data for the institutionalised effectiveness of government from the Centre for systemic Peace (2020) . The variable is also available at POLCON (2019).

Countries such as Saudi Arabia and the United Arab Emirates have a monarchy system of government, with a strong emphasis on the delivery of social welfare to the population. These two economies, it could be argued, have strong and effective government unlike, for example, Venezuela, Iraq, Nigeria, Libya, and Congo where democratic institutions appear to be unresponsive to the population. Whilst almost all of the countries listed above could be described as 'democratic' states, empirical investigation reveals that many are in reality authoritarian states. It is important to evaluate the implications of government effectiveness for growth in the OPEC economies. The logical deduction from the above analysis is that the system of government, whether democracy or otherwise, is likely to be a secondary determinant of economic growth, according to political-economics literature (Ross, 2001). Perhaps the most crucial factor is the effectiveness of the system of government in meeting the needs of the population, and its stability which ultimately determines long-term growth. Related literature is reviewed below.

3.9   The related literature- A theoretical perspective

In chapter Two , we have reviewed the related growth literature like the neo-classical theory and endogenous model of growth. There are a good number of theories and models that can describe OPEC operations in particular in addition to the neo-classical theory and endogenous growth model. However, empirical evidence demonstrates that no single model or theory can fully analyse the operations of OPEC. The previous attempt to narrow down the activities of OPEC within the confines of a single theoretical model is defective, as argued by Geroski et al. (1987), Almoguera et al. (2011), and Kaufmann et al. (2008). Given the propositions of these theorists, it is evident that this chapter should explore dynamically the theoretical stands of OPEC. This chapter considers two distinct theoretical strands that directly relate to the objectives of our empirical study. These theories include the oligopoly theory of OPEC, and the pricing theory of OPEC, each of which are briefly outlined below.

3.9.1   Oligopoly theory and OPEC operations

The oligopoly theory of OPEC asserts that OPEC operates like an oligopolist in the international market for crude oil. By oligopoly, it refers to a market structure whereby slightly differentiated products, such as crude oil in the case of OPEC, are being offered for sale by a small number of producers or sellers. The possibility of increased oil rents for OPEC, in the long run, is dependent in part on the existing barriers to entering the oil market. According to the US Energy Information Administration (2018), the share of world crude oil produced by OPEC

is approximately 40%, suggesting that OPEC has some form of control over the market, which it could leverage to advance its objective of profit maximisation (oil rents) for the member states.

Pindyck (1978) and Salant (1976) corroborated the oligopoly theory of OPEC by arguing that the firms operating in a competitive organisation such as OPEC must simultaneously choose the quantity to be produced or supplied rather than focusing on the price level. This assertion is rooted in OPEC's procedural policies which use production quotas to regulate supply and ensure that, in the economy of petroleum products, demand and supply work in favour of OPEC's mission statement.

The prime role of Saudi Arabia as the swing producer within OPEC is explained under Stackelberg's oligopoly model (Hamilton and Slutsky, 1990; and Von Stengel, 2010). The role of Saudi Arabia as the de facto leader of OPEC has a far-reaching effect on the operations of OPEC according to the literature. The theoretical perspective on leadership and followership in economics, otherwise known as the Stackelberg model, has implications for OPEC's oil price stabilisation drive. Saudi Arabia is the largest producer of crude oil in OPEC, with one of the lowest extraction costs globally. This privilege, therefore, confers an advantage on Saudi Arabia who, as the 'police' of OPEC, acts to enforce OPEC guidelines through the price wars (excess supply) or production quota conflicts. Saudi Arabia is the leader of OPEC, while other members are the followers, as per the principles of the Stackelberg model, which illustrates the leadership and followership relationship (Lewis and Schmalensee, 1980a; Van der Ploeg, 2017; and Polasky, 1992).

One of the challenges to OPEC's oligopoly power, as demonstrated within economics literature, is the seeming increase in the share of non-OPEC suppliers of crude oil, notably due to the surge in US shale oil extraction through hydraulic fracturing ('fracking') entering the international oil market. The shale oil from an unconventional[5] source in the US states of North Dakota and Montana has proven to be a challenge to the efficacy of the oligopoly power of OPEC, as members are forced to violate the output quotas as a consequence of oil price instability. Adelman (1993) observed decades ago that offshore oil was unconventional. Whilst various factors have contributed to the decline in the oligopoly power of OPEC, Huppmann and Holz (2012) note that in the aftermath of the 2008 financial crisis, OPEC oligopoly power declined dramatically.

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[5]'Conventional oil is crude oil produced by a well drilled into a geologic formation in which the reservoir and fluid characteristics permit the oil to readily flow to the wellbore; unconventional oil does not meet the criteria for the conventional production". US Energy Information Administration (2019).

3.9.2 Pricing theory and OPEC operations

OPEC pricing theory of crude oil revolves around the economics of the global oil sector, which is premised on the interaction of demand and supply of crude oil as a significant source of global energy. Fluctuating oil prices have far-reaching implications for the stability of OPEC economies and an indirect effect on the global economy. Oil price instability tends to snowball into a significant global economic challenge, as witnessed in the past decades. Empirical evidence suggests that the crisis in the global oil industry was responsible for the global financial crisis of 2008, but not the opposite or, in econometric parlance, the reverse causation problem. Fluctuating oil prices have far-reaching implications for the stability of OPEC economies, given their dependency on oil rents.

Figure 3.2:   Chart of spot crude oil prices in constant 2010 US Dollar : 1967-2017
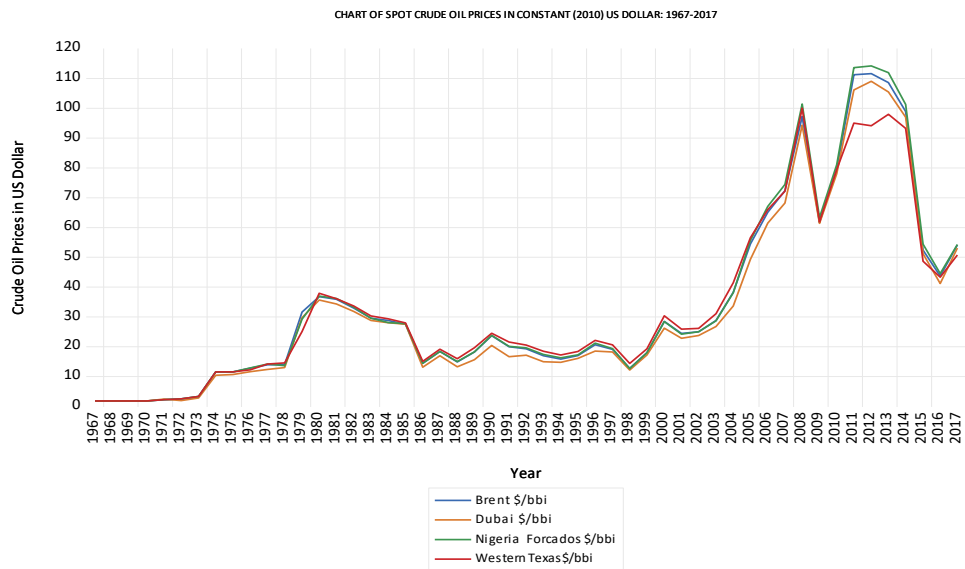
Source: Author's Computation with data sourced from BP Statistical bulletin (2019).

*Spot crude oil prices in constant are the commodity prices of crude oil in US dollar at the international market.

For the shocks occasioned by the variability in the oil price, scholars have argued that if oil prices are stationary, there is mean reversion, but oil prices with unit root would lead to the shocks with permanent effects. For Pindyck (1999), oil prices have unit roots implying that oil price shocks have permanent effects. Accordingly to the prediction or forecast of the US Energy Information Administration-EIA in 2005, the real price of crude oil was to decline to the threshold of $33.67 per barrel in the year 2020. This prediction is invalid on the surface or questionable for lack of sound economic justification or historical antecedence. However, a critical examination of oil price volatility over the last four years shows that the prevailing price of crude oil per barrel has not matched 2014 levels. Specifically, the prevailing price of crude oil at the end of October 2018 stood at $75.51 per barrel (OPEC, 2018), compared with an

average price of \$54.41 in 2015, \$44.54 in 2016, and \$54.31 at the end of 2017 (see the crude oil price- Nigeria Forcados in Table 5.8 of the appendices).

The statistical evidence from Figure 3.2 above showed that oil price has been unstable or somewhat steadily declining. Therefore, the declining crude oil price call for OPEC attention. A closer look at Figure 3.2 above shows that the crude oil price did not match the level of 2011 until 2017. Adelman (1993) suggested that the decline or volatility of the oil price calls for concern amongst both OPEC and non-OPEC economies. The concern is that oil is one of the most strategic and particular commodities, which is an almost indispensable product in the modern world. Hamilton (2013) in his analysis of the impact of oil price instability within the global economy identified five main periods characterised by high oil price volatility: 1859-1899, 1900-1945, 1946-1972, 1973-1996 and 1997 to the present. We question the submission of Hamilton (2013). There was a steady rise in the price of oil between 2011 and 2012. The eventual fall in the oil price began to set in in the latter part of 2012.

The consequence of a sharp decline in the oil price is devastating for OPEC. More than 50% of the income and export earnings of the OPEC economies emanate from crude oil sales. Since OPEC is a loose cartel with the potential to fix and regulate oil production and prices, scholars have questioned the inability of OPEC to fulfil its obligations in this regard. Scholars such as Smith (2005) disagreed with the above conclusion when he observed that evidence of OPEC acting as a price-raising cartel was inconclusive. With the formal production quota system of OPEC, which officially commenced in 1982, the widespread cheating among the OPEC members over the volume of output has rendered the operation of the quota system ineffective. In the light of this theoretical exposition regarding OPEC, a review of the empirical literature is presented below.

3.9.3 The related literature-empirical perspective

Oil rents and economic growth in OPEC

The empirical evidence on the effect of oil rents and economic growth in OPEC is mixed. The pessimistic school of thought on natural resources contends that oil rents negatively impact OPEC economies. An alternative perspective argues that OPEC economies depend primarily on oil rents, and therefore, oil rent is likely to have a positive effect. A third view has recently emerged in the literature, which maintains a neutral position, and focuses on the emerging role of institutions in OPEC economies. Several studies exist on the implications of oil rents and institutions on the economic growth of oil producers including the OPEC economies, for instance, Acemoglu and Robinson (2005), Acemoglu et al.(2004), Bhattacharrya and Hodler

(2010), and Barro and Sala-i- Martin (2004) among others, generating various empirical findings and conclusions.

Alexeev and Conrad (2009) contend that oil rents had a positive impact on per capita GDP in oil-endowed economies like OPEC. This contradicts the 'negativity resource school of thought' who maintain that oil constitutes an impediment to growth in OPEC (Sachs and Warner, 1999, 2001; Gylfason et al., 1999; and Rodriguez and Sachs, 1999). Amongst the OPEC economies, the effects of oil rents on economic growth vary. Regarding the growth rate of the GDP per capita, a few of the OPEC economies appear to be doing reasonably well in terms of using oil rents to promote economic growth. For example, the development of tourism in Saudi Arabia and the United Arab Emirates (Dubai in particular) is financed through the application of oil rents.

However, the experience of economies like Venezuela, Nigeria, Angola, and Iraq with oil rents and growth, has not been smooth. These are 'oil trade losers' owing to the perceived challenges ravaging their economies, suggesting the presence of the resource curse problem. According to US Energy Information and Administration (2018), oil rents are an essential segment of the OPEC economies. For OPEC to sustain the flow of oil rents to member states, there is a need to foster a unified front, and operate as collusive agents in the oil market. Huppmann (2013), Nakov, and Nuno (2013) observe that OPEC acts more as non-cooperative producers of oil, thus failing to guarantee the regulation of oil supply that would ensure fair oil rents for the member states. The policy implication of this assertion is that, for a sustained increase in oil rents to be realised, collusive power in the form of oligopoly power must be strengthened by OPEC. This is partly linked with the development of economic institutions, as suggested in the literature.

The price elasticity of demand for crude oil is an essential determinant of OPEC's economic fortunes, given its dependence on oil rents for budgetary allocations. Some studies like Cooper (2003) contrast inelastic demand for crude oil in the short run with possible elastic demand in the long run, albeit less than unity. For Kaufmann et al. (2008), in their exploration of whether the determinants of crude oil prices were refinery capacity, non-linearity in supply conditions, or expectations during the price increase period of 2004-2006, concluded that all the listed factors determined the oil price increase during the period.

Dees et al. (2007) considering the period 1986 to 2003, argued that crude oil prices are dependent on OPEC capacity, OECD crude oil stocks, OPEC quotas and cheating on those quotas. Crude oil prices are also intertwined with the political economy of OPEC, as argued by

Hochman and Zilberman (2015). By implication, Johany (1980) suggests that crude oil prices in the international market can be modelled with OPEC as the dominant player, dictating the price that non-OPEC countries are then obliged to accept. This assertion becomes invalid, however, given the decline in the influence of OPEC in the global oil industry following the increased supply from non-OPEC economies.

Lane and Tornell (1996, 1999) maintain that the challenges to applying oil rents to economic growth in countries like Nigeria and Venezuela are by-products of defective institutions which have led to rent-seeking behaviour and corruption. Nigeria and Venezuela have arguably experienced the worst form of political institutions for decades, since joining OPEC. Although Nigeria became a democratic state in 1999, the democratic dividend in the form of an equitable redistribution of oil rents and promotion of the welfare of the population has not been realised. The case of Venezuela appears to be worse in terms of democratic credibility. An increase in oil rents perhaps creates avenues for dictators to 'buy off' opponents, according to Acemoglu et al. (2014). This assertion underscores the failure of institutions in certain OPEC economies.

Institutions and economic growth in OPEC economies

Robinson et al. (2002) and Acemoglu (2004) have argued that the positive effects of resources like oil can only be significant in states with political incentives in the form of good institutions, which complement the flow of oil rents. In this chapter, their conclusion is challenged partly because of the nature of the political institutions in two countries regarded as model economies by other OPEC members, namely Saudi Arabia and the United Arab Emirates. Using any of the significant known metrics of the political institutions such as Transparency International (2016), Freedom House (2017), or the Polity IV Index (2018), it has been demonstrated that both countries are deficient in democratic institutions with a record of insufficient human rights. Meanwhile, in terms of economic institutions, these same two countries are in the World Bank's high-income group. The logical deduction from the preceding discussion is that an institution could be a sufficient condition for economic growth, but whether an institution is necessary for economic growth is subject of further empirical review given the economic experience of Saudi Arabia and the United Arab Emirates, as indicated above.

Barro and Sala-i-Martin (2004) showed that oil rents have not positively impacted the growth rate of members of OPEC in the developing world, partly because of the failure of government in those economies to translate the gains from oil into meaningful development in their domestic economies. This indicates that institutions matter for economic growth at least in some sense. Property rights, legislation and the rule of law are some of the institutional

conditions required for efficient application of oil rents among OPEC economies. Knack and Keefer (1995) using cross-country data to investigate the association between property rights as a proxy for institutions and economic growth argued that there was no causal relationship, given the associated challenges of endogeneity. The measurement problem and subjectivity of the instrument could be partly responsible for their inconclusive results. This chapter addresses the challenge in two ways; firstly, we use four distinct measurements to determine the impact of institutions in OPEC economies from multiple perspectives. Secondly, to address the problems of endogeneity and measurement, especially with regard to institutions, we apply the econometric method of a dynamic panel instrumental variable estimator with fixed effects, otherwise known as the Anderson Hsiao instrumental variable.

Ades and Di Tella (1999) in their cross-country regression analysis, demonstrated that oil rents may stimulate corruption among public officers and politicians in economies endowed with oil, like OPEC countries. For example, Nigeria's Amnesty Programme, which was established to fund, reorientate and rebrand reformed warlords, ex-rebels and ex-militants in oil-producing host communities, has been described as an avenue whereby political office holders have siphoned scarce resources into private pockets. Despite this Amnesty Programme, resource control induced violence, theft of crude oil, vandalising of oil pipelines and skirmishes among warring rebel groups and warlords continue unabated in Nigeria's oil-producing areas (Skaperdas, 2002).

Ross (2001) in his analysis of the effect of oil rents on economic growth was more critical. He based his assessment on the experience of certain developing oil-producing economies with fragile or deficient institutions pursuing economic growth through oil rents. He concluded that oil rents impede economic growth, especially in fragile states with dysfunctional institutions. This thesis chapter builds on his empirical work, firstly with findings demonstrating that there is a long-run negative effect of oil rents on economic growth within OPEC. Secondly, the Gulf States in OPEC lack democratic institutions, as affirmed by Ross (2001); but lack of democratic institutions has not impeded the growth rate of the Gulf States thanks to the presence of incentives to manage oil rents, in contrast to economies like Nigeria, Angola, and Venezuela.

This summary of the related literature above draws three conclusions: firstly, the economic growth of OPEC economies may be dependent on oil rents conditioned upon institutional changes. Secondly, given the diversity in the economic configurations of OPEC members, oil rents are not likely to have a uniform effect on their economic growth. Thirdly, further empirical investigation should be undertaken regarding the nature, measurement, and validity of institutions as a complement to economic growth in OPEC countries. As Acemoglu and Robinson

(2005) argued, the discussion of the different types of institutions within an economy is critical for research into their relationship with economic growth.

3.10   The nature and sources of data

3.10.1   The data and its measurements

In this chapter, we utilise panel dataset (yearly) with the fourteen OPEC economies to represent the cross-section dimension; the scope of coverage is between 1967 to 2017. Sources of variables utilised in this study include the World Bank-World Development Indicators (2019), BP Statistical bulletin (2019), Polity IV index of regime characteristics, and the Political Constraints Index (2017).

The dependent variable for this study is the per capita real GDP growth rate of the OPEC economies. The explanatory variables are the share of oil rents in the real GDP of OPEC economies. There are four proxy variables for the qualities of institution in this chapter, the democratic institution, the legal institution, the anti-corruption institution and government effectiveness institution qualities of OPEC economies. For the determination of the oligopoly power of OPEC, we develop a proxy variable for the oligopoly power of OPEC with the share of crude oil produced in OPEC as a proportion of the total world crude oil produced. Lastly, the official real exchange rate of OPEC economies currencies into the US dollar. .The full description of the variables is available in Table 3.2. A brief explanation of our justification for each of the variables utilised for this study follows below:

Economic growth proxy of OPEC economies[GRO]

The real per capita GDP growth rate of the 14 OPEC economies is utilised in this chapter to model economic growth which closely represents the economic growth rate of each of the sampled OPEC economies in our panel .

Oil rents as a percentage of GDP[REN]

Previous studies in the context of OPEC has utilised a mixture of oil revenue and oil rents. In this chapter, we assume that the production cost component of the oil sector must be a factor in when dealing with the possible returns on investment from oil. Therefore, the chapter utilises oil rents which are the difference between the price of crude oil at the international market and production cost as our primary explanatory variable that explains the growth rate of OPEC economies.

Table 3.2: General description of variable and notation with source

Notation	Variable	Description and Measurement	Unit of Measurement	Source
headers		TABLE 3.2: The General Description of Variable and Measurement		
GRO	Per Capita Real GDP Growth Rate	Gross domestic product divided by midyear population. Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2010 US dollar	Annual Percentage	World Bank's World Development Indicator (2019)
REN	Share of oil rents in GDP	It is the percentage measured of the difference between the value of crude oil production at the world prices (constant price) and the total costs of production	Percentage	World Bank's World Development Indicator (2019)
WERO**	OPEC Oligopoly Power	The share of crude oil produced by OPEC as a proportion of the total world crude oil produced which proxy OPEC oligopoly power.	Numerical Value	BP Statistical Bulletin (2019)
DEM	The Democratic Institution Quality.	Institutionalised democracy indicator which differentiates among varying system of political system with -10 as the lower bound (strongly autocratic) and +10 as the upper bound (strongly democratic).	Numerical Value	Polity IV Index of Regime Characteristic (2019)
ACOI	Anti-Corruption Institution Quality.	The variable is called the XCONST by POLCON, which is an institutionalised constraint on the decision power of the executives in government with a view to promote accountability. Given the prevalence of corruption in the developing oil producing states, we utilised it to determine the measure of corruption among the executives in government. It ranges from the lower score of 1 being a state with no accountable government and 7, a state with highly accountable government. We utilised it as one of the qualities of anti-corruption.	Numerical Value	Centre for systemic Peace (2020) and POLCON dataset (2017), available at : The Political Constraint Index (POLCON) Dataset - Management Department (upenn.edu)
LEGI**	The legal Institution Quality.	A composite variable. The legal institution quality is generated from the interaction of the institutionalised index from Political constraint index (POLCON). The two interacted variables are: ALIGN12, alignment between the executive and the upper legislative chamber index and LAWORDERCRG, the quality of law-and-order index. The POLCON variables are measure of political constraint, and determine the underlying political structure to be able to assess credible policy formulation. The lower bound for each of the two variable is 0 and the higher bound is 1. Score of 1 is assigned when the party controlling the executive branch is either the largest party in the upper legislative chamber or is a member of a ruling coalition in that chamber, otherwise 0. A country with high degree of law and order is assigned 1, otherwise zero. We combine the two variables to form a composite variable called the Legal institution in OPEC economies.	Numerical Value	Centre for systemic Peace (2020) and POLCON dataset (2017), available at: The Political Constraint Index (POLCON) Dataset - Management Department (upenn.edu)
GEFI	Government Effectiveness Institution Quality.	The variable is called EXREC which implies executive recruitment, that is, the technique through which states adopt in the selection or election of the people in the executive arm of government. Given that the policy implementation of the state rest in the hand of the executive, in this study, we presumed that the efficiency level of the executive in policy implementation possibly have linkage with economic growth. The lower bound is 0 for a state with poor quality of executive recruitment and 1 as the higher bound for state with high quality of executive recruitment. The range can also be converted to percentage values, from 0 to 100.	Numerical Value	Polity IV Index of Regime Characteristic (2019)
VGS	Share of Gross Saving in GDP	Gross savings are calculated as gross national income less total consumption, plus net transfers.	Percentage	World Bank's World Development Indicator (2019)
EXR	Official Real Exchange Rate	OPEC Economies official Real Exchange Rate to US dollar	Monetary Value-US Dollar	World Bank's World Development Indicator (2019)
PRIC	Spot price of crude oil	The spot price of crude oil at the international market.	Monetary Value-US Dollar	BP Statistical Bulletin (2019)
CPL	Volume of crude oil produced by OPEC	The total volume of crude oil produced in millions of barrels by OPEC economies.	Million Barrel	BP Statistical Bulletin (2019)
RESE	Volume of Crude Oil Reserve	The total volume of Crude oil reserve held by each of the OPEC economies.	Million Barrel	BP Statistical Bulletin (2019)

Note: ** Author's contribution to the literature.   Annual Panel data for the 14 OPEC Economies for the period 1967-2017.

OPEC oligopoly power proxy[WERO]

There is an assumption in the economic literature that correlation exists between the influence of OPEC at the international crude oil market and the probability of higher oil rents to OPEC. In the light of this assumption, we model OPEC oligopoly power proxy by the share of OPEC volume of production in the total world crude oil produced to ascertain the strength of OPEC in the global crude oil market.

Democratic institution quality [DEM]

Ross (2001) contends that democracy hinders growth. Building on his proposition, we proxy the political institution in OPEC economies with the democratic institution quality to observe the implication of democratic government in OPEC economies.

Anti-corruption institution quality [ACOI]

Although corruption perception index is challenging to utilise as a measurement of institutional quality as espoused in economic literature, there is a widespread assumption that corruption impedes economic growth especially among natural resource endowed economies. In the light of this, we utilised the XCONST variable from the Political Constraint index- POLCON (2017) which is a measure of the quality of institutionalised constraints on the government executives to promote accountability in public decision making. The dataset is also available from the Centre for Systemic Peace(2019).

Legal institution quality [LEGI]

Within the previous studies about oil rents and economic growth or institutions and economic growth in OPEC economies, there has not been a study that directly utilises a variable to model the legal institution to the best of our knowledge. The property right is one of the vital laws to guide the operation of the oil business in OPEC economies.by the state. In furtherance of this argument, we model the legal institution in this study via the composite variable created from the interaction of the rule of law index from the Political Constraint index- POLCON (2017) and the index of alignment between the executive and the legislature from POLCON (2017). The datset can also be obtained from the Centre for Systemic Peace(2019).

Government effectiveness institution quality[GEFI]

The quality of government effectiveness is a crucial institutional quality in the literature. Given the dynamism of the composition of the quality of an institution, we utilise the EXREC variable from the Polity IV index of regime characteristics (2019) which measures the quality of executive recruitment and selection procedure as an important variable determining the efficiency in government administration to denote the government effectiveness quality.

Official real exchange rate of OPEC currencies to US Dollar[EXR]

We introduce the official real Exchange rate of individual OPEC economies into US dollar to represent the likely effect of the impact of exchange rate determination in OPEC.

3.10.2 The descriptive statistics

In Table 3.3, we present the descriptive statistics of the full variables utilised in this chapter for the sample of 14 OPEC economies (n) between 1967 to 2017 (T =51). It is evident from the table that, the per capita real GDP growth rate averaged (mean) at 1.35, with the overall standard deviation of 11.59, the minimum value of -62.38, its maximum value of 140.4 and with 714 as the number of observation. We restrict the standard deviation in Table 3.3 to only the overall for space consideration. The standard deviation for the overall sample statistically equals $\frac{\sqrt{\sum_1^N (x-\bar{x})^2}}{N-1}$. Within standard deviation in the panels is the difference between the value of an observation and the panel mean. By implication, a panel data have two categories of mean, the sample mean and the panel means with three types of standard deviation, overall, between and within.

Table 3.3: The descriptive statistics

VARIABLES [Notation]	(1) MEAN	(2) SD	(3) MIN	(4) MAX	(5) N
Per Capita Real GDP Growth Rate [GRO]	1.35	11.59	-62.38	140.4	714
Oil Rents as Percentage of GDP[REN]	23.19	16.33	0	83.19	714
OPEC Oligopoly Power Proxy [WERO]	0.06	0.08	0	0.39	714
Democratic Institution Quality [DEM]	-4.33	5.70	-10	9	714
Anti-Corruption Institution Quality[ACOI]	2.41	1.62	1	7	714
Legal Institution Quality [LEGI]	0.24	0.15	0	0.6	714
Effectiveness of Government Quality[GEFI]	3.61	2.98	-8	8	714
Gross Savings as Percentage of GDP[VGS]	31.74	25.39	-236.2	124.2	714
Official Real Exchange Rate to US Dollar [EXR]	567.94	2388.14	0 .001	30915	714
Spot Price of crude oil [PRIC]	32.52	29.08	1.9.	114.21	714
Volume of crude oil produced [CPL]	2044.95	2275.4	0.04	12402	714
Crude Oil Reserve [RESE]	61.69	75.23	0.3	303.2	714

3.11 The research method and estimation technique

This chapter utilises the Panel instrumental variable approach given the likelihood of an endogeneity risk in our model. The full discussion of the endogeneity issue is available in subsubsection 3.7.4 of this section. Bond et al (2001) argued that the econometric work of panel data should begin with the Pooled OLS, to be followed by the fixed effect method (or random effect, subject to the outcome of Hausmann specification test) before the introduction of superior econometric method like the Panel instrumental variable. For this chapter, the Pooled OLS would not account for the inter-country differences among the 14 OPEC economies, therefore either fixed effect or random effect may be needed. To align this chapter with the propositions of Bond et al (2001) about Panel data, we provide in the appendices subsection 5.2.5 the empirical results obtained using our specific model with the Pooled OLS and fixed effect approach given the possible need to observe our econometric steps towards the application of the Panel

instrumental variable, which is our consistent estimator. Further, in subsection 7.3, we briefly review the theoretical stand of the fixed effect model. Before the formal regression procedure , the optimal lag selection process would be determined to guide us with the number of required lags for our variables of interest in the General model. Following the lag selection procedure, we utilise the Pooled OLS to determine our general model and guide the application of our restriction procedures.

3.11.1 The lag selection procedure

The utilisation of the correct lag structure in a regression model is vital to draw a valid conclusion in an empirical work. Economic changes are sometimes not instantaneous. The events of the past period could have implications on the current growth rate or the future growth rate in an economy, OPEC economies inclusive. Because of this, we perform the VAR lag selection procedure to determine the optimal lag selection for the variables utilised in this study. There are three information criteria to be used in the selection procedure, which are, the Akaike Information Criterion (AIC), the Schwartz Information Criterion (SIC), and Hannan-Quinn Information Criterion (HQIC). Any of the criteria can be used for our lag selection procedure as suggested by empirical assumption, but AIC criterion is selected among the optimal criterion with a corresponding significant value of 27.55262* indicating one lag for all our explanatory variables in Table 3.4.

Table 3.4: VAR lag selection criterion result

LAG	LL	LR	FPE	AIC	SC	HQ
0	-7578.975	NA	24.542808	38.89218	38.94303	38.91234
1	-5342.761	4403.622*	636187.2*	27.55262*	27.85771*	27.67356*
2	-5327.176	30.29118	667698.5	27.60090	28.16023	27.82262
3	-5317.338	18.86901	721798.2	27.67866	28.49222	28.00116
4	-5299.784	33.21804	750110.0	27.71684	28.78465	28.14012

Endogenous Variables: Gr0, Ren, Wero, Vgs, Dem, Acoi, Gefi, Legi ,Exr.
Exogenous : Constant
*Indicates Lag Order Selected by the Criterion.(Each test at 5% level)
Source : Author's computation

3.11.2 The pooled OLS model- preliminary estimator-1

Given the outcome of our VAR lag procedure in Table 3.4 above, we specify our initial (General) model with the Pooled OLS model for this study as:

$$\text{GRO}_{it} = \beta_0 + \beta_1 \text{REN}_{it} + \beta_2 \text{REN}_{it-1} + \beta_3 WERO_{it} + \beta_4 WERO_{it-1} + \beta_5 \text{DEM}_{it} + \beta_6 DEM_{it-1} +$$

$\beta_7\text{LEGI}_{it} + \beta_8 LEGI_{it-1} + \beta_9\text{EXR}_{it} + \beta_{10}EXR_{it-1} + \beta_{11}\text{ACOI}_{it} + \beta_{12}ACOI_{it-1} + \beta_{13}\text{VGS}_{it} + \beta_{14}VGS_{it-1} + \beta_{15}GEFI_{it} + \beta_{16}GEFI_{it-1} + \beta_{17}\text{GRO}_{it-1} + \mu_{it} \ldots \ldots \ldots (1)$

From equation (1), GRO is the per capita real GDP growth rate of the 14 OPEC economies in our sample, which represents economic growth. REN is the share of oil rents in GDP of the OPEC economies in our sample. At the same time, $WERO$ is the proxy variable for OPEC oligopoly power which is the share of OPEC crude oil produced as a proportion of the total world crude oil produced. DEM denotes the OPEC economies political institution proxy by democratic institutional index from the Polity IV project (2019). $ACOI$ is the OPEC anti-corruption institution quality. $GEFI$ is the government effectiveness quality. $LEGI$ is the legal institution quality which is a composite variable created to control for the legal aspect of an institution. EXR represents the official real exchange rate of OPEC economies currencies into US dollar, VGS is the share of gross saving in GDP sourced from the World Development Indicators (2019), GRO_{t-1} is the lag one of our dependent variable used as part of our regressors and μ_{it} are the error terms. From the general model specified above in equation (1), using the Pooled OLS estimator , our initial general empirical output is presented below in Table 3.5:

Table 3.5:   The General Model selection using Pooled OLS estimator

VARIABLES	(1) Pooled OLS Model
Oil Rents as a Percentage of GDP[REN]	0.234*
	(0.115)
Oil Rents as a Percentage of GDP[REN](-1)	-0.001
	(0.101)
Democratic Institution Quality [DEM]	-0.030
	(0.391)
Democratic Institution Quality [DEM](-1)	0.023
	(0.405)
Legal Institution Quality[LEGI]	0.636
	(1.522)
Legal Institution Quality [LEGI](-1)	-0.624
	(1.100)
Anti-corruption Institution Quality [ACOI]	0.535
	(0.619)
Anti-corruption Institution Quality [ACOI](-1)	0.344
	(0.559)
Government Effectiveness Quality [GEFI]	0.571
	(0.619)
Government Effectiveness Quality [GEFI](-1)	0.344
	(0.559)
OPEC Oligopoly Power Proxy [WERO]	4.897
	(38.631)
OPEC Oligopoly Power Proxy [WERO](-1)	-74.646
	(48.139)
Official Real Exchange Rate to US Dollar[EXR]	0.000369
	(0.000405)
Official Real Exchange Rate to US Dollar[EXR](-1)	0.000390
	(0.0004)
Gross Savings as a Percentage of GDP [VGS]	0.0375
	(0.078)
Gross Savings as a Percentage of GDP [VGS](-1)	0.0237
	(0.056)
Per Capita GDP Growth Rate[GRO](-1)	-0.169**
	(0.0792)
Constant	787.32
	(755.3)
Number of Countries	14
Observations	219
R-squared	0.2946

Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

To derive our specific model, we introduce the restriction procedure to equation (1) above by *'eliminating the irrelevant variables'* as proposed by Hendry and Krolzig (2005). Table 3.6 (3.6A and 3.6B) shows the output of the restriction procedure using the elimination procedure of General-To-Specific-[GETS] model selection as exemplified by Hendry and Nielsen[6](2007:291-292) which states that *'.... there are two aspects to keep in mind: the elimination of irrelevant variables and the retention of relevant variables. The cost of eliminating the irrelevant variables,*

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[6]See David F. Hendry and Bent Nielsen: Econometric Modelling-A likelihood Approach, chapter 19.

which could be called the cost of the search is low, whereas the cost of retaining relevant variables is high, associated with the cost of making inference……. General-to-specific (Gets) searches from a congruent initial model are successful' . In this chapter, we maintain the General- To -Specific model selection otherwise known as the 'Gets' approach, and eliminates the 'least significant variable(s)' to develop 'the terminal equation' model. We develop the Pooled OLS estimator as the basis of our General model selection. The output of the Pooled OLS estimator is in Table 3.5 above. From Tables 3.6 (3.6A and 3.6B), the null hypothesis for the F stat restriction procedure is that all the tested variables are zero, with the alternative hypothesis implying that at least one of the variables in the joint hypothesis is not equal to zero. The F stat statistical formula is:

$$F = \frac{(SSR_r - SSR_{ur})/q}{SSR_{ur}/n - k - 1}$$

Table 3.6:   Table of restrictions: General-to-Specific (GETS)

Table 3.6A: Restrictions Results-2: General-To-Specific Model Selection (GETS)

Lag Variable	Null Hypothesis	Alternative Hypothesis	Probability Value	Outcome
Oil Rents as a Percentage of GDP	$\beta_2 = 0$	$\beta_2 \neq 0$	0.9900	Not Reject the Null
Democratic Institution Quality	$\beta_6 = 0$	$\beta_6 \neq 0$	0.9544	Not Reject the Null
Legal Institution Quality	$\beta_8 = 0$	$\beta_8 \neq 0$	0.5715	Not Reject the Null
Anti-corruption Institution Quality	$\beta_{12} = 0$	$\beta_{12} \neq 0$	0.5394	Not Reject the Null
Government Effectiveness Quality	$\beta_{16} = 0$	$\beta_{16} \neq 0$	0.5828	Not Reject the Null
OPEC Oligopoly Power Proxy	$\beta_4 = 0$	$\beta_4 \neq 0$	0.1360	Not Reject the Null
Gross Savings as Percentage of GDP	$\beta_{14} = 0$	$\beta_{14} \neq 0$	0.6734	Not Reject the Null
Official Real Exchange Rate	$\beta_{10} = 0$	$\beta_{10} \neq 0$	0.1874	Not Reject the Null

Source: Author's Computation.

Table 3.6B: Restrictions Results-3: General-To-Specific Model Selection (GETS)

Lag Variable	Null Hypothesis	Alternative Hypothesis	Probability Value	Outcome
Oil Rents as a Percentage of GDP	$\beta_1 = \beta_2 = 0$	Null is not correct	0.1244	Not Reject the Null
Democratic Institution Quality	$\beta_5 = \beta_6 = 0$	Null is not correct	0.9935	Not Reject the Null
Legal Institution Quality	$\beta_7 = \beta_8 = 0$	Null is not correct	0.6998	Not Reject the Null
Anti-corruption Institution Quality	$\beta_{11} = \beta_{12} = 0$	Null is not correct	0.5984	Not Reject the Null
Government Effectiveness Quality	$\beta_{15} = \beta_{16} = 0$	Null is not correct	0.2129	Not Reject the Null
OPEC Oligopoly Power Proxy	$\beta_3 = \beta_4 = 0$	Null is not correct	0.2184	Not Reject the Null
Gross Savings as Percentage of GDP	$\beta_{13} = \beta_{14} = 0$	Null is not correct	0.7794	Not Reject the Null
Official Real Exchange Rate	$\beta_9 = \beta_{10} = 0$	Null is not correct	0.3099	Not Reject the Null

Source: Author's Computation.

From the restriction procedures above, we identify all the lag components of our explanatory variables except for the lag one of the dependent variable to be statistically insignificant. That leads to the exclusion of all the lags from the model except for the lag one of dependent variable. The application of the General-to-specific model selection allows for the specification tests and choice of relevant variables for our model. However, the Pooled OLS approach is not a consistent estimator for this study due to the inter-country differences among the 14 OPEC economies otherwise known as the heterogeneity issue which the Pooled OLS does not take into

account. Therefore, there is a need for the choice of an estimation procedure that overcomes the perceived shortcoming of the Pooled OLS. Base on the outcome of our Hausmann specification test, the fixed effect is approved as the estimation procedure to be utilised. The null hypothesis of the Hausmann specification test at 5% critical value indicates that the random effect model is appropriate, whilst the alternative hypothesis says that the fixed effect model is the appropriate model option to be utilised. The probability value of our Hausmann specification test result equal to 0.000. By implication, we reject the null hypothesis and conclude that the fixed effect model is the appropriate method. That is the justification of our choice of the fixed-effects estimator model as the next estimation procedure to be utilised. Using the specific model obtained with our restriction procedure in Table 3.6A and 3.6B, we proceed below to briefly explain the theoretical stand of fixed effect model.

Justification for the Inclusion or Exclusion of Lagged and Level Variables

The pooled OLS is initially utilised in this chapter to guide our specification tests in determining the relevant explanatory variables for our model development. Given the outcome of our VAR lag selection procedure, we deduce that lag one is recommended for the initial general model with the Pooled OLS. The result of our initial regression model with the Pooled OLS, as shown in Table 3.5, illustrating that only the lag one of the per capita GDP growth rate of the OPEC economies is statistically significant. We followed suit with the formal restriction procedure, indicating that statistically insignificant variables can be dropped from our general model.

In essence, we utilise some of the lag variables with our specific model for specification purpose in our panel instrumental variable estimation. However, it turns out that their inclusion results in the weakening of our instruments. Therefore, the exclusion of those variables become justified, as earlier argued.

3.11.3   The fixed effect model- preliminary estimator 2

$\text{GRO}_{it} = \beta_0 + \beta_1 \text{REN}_{it} + \beta_2 DEM_{it} + \beta_3 \text{WERO}_{it} + \beta_4 \text{LEGI}_{it} + \beta_5 \text{EXR}_{it} + \beta_6 VGS_{it} + \beta_7 \text{ACOI}_{it} + \beta_8 \text{GEFI}_{it} + \beta_9 \text{GRO}_{it-1} + \mu_{it}$........(2)

For i=1,....N and t=1,2,......T The stochastic error component in equation (2) is decomposed into: $\mu_{it} = \varepsilon_{it} + v_i + \delta_t$........(3)

From the above equation (3) which consists of the decomposition of the stochastic error component, ε_{it} denotes the unobservable country-specific effect (14 OPEC economies), whilst v_i is the unknown intercept for each country and δ_t is the time effect, that is, the dummy component which indicates the time trend common among all the 14 OPEC economies . The

fixed effect estimator corrects for the time-invariant differences among our sample population for this study, the 14 OPEC economies. By implication, the fixed effect approach eliminates omitted variable bias in our model due to time-constant factors.

The fixed effect estimator though overcomes the shortcoming of the Pooled OLS by controlling for heterogeneity and some form of omitted variable bias due mainly to time-varying conditions, however, the fixed effect estimator cannot correct all the inherent omitted variable bias especially the time-varying unobserved effect, time-varying measurement error, simultaneity or feedback effect. In essence, when confronted with endogeneity concern and the need to derive consistent estimates, the application of fixed effect estimator becomes grossly limited as an appropriate econometric method. Therefore, there is a need to utilise an advance econometric method which addresses the endogeneity problem. Given the explained limitations of the fixed effects estimator and the outcome of our restriction procedure using GETS (General-To-Specific) above which indicated that the lag components are proven to be statistically insignificant to our model selection, we proceed below to discuss the endogeneity concern for this study before the introduction of a sophisticated estimation procedure, the panel instrumental variable estimator as a remedy for the endogeneity concern.

3.11.4 The discussion of endogeneity problem

Economic literature shows that addressing the challenges posed by the endogeneity problem is an appropriate step to drawing valid empirical conclusions. Therefore, one of our primary estimation goals is to address the likelihood of endogeneity in our model. According to Baltagi (2013: 129)

'Endogeneity of the right-hand regressors is a severe problem in econometrics. By endogeneity, we mean the correlation of the right-hand regressors and the disturbances. That may be due to the omission of relevant variables, measurement error, sample selectivity, self-selection, or other reasons. Endogeneity leads to inconsistency of the usual OLS estimates and requires instrumental variable (IV) methods such as two-stage least squares (2SLS) to obtain consistent parameter estimates'.

In econometric literature, a correlated variable with the error term is called an endogenous variable. For the potential endogeneity risk in model development, we proceed to discuss sources of endogeneity:

[a] **Measurement Error with Oil Rents and OPEC Economic Growth** First, one of the potential ways through which endogeneity arises in our model development relates to the

measurement of oil rents as a percentage of GDP. Oil rents, by definition, are the difference between the production costs of oil and the price of oil at the international market. Because of this, the estimation of oil rents by each of the 14 OPEC economies differs. The inherent difference stems from the implication of the actual production costs on crude oil within the OPEC economies. Although, few of the OPEC economies like Saudi Arabia and the United Arab Emirates possibly have production cost advantage partly for crude oil and the volume of crude oil extracted in the affected economies. Similar cost advantage is probably not prevalent in many of the other OPEC economies. Therefore, in our estimation of the OPEC oil rents, it becomes challenging to determine the actual production costs of oil among the 14 OPEC economies. Given the prevalence of differences in the estimation of oil rents among OPEC economies, there is a likelihood for error-in -variable either deliberately to achieve some predetermine domestic objectives or unwittingly given computation anomalies. The likely inconsistencies in the estimation of the actual production costs lead to an inaccurate measure of oil rents which has a linkage with the error term since the anomalies in the production cost would not be captured within the revenue equation of OPEC.

Furthermore, the calculation of production costs of crude oil entails sunk costs, associated rent-seeking costs and secretive overhead costs laced with corruption, especially in most of the developing OPEC economies like Venezuela, Nigeria, Libya, Angola and Congo with institutionalised rent-seeking behaviour, corruption and mismanagement of oil rents. Interestingly, the large chunk of the above rent-seeking costs is not likely to be fully captured within the formal accounting procedure of the crude oil business in OPEC economies. Nevertheless, the assumption is that those sunk costs or rent-seeking costs will be included in the disturbance. The aggregate of the above accounting costs inaccuracies potentially correlates with the error term leading into measurement error of oil rents and perhaps endogeneity bias.

[b] Reverse Causation or Simultaneity between Oil Rents and Economic Growth
By definition, reverse causation occurs whenever there is feedback from an independent variable to the dependent variable. Specifically, reverse causation happens if economic growth drives oil rents instead of the opposite in econometric parlance. In particular, the challenge of reverse causation has been debated in the economic literature on oil rents and economic growth, especially in the Rentier states among OPEC. The incentives that oil rents provide allowed the oil rents in OPEC to depend on economic growth instead of the opposite, as argued in the literature. Once there is sustained growth in OPEC economies, the likelihood exists that OPEC economies would have more capita outlay. For example, OPEC economies would have incentives to develop refinery capacities, increase pay-out of dividends to shareholders like in Aramco in Saudi Arabia, and expand oil business into other energy frontiers, particularly re-

newable energy. In this instance, economic growth drives the oil rents in place of the opposite, which is called reverse causation in econometric literature. There is a likelihood that such presumption holds for our regression equation in this study, especially with the application of oil rents among OPEC economies as an explanatory variable. Therefore, there is a probability that such reverse causation correlates with the error term. Perhaps endogeneity bias or an inconsistent estimate with the application of OLS would occur if utilised.

[c] Potential Misspecification of Qualities of Institutions in OPEC Economies

One of the prevalent misspecification problems with institutional qualities is the determination of what constitutes a political institution. Some of the Rentier States have no known quality of the political institution in the OPEC economies, which is widely known. In our determination to address the misspecification problem with institutions in OPEC, we focus attention on how institutions are measured in particular. Accurate measurement of institutions is the first condition to correcting the misspecification error with institutions in OPEC. To accomplish that goal, we source data on institutions from well-established and international agencies or organisation like Polity IV index of regime characteristics (2018), Quality of Government Indicators, Teorell et al., (2018), and Political Constraint Institute, POLCON (2018). The implications from utilising these standardised institutions sources are as follows: firstly, the institutionalised metrics reflect in an accurate term the existing and historical institutional conditions among the OPEC economies with a piece of empirical evidence in a text and visual forms (as evident on page 84 of this chapter under the measurement of democratic institution).

Secondly, the primary interest of this chapter on the institution is to accurately measure how institutions are determined in OPEC economies vis-a-vis the effects of those measured institutions as co-determinants of economic growth. We hold assumptions in this chapter that endogeneity challenges with the institution have been addressed, given our standardised sources of data for the qualities of institutions. This chapter is not oblivion of the propositions in some literature segment that likelihood exists for endogeneity in some institutions' qualities because of the non-random of data used as metrics. The corruption perception index of Transparency International is supposed to be exposed to such poor estimation in our view, given the non-random allocation of values for the corruption perception index. That is one of the main reasons we did not adopt it as one of our measurements of qualities of institutions in OPEC.

Choice of Instruments: OPEC volume of crude oil reserve and volume of crude oil produced

In our econometric work for this chapter, we utilise two instruments: volume of crude oil reserve in OPEC (RESE) and the volume of crude oil produced among the 14 OPEC economies in a million barrels (CPL) as our instruments. Two specific conditions are to be satisfied for these

two instruments to be valid: instrument relevance and instrument exogeneity. Although these two conditions are fulfilled through our econometric experiments by the two instruments, as we shall see under our empirical works, we proceed below to briefly discuss the fundamental justifications for the choice of the two instruments: According to Hendry and Doornik (2014: 109), *'The first step is to test for the relevance of the instruments, and failure to reject no relation warns of seriously weak instruments'* . Our argument supporting the two instruments is as follows: firstly, the oil rents in OPEC economies are dependent in part on the volume of crude oil produced, subject to the production quotas (instrument relevance). In furtherance to this position, holding all other factors constant, a rising production level with an increasing demand for crude oil at the international market would shift the oil rents curve outward. Secondly, empirical evidence from energy economics literature showed that the undercurrent motive for the violation of the OPEC production quotas, otherwise known as the cheat attitude of OPEC members is to raise supply level to increase the oil rents. Because of the above, plausible assumptions hold from the above analysis that the volume of crude oil produced in the 14 OPEC economies in a million barrel is correlated with the oil rents, but not with the error term (instrument exogeneity).

As for the crude oil reserves in OPEC, statistical evidence shows that OPEC economies hold over 40% of the world crude oil reserve. In a sense, the periodic forecast of OPEC volume of oil supply is related to the volume of crude oil reserves in OPEC. The projections of both the supply and demand of crude oil impact oil rents. There is a correlation between the crude oil reserve and oil rents, meaning the relevance of our crude oil reserve as an instrument. Empirical evidence illustrates that each OPEC economy and the international oil stakeholders comprehend the magnitude of oil reserve in each OPEC economy. Given the potential transparency in the oil reserve policies, assumptions hold that crude oil reserve in OPEC is uncorrelated with the error term, which fulfils an instrument's exogeneity condition. Above all, our statistical procedure confirms the relevance and exogeneity of both instruments, as earlier posited.

The fixed-effect model can address the challenges associated with heterogeneity condition or inter-country differences among the 14 OPEC economies, which bias the pooled OLS. Suppose there is a risk of an endogeneity bias in panel data, as witnessed in this chapter; econometric literature recommends using a panel instrumental variable estimator, provided we can get a valid instrument. In our case, we have statistically identified two instruments, namely, the volume of crude oil produced by the OPEC economies and crude oil reserve. Alternatively, we could apply the GMM model to address the challenges associated with endogeneity. For the application of the GMM to be tenable, the first condition is that the N must be greater than T. N is the number of observations, and T is the time series in the given sample. Both the

Panel IV and GMM models utilise instruments as part of the estimation techniques, with that of the GMM applying some form of moment condition. Our sample population for this study consists of the 14 OPEC economies, meaning that our N is 14, while the (number) cross-section time series, T in our sample, is 50 years (1967-2017). By implication, our N is less than T. Therefore, our estimation method for addressing the associated endogeneity challenges for the regression model developed in this study is the dynamic panel instrumental variable technique, as explained below.

3.11.5   Panel instrumental variable- the consistent estimator

The dynamic panel instrumental variable technique for this study followed the assumptions of Anderson and Hsiao (1982:47-82) empirical work on the applications of an instrumental variable for panel data published in the *Journal of Econometrics*. Given our restriction outcome with the application of an F test procedure as presented in Table 3.6 to 3.8 earlier, we specify the dynamic panel IV model for this chapter as:

$$\text{GRO}_{it} = \beta_0 + \beta_1 \text{REN}_{it} + \beta_2 DEM_{it} + \beta_3 \text{WERO}_{it} + \beta_4 \text{LEGI}_{it} + \beta_5 \text{EXR}_{it} + \beta_6 VGS_{it} + \beta_7 \text{ACOI}_{it} + \beta_8 \text{GEFI}_{it} + \beta_9 \text{GRO}_{it-1} + \mu_{it} \dots (4)$$

We utilise two instruments, namely, the volume of crude oil reserve held by OPEC economies and the volume of crude oil produced. The two instruments are denoted by RESE and CPL, respectively. From equation (4): the *REN* is the share of oil rents in GDP of OPEC economies, which is the endogenous variable for this study [7] The exogenous explanatory variables are:*WERO* which is the proxy variable for the OPEC Oligopoly power,*DEM* implies the democratic institution quality, *ACOI* is the OPEC anti-corruption institution quality,   *LEGI* is the legal institution quality in OPEC economies,*VGS* is the share of gross saving in GDP,   *EXRO* is the official real exchange rate of OPEC economies currencies into US dollar, *GEFI* is the government effectiveness institution quality in OPEC economies and GRO_{t-1} which is the lag one of the dependent variable.

The *REN*, our endogenous variable is correlated with the error term given our assumptions. The total costs component of the oil production in the context of OPEC economies cannot be fully captured or explained. The extraction cost of petroleum is prone to sunk costs and other rent-seeking associated costs. Some of these costs are uncounted as part of the total production cost. Empirical evidence suggests that variations exist in the production costs of crude oil in OPEC economies, not necessarily for the type of crude oil produced like Nigeria Forcados or Brent to mention but few, but for the extraneous production costs within OPEC economies. Therefore, the aggregate of all other costs not explained in OPEC has implications for OPEC economic growth, especially for the dependence of OPEC economies on the oil rents.

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[7]It satisfies our endogeneity tests after considering other alternatives among our possible endogenous variables.

The panel instrumental variable estimator for this study follows the assumption of Schaffer(2020) with the application of xtivreg2. The merit of the approach includes the ability of the Stata statistical software to report the weak instruments tests, overidentifying restrictions test and Sargan tests together. The application of the panel IV approach involves two stages, in the first stage, the endogenous variable,GRO is regressed on the two instruments for this study, crude oil reserve,$RESE$ and the volume of crude oil produced by the OPEC economies,CPL; and regress on all the exogenous explanatory variables in the model: REN_{i_t}, $WERO_{it}$, $ACOI_{i_t}$, DEM_{it} , $GEFI_{i_t}$, $LEGI_{i_t}$, EXR_{i_t} , VGS_{i_t} and GRO_{i_t-1} by applying the OLS approach. We saved the predicted value of the endogenous variable. The next stage of the panel IV is to regress the regressand, GRO on the predicted value of the endogenous variable,GRO and on all our exogenous explanatory variables REN_{i_t}, $WERO_i t$, DEM_{it} , $ACOI_{i_t}$,$GEFI_{i_t}$, $LEGI_{i_t}$, VGA_{i_t}, EXR_{i_t} and GRO_{i_t-1} with the OLS estimator. The primary conditions for an IV estimator are instrument relevance and instrument exogeneity. By instrument relevance, expectation holds for the correlation of the instrument with the endogenous variable. Instrument exogeneity implies that such an instrument(s) are uncorrelated with the stochastic error term. Therefore, we present below the empirical result with the estimator that take into account endogeneity issues-Panel IV.

3.12   The empirical results

Table 3.7 below shows our empirical output for this chapter. The regression equation results in column 1 of Table 3.7 using the Pooled OLS consists of the parameter estimates of all our explanatory variables, notably OPEC economies oil rents share in GDP, all the institutional qualities: political, anti-corruption, the legal and government effectiveness institutional qualities, the oligopoly power of OPEC proxy, official real exchange rate, gross savings as a percentage of GDP and the lag one of the dependent variable. Given the associated challenges with the Pooled OLS as explained earlier (heterogeneity conditions among the 14 OPEC economies), we introduce the fixed effect with its output in column 2 of Table 3.7 with a replica of all the explanatory variables utilised for the Pooled OLS. To address the potential endogeneity risks (See Bond et al, 2001) in our model which the fixed effect could not fully address, we present the output of the introduced panel instrumental variable in column 3 of Table 3.7. The model utilise for the panel IV regression equation in Table 3.7 entails all our relevant explanatory variables to respond to our research objectives for chapter 3. Specifically, our consistent estimator output in column 3 of Table 3.7 is utilise for the findings of this chapter.

Table 3.7: The empirical result-Consistent estimator and the preliminary estimators
Dependent Variable: Real GDP per capita Growth Rate [GRO]

VARIABLES [Notations]	(1) Pooled OLS	(2) Fixed Effect	(3) Panel IV
Oil Rents as a Percentage of GDP[REN]	0.186***	0.154***	-0.471**
	(0.068)	(0.075)	(0.192)
Democratic Institution Quality [DEM]	-0.0332	0.023	-0.317
	(0.235)	(0.236)	(0.325)
Legal Institution Quality[LEGI]	1.06	1.056	5.233**
	(0.738)	(0.817)	(2.243)
Anti-corruption Institution Quality [ACOI]	0.709	0.531	6.627***
	(0.384)	(0.472)	(2.817)
Government Effectiveness Quality [GEFI]	0.393	0.269	2.342***
	(0.234)	(0.822)	(1.078)
OPEC Oligopoly Power Proxy [WERO]	-16.74	-16.55	-90.24***
	(20.965)	(20.854)	(31.21)
Official Real Exchange Rate to US Dollar[EXR]	0.000478	0.000262	-0.000233
	(0.000284)	(0.000367)	(0.000403)
Gross Savings as a Percentage of GDP [VGS]	0.065	-0.0825	0.167***
	(0.0367)	(0.0522)	(0.061)
Per Capita GDP Growth Rate[GRO](-1)	-0.143	-0.116	-0.176***
	(0.0651)	(0.092)	(0.0773)
Constant	784.9	-8.095	0
	(642.7)	(7.428)	(0)
Observations	272	267	239
Number of Sample Countries	14	14	14
R-squared	0.271	0.0587	0.1189
Year Dummy	YES	YES	YES
Country Fixed Effect			YES
Anderson Canon LM Stat			0.0000
Cragg-Donald Wald F statistic			20.930
Stock-Yogo Minimum Eigenvalue F statistics			19.93/11.59
Sargan-Test			0.1788

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Anderson Canon LM Chi square Stat of underidentification test Chi square is 0.000, with the null hypothesis : matrix of reduced form coefficients has rank=K1-1 (underidentified) and alternative hypothesis: matrix has rank=K1 (identified).The Stock-Yogo critical values are at the 5% critical values for weak instruments tests based on, respectively 10% and 15% maximal IV size, that is, the maximal fuller relative bias. The rule of thumb is that an instrument is strong if the Fstat of Stock and Yogo is gretaer than or equal to 10. The Sargan test of the null hypothesis is that the instruments as a group are exogenous.The Sargan tests P value of 0.1788 indicates that our Panel IV estimator is robust to the heteroskedasticity and autocorrelation.

3.12.1 The discussion of diagnostic tests - panel instrumental variable

To determine the efficacy of our empirical findings, we perform a series of diagnostic tests for our panel IV estimates in column 3 of Table 3.7. The tests include the Anderson Canon LM test, the Cragg-Donald Wald F test [8], the Stock and Yogo test of instrument strength and the

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[8]One of the assumptions of Zivot et al. (1998) about instrumental variables is that testing the significance of the first stage regression is better performed using Lagrange multiplier or Likelihood ratio than Wald statistics. In dealing with this assumption, our model utilised both the LM test and the Wald test to satisfy the identification conditions.

Sagan test of overidentifying restriction. We provide below the discussion of the output of our diagnostic tests :

Anderson Canon LM test statistic

The null hypothesis for the Anderson Canon LM Chi-square test statistics is that the instruments utilised are underidentified and the alternative hypothesis is that the instruments used are identified. Base on the probability of the value of 0.0000 at 5% level of significance, we can reject the null hypothesis and conclude that our instruments are identified.

Cragg-Donald Wald F statistic test of instruments strength

For the Cragg-Donald Wald F test statistics, if the instruments utilised are greater than one, there is a need to apply it in addition to the rule of thumb of Stcok and Yogo (2005) with the application of the minimum Eigenvalue. In this study, two instruments are utilised, the volume of crude oil produced by OPEC economies and OPEC crude oil reserve. Therefore, we performed the test, as shown in column 3 of Table 3.7. The null hypothesis is to compare the test result of the Cragg-Donald Wald test with the Stock and Yogo (2005) range of critical values. Once the test statistics result of Cragg-Donald is greater than the chosen maximal value for the Stock and Yogo (2005) critical regions, then we reject the null and conclude that our instruments are not weak; otherwise, we cannot reject the null. The 10% maximal IV value and 15% maximal IV value of Stcok and Yogo (2005) critical values are 19.93 and 11.59, respectively. Our Cragg-Donald Wald F statistics is 20.930. By implication, it is greater than the tolerable thresholds of both maximal values of Stock and Yogo (2005). Therefore, our instruments are not weak.

Stock and Yogo strength of instrument test

The test result for our Stock and Yogo (2005) minimum Eigenvalue statistics is 19.93 and 11.59 for 10% and 15% maximal IV values respectively. The rule of thumb for Stock and Yogo (2005) weak identification test is that, once the minimum F stat is equal or greater than 10, the instruments are not weak. The F stats for the panel IV are 19.93 and 11.59 at 10% and 15% size-maximal fuller relative bias. The two tests confirmed that the instruments utilised for the panel IV are robust.

Sagan test of overidentifying restriction

The instruments for panel IV is more than one, which requires the introduction of the overidentifying restriction test. Using the Sagan test, our P-value is 0.1788. The null hypothesis is that the instruments as a group are exogenous, while the alternative hypothesis denotes the opposite at 5% critical levels. From the result, our Sargan test is greater than 0.005 per cent

critical value, which implies that we cannot reject the null hypothesis, which is suitable for our empirical work. The diagnostic tests performed illustrates that our model is robust for the results of our empirical work for this study.

3.12.2 Long run equilibrium solution analysis using the panel IV

The coefficients of our parameter for the panel instrumental variable in column 3 of Table 3.7 are the short run or marginal effects of each of the explanatory variables on the per capita real GDP growth rate of OPEC economies. The long run solution (for only the statistically significant short run parameter estimates) and coefficients are presented below:

$$GRO = -0.4[REN] + 4.5[LEGI] + 5.7[ACOI] + 1.9[GEFI] - 76.7[WERO] + 0.14[VGS]$$

By interpretation, there exist negative long run relationship between oil rents and economic growth in OPEC economies with a magnitude of (-0.4) percent point. The three qualities of institutions in the long run equilibrium solution indicates positive long run association with economic growth. That is, quality of legal institution (LEGI), quality of anti-corruption institution (ACOI), and quality of government effectiveness. From the equilibrium solution, there is a negative long run relationship between OPEC oligopoly power proxy (WERO) and economic growth of OPEC economies with a magnitude of -76.7 percent point. The exchange rate has an inverse long run relationship with OPEC economic growth, whilst gross savings as a percentage of GDP has a positive long run association with economic growth of OPEC economies.

3.13 Discussion of findings

The discussion of our findings base on the outcome of our consistent estimator, the panel instrumental variable estimator in column 3 of Table 3.7 are below:

3.13.1 Oil rents and economic growth in OPEC countries

In column 1 of Table 3.7 with our pooled OLS, the point estimate of oil rents share in OPEC economies GDP is 0.186***. For column 2, the point estimate with the fixed effect estimator is 0.154***. By implication, our parameter estimates with the Pooled OLS and the fixed effect estimators for the share of oil rent are both positive, statistically significant, and greater than the point estimate of panel IV. However, from column 3 of Table 3.7, the marginal effect of the share of oil rents in the real per capita GDP of OPEC economies is negative with a magnitude

of -0.471** in the short run at a 5% level of significance. In contrast to the point estimate of the pooled OLS, that of the panel IV has negative sign, but statistically significant. In the long run, the equilibrium estimate is -0.4, which is negative and significant. The short-run or marginal effect implies that holding all other factors constant, one percentage point increase in the share of oil rents in the GDP of the OPEC economies decreases the aggregate economic growth by an approximate of -0.471 per cent point. This empirical result is consistent with previous empirical works like the proposition of Sach and Warners (1997) concerning an inverse relationship between natural resources like oil and economic growth. Virtually all the OPEC economies are dependent on oil rents for budgetary allocations and fiscal policy. The rentier [9] states in OPEC consists of Saudi Arabia, Qatar, and Iran to a large extent. The likelihood exists that oil rents have positive effects on the growth of there economies (Rentier states). However, in the context of over 50% of OPEC members like Nigeria, Venezuela, Congo, Angola, and Gabon; it may not be sufficient to argue that oil rents have a positive association with there economies.

Given the above, expectations hold that the effect of the oil rents on economic growth would be negative for the OPEC economies in aggregate. The associated shocks to the OPEC economies in respect of there dependence on oil is a pointer to the possible negative association. For instance, the impacts of 2020 COVID- 19 pandemic and the oil price war between Russia and Saudi Arabia which led to the decline of the price of crude oil to an average of $35 in March showed the possible challenges of oil rents to the OPEC economies. The basis of the Nigerian budget for 2020 was on a projected oil price of $57 per barrel for the year 2020 fiscal year. The budget deficit for Nigeria is one of the likely implications of the decline in the oil price or the worst case, a recession. The experience of Nigeria is likely to be widely shared by virtually all the OPEC economies. The implication of budget deficit occasioned by the declining oil rents for Nigeria is that many economic activities within the Nigeria would be negatively affected, productivity level inclusive. The combination of all of the above potentially leads to a negative growth, given the dependency of the Nigerian economy on oil rents. Several other OPEC economies also fall into that economic situation.

3.13.2 Institutional qualities and economic growth of OPEC countries

In column 1 of Table 3.7, the parameter estimate of our legal institution quality with the pooled OLS is 1.06 and with the fixed effect, 1.056 (in column 2). Both estimates have positive signs, statistically insignificant and less than the point estimate of our panel IV in magnitude. By implication, the short-run coefficient of the legal institution quality as shown in column 3 of

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[9]Rentier theory illustrates that if the public authority derives most of its income from external sources in the form of rents from mineral resources and foreign assistance, it makes such government not to tax the population and allows the government to be less accountable to the population

Table 3.7 illustrates a positive and statistically significant effect on the growth rate of the OPEC economies with the magnitude of effect at 5.233** in the short run, at 5% level of significance. Holding other factors the same, a unit increase in the quality of legal institution of OPEC economies increases economic growth by 5.233 per cent point. For the long-run equilibrium coefficient of the legal institution quality, the coefficient is 4.5 with a positive sign. Given this outcome, this study suggests a positive and statistically significant short-run effect and the long-run association between the legal institution quality and economic growth of OPEC economies. The legal institution quality in the OPEC economies is one of the novelties of this study. Studies like Acemoglu et al. (2005, 2019) showed that economic growth is partly dependent on good institutions. The rule of law is one of the necessary foundations of political-economic development. Therefore, an increase in the rule of law within the OPEC economies, especially the Gulf states among OPEC and robust accountability within the rentier states among OPEC economies could promote economic growth. The rule of law facilitates business opportunities because of the confidence that investors place on economies with the operations of rule of law.

For the anti-corruption institution quality in OPEC, our estimated parameter in column 1 of Table 3.7 with the pooled OLS is 0.709, whereas with the fixed effect, we have 0.531 in column 2. In both instances, our point estimates have positive signs, statistically insignificant; with the point estimate of our pooled OLS less than our panel IV estimates. Specifically, the parameter estimate of the anti-corruption institution quality with the panel IV in the short run, as seen in column 3, Table 3.7 is 6.627*** . It indicates that at a 1% level of significance, a unit per cent point increase in the anti-corruption institution quality within the OPEC economies leads to a corresponding rise in OPEC economies growth by an approximate of 6.627 per cent point, holding other factors constant. In the long run, the coefficient of the parameter estimate for the anti-corruption institution quality in OPEC economies is 5.7, which is positive and statistically significant. Transparency International has consistently argued that corruption impedes economic growth. Therefore, our a priori expectation holds with the sign of the estimated parameter, which is positive. By implication, the higher the control of corruption in OPEC economies, the more the likelihood that OPEC economies would grow, all thing the same.

Our point estimate for the government effectiveness quality with the pooled OLS in column 1 of Table 3.7 is 0.393 and 0.269 (column 2) with the fixed effect estimator. For the two parameter estimates, the both have positive signs, statistically insignificant and less than the point estimate of our panel IV. That is, from column 3 of Table 3.7, the coefficient of government effectiveness quality in the short run is 2.342***. Ceteris paribus, a unit increase in the level of government effectiveness institution quality in OPEC economies increases economic growth on average by 2.342 per cent point in the short run at a 1% level of significance. In the long run, the

estimated parameter coefficient is 1.9. That positive sign tallies with our a priori expectation about the relationship between the effectiveness of government quality and economic growth in OPEC economies. Using diverse estimators as shown in column 1 to 3 of Table 3.7, we observe that the point estimates of all our qualities of institutions have the same signs (positive), apart from the democratic institution,with its panel estimate being statistically insignificant. The magnitude of our point estimates with the panel IV is bigger than the pooled OLS in all respect.

3.13.3 The oligopoly power proxy and economic growth of OPEC countries

In column 1 of Table 3.7, the point estimate of our oligopoly power proxy with the pooled OLS is -16.74, but -16.55 with the fixed effect estimator in column 2. In the two cases, the signs of our estimated parameter is negative, but statistically insignificant and greater than the point estimate with the panel IV. Meaning that in column 3 of Table 3.7, the coefficient of the proxy variable for the OPEC oligopoly power shows a negative marginal effect with the growth rate of OPEC economies. The magnitude of the effect in the short run is -90.24*** in the short run at a 1% level of significance. We observe that the same sign applies to all our estimated parameters using the three estimators as demonstrated in Table 3.7. In the long run, however, there exists a negative long-run equilibrium with an estimate of -76.7.

The US Energy Information Agency (2018) shows that OPEC controls about 40% of the total world crude oil supply. This suggests that about 60% of the world oil supply is controlled by non-OPEC members. Because of the intense competition for market share of oil driven primarily for the promotion of oil rents, an increase in the market share of OPEC, say from 40% to 45% is likely to drive up the rents from oil, by assumption. Although, an increase in the share of the OPEC control of the total world crude oil supply is not entirely the same with an increase market share. However, expectations hold in economics literature that correlation exists between oil rents and market share vis-a-vis crude oil supply. For instance, the demand theory suggests that an increase in supply is likely to depress the price level. A decrease in the level of oil price is likely to lead to a decline in the oil rents and corresponding negative impacts on the growth rate of the OPEC economies. Within the practical realm of the global oil sector, this scenario is the economic reality of the challenge that OPEC economies face at the beginning of March 2020 partly for the price war between Russia (a non-OPEC member) and Saudi Arabia, the de facto leader of OPEC about the failed agreement to curtail the excess supply of oil at the global market to drive up the price. Although OPEC controls roughly 40% of the total world crude oil supply which sustain OPEC as the global oil sector oligopoly power-house; the influence of non-OPEC players like Russia and the US (taking into account the Shale oil and

currently the world's largest oil producer) is enormous. Given this, our finding for the negative association between OPEC oligopoly power and the economic growth of OPEC is justifiable.

3.13.4 Official exchange rate to US dollar and economic growth of OPEC countries

The oil business, to a large extent, is being carried out in the US dollar, although other national currencies can also be utilised mainly during the oil market panic period. Given this, the impact of the official real exchange rate of the US dollar on the OPEC economies' currencies is very crucial for the level of oil rents receive and the economic growth of OPEC economies by extension. However, for this chapter, the parameter estimate for the official real exchange rate to the US dollar is statistically insignificant for the OPEC economies' growth using the three estimators, pooled OLS, fixed effect and panel IV estimators as observe in column 1 to 3 of Table 3.7.

3.13.5 Gross savings share of GDP and economic growth of OPEC

Our estimated parameter for the gross saving in GDP with the pooled OLS in column 1 of Table 3.7 is 0.065 and -0.0825 with the fixed effect in column 2. Although, the two point estimates have different signs, they are statistically insignificant and less than the point estimate with the panel IV. In effect, with the column 3 of Table 3.7 with the panel IV, the estimated parameter of the short-run share of gross savings in GDP is 0.167***. That shows that all things the same, a one percentage point increase in the share of gross saving in GDP in the short run increases the OPEC economies' growth by an approximate of 0.167 per cent point in the short run at a 1% level of significance. In the long run, the estimated coefficient is 0.14, which is positive and statistically significant. The implication of saving on the long term growth of an economy is one of the basics of the Solow model. Our finding of the relationship between the gross savings share of GDP and OPEC economies growth aligns with our a priori expectation. There is need for long term savings in the form of a Sovereign Wealth Fund for the growth of the OPEC economies as obtainable in Norway with the Government Pension Fund Global established in 1990 to set aside the excess of oil rents in a distinct account as an insurance for the likely instabilities in the oil rents and cater for the need of the future generation.

3.14   Summary of Chapter Three

This chapter investigates whether oil rents and institutions are determinants of economic growth in OPEC economies. We identify that there is a negative long-run association between oil rents and economic growth in OPEC economies. Whilst its truism that oil rents heavily dominate the total government revenue of the OPEC economies, there have been several empirical attacks as to the future relevance of oil in the global economy especially with the pronounced instabilities in the oil price regime which has adversely affected the volume of oil rents to the OPEC economies. This study, given our findings, aligns with the proposition of Sachs and Warners (1997) about the inverse relationship between natural resources like oil and economic growth. Despite the presence of relevance institutional quality variables in our model, the identify relationship between oil rents and OPEC economic growth is negative.

Furthermore, the chapter establishes a long-run positive effect between institutional qualities like the legal institution quality, the anti-corruption institution quality, and government effectiveness institutional quality and OPEC economic growth. Although the Gulf states among OPEC are undemocratic[10] as demonstrated in this thesis chapter, empirical evidence from Nigeria with pseudo -democracy shows that on average, democracy promotes economic growth. Secondly, the quality of government effectiveness is not restricted to only the democratise countries, as suggested in the political literature. Other political-institutional qualities like the effectiveness of government, stable political environment, robust legal and institutional qualities are relevant for economic growth. The legal institution quality in the context of this study is essential for the long-run growth of OPEC economies. Laws that protect commercial enterprise and property rights are likely to be relevant for economic growth. Moreso, drawing from a large body of previous empirical works in alliance with our findings, it has been demonstrated that good institutions performed better in advancing economic growth. See Acemoglu and Robinson(2005); Zweifel and Navia (2000); Bueno de Mesquita et al. (2003); Prezworski et al. (2000); Halpern and Weinstein (2004); Lake and Baum (2001); Russett (2004).

The increasing competition in the global oil sector has called for a new approach to the emphasis of OPEC economies on oil rents as a determinant of economic growth. An increase in the OPEC oligopoly power, according to this chapter, tends to reduce the growth rate of OPEC economies. The price war between Russia and Saudi Arabia, the de-facto OPEC leader in 2020 drastically reduced the oil price at the international market; it has also contrasted the level of oil rents accrue to the total government revenue of OPEC economies partly for the excess supply of crude oil and the COVID-19 pandemic of the year 2020. Empirical evidence

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[10]Some scholars have argued that liberal democracy is not a prerequisite for economic growth. This assumption could be responsible for the insignificant negative effect of democratic institution for OPEC economies. See Sirowy and Linkels (1991); Przeworski and Limongi (2007)

also suggests that the influence of OPEC on the world crude oil production appears to be on the decline, especially for the influx of Shale oil into the global oil market by the US. The combination of all of these factors show that the long-run implication of oil rents on the growth of OPEC economies is justifiably negative as identified in this study.

Savings within the neoclassical theory is one of the primary determinants of economic growth. This chapter identify that savings have a positive long-run effect on the growth rate of the OPEC economies. The far-reaching implications of saving the excess of oil rents into a separate account in the form of the Norwegian Sovereign Wealth Fund, otherwise known as the Government Pension Fund Global is enormous. In this wise and borrowing from the example of the Solow model (1956), the identified long term positive relationship between the level of gross savings in GDP and OPEC economic growth is justifiable.

3.15   Policy recommendations

This chapter identifies that oil rents have negative long term implications for the economic growth of OPEC economies. In addition, that institutions are essential for the long-run economic growth of OPEC economies and that increase in OPEC oligopoly power has a negative long-run association with economic growth. Because of the above, below are the policy recommendation or priorities that we consider to be necessary for the advancement of the growth of OPEC economies:

[1]. For the negative long term association of oil rents with the growth of OPEC economies, efforts should be put in place by OPEC economies to have strong Sovereign Wealth Fund management with a view to saving the excess of oil rents in a separate account to cater for the need of future generations and serve as a buffer during the doom oil periods. Such a Fund Management portfolio should be comparable to the Norwegian Government Pension Fund Global which stands as a global reference point for the Sovereign Wealth Fund management. Although few of the OPEC economies like Nigeria can lay claim to the existence of Sovereign Wealth Fund management in her economy, empirical evidence suggests that the Nigeria version is at best in the moribund state for the inability of the government to fully commit itself into its implementation.

[2]. The global economic realities illustrate a dwindling influence of the OPEC oligopoly power partly for the increasing competition for the oil space by the non-OPEC economies and the unusual approach of the Shale oil revolution which has made the US the largest oil-producing economy in the world. For this reason, there is a need for the OPEC economies to intensify the development of long term gas export to divest part of the focus on oil into gas. Nigeria, for

instance, is a member of Qatar based Organization of the Gas exporting Forum. Since virtually all the OPEC economies produce gas, effort should be geared towards the full development of the gas sector to limit the challenges posed by the increasing competition in the global oil industry.

[3]. An institution is crucial for the attainment of economic growth in any economy, OPEC economies inclusive. As a result of this, sustained efforts on the development of the institutional qualities are essential. Empirical evidence from this chapter demonstrates that politics and economics are interrelated. However, the general nature of institutions in OPEC economies is probably one of the primary factors responsible for the low economic growth experienced by some of the OPEC economies within the period of study, notably Nigeria, Venezuela, Angola, and Gabon. In addition to this, the Gulf states among OPEC economies probably have an abysmal record of a democratic institution. Economic literature suggests that the incentives that oil rents create allow the government of the Gulf states, notably Saudi Arabia, Iran, the United Arab Emirates not to embrace vital democratic institution, but invest in the provision of social service schemes for the population to prevent popular revolt against anti-democratic actions of the states (See Lake and Baum,2001). In this study, we identify positive long-run implications of a legal institution quality, anti-corruption institution quality, and government effectiveness institution quality on the economic growth of OPEC Economies. Therefore efforts must be made to implement and maintain substantial institutional reforms to nourish, promote, and sustain the cause of growth in OPEC economies.

[4]. There have been debates about the harmful effects of Shale oil production on the environment. Attempt in the UK for the exploration of oil from unconventional sources similar to the Shale oil is on hold. The UK government put the attempt on hold partly for the actions of the environmentalists who convinced the government about the possible harmful effects of the Shale oil for the environment. That action is a learning curve for OPEC to lobby against the production of oil from Shale sources, notably in the US. Therefore, OPEC should focus attention on how to lobby and intensify campaign about the negative impacts of Shale oil for the environment at the international scenes to probably limit the supply of Shale oil to curtail the loss of market share of OPEC to competition from non-OPEC suppliers.

Chapter Four: An Empirical Essay on the Effects of Demographic Factors, Natural Resource Rents and Political Institutions on Economic Growth

4.1 The background of the study and motivation

While Chapter Two is an empirical investigation of the impacts of oil rents and institutions on economic growth in Nigeria, Chapter Three concerns the effects of oil rents and institutions on economic growth of the 14 OPEC economies. Given our findings in the previous chapter, we observe that the implications of oil rents are likely to vary across OPEC countries. Countries like Saudi Arabia and the United Arab Emirates may have experienced positive impacts of oil rents on their economic growth, but the same favourable outcomes may be untenable in countries like Libya, Venezuela, Gabon, Angola, Iraq and Congo. There is substantial evidence that, given the disparities in the features of OPEC economies, oil rents are not likely to have uniform effects on growth.

In the search of practical answers as to the factors responsible for the perceived variations across OPEC economies, demographic indicators such as population size and population growth rates became of interest. Although these were not examined in the previous two chapters, it is worth considering whether demographic factors play a role in determining economic growth. It is evident from the economic literature that demographic factors influence economic growth across both OPEC and non-OPEC economies, given that population economics is a global issue. Various national and multinational agencies have interests in the dynamics of demographic indicators because of the perceived correlation of demographic indices with global economic growth.

Empirical work on demographic factors and economic growth is likely to be more robust if it extends beyond OPEC economies, which distinguishes Chapter Four from the previous two chapters. Moreover, it is necessary to extend the coverage of this study to enhance the external

validity of its findings. Therefore, we extend the debate about factors influencing economic growth to other vital and uncharted areas, primarily the impact of demographic indicators on economic growth using an extensive panel data of 216 countries.

There is extensive empirical work on the influence of demographic factors, although there is no consensus about their relationship with economic growth. In the demographic economics literature, it is necessary to distinguish between the observed effects of population size and of the population growth rate on economic growth. This distinction between population size and population growth is of utmost importance to this chapter, determining whether demographic factors impact long-term economic growth. Some scholars argue that demographic indicators have adverse effects on economic growth. There are three distinctive perspectives. The first is the presumption that demographic indicators like population size or population growth rate negatively impact economic growth, based on the Malthusian hypothesis of 1798.

This has influenced the works of other neo-Malthusian scholars like Paul Ehrlich (1968) in his empirical work titled *The Population Bomb* and Garrett Hardin (1968) in his famous work titled *The Tragedy of the Commons.* Brander and Dowrick (1968) likewise are neo-Malthusians, stating that *'....our analysis favours a neo-Malthusian interpretation: decreases in fertility tend to promote the growth of per capita real income'.* Kelley and Schmidt (1995) *'.........reveal a negative association between population and economic growth based on international cross-country data for the 1980s.'*

Neo-Malthusian scholars concur with the pessimistic population study of Malthus (1798) in his exposition titled *'The Principle of Population'*, in which the main thrust of his argument was that population was increasing at a geometric rate while, in contrast, food or resource production increased by arithmetic progression. He suggested that if the population remained unchecked, the availability of resources would eventually fall short of the population. Malthus (1798) argued for *'moral restraint'* in procreation and possibly the postponement of marriage. Famine, pestilence, war and other natural disasters, he noted, could also serve as checks on the rapid population growth rate.

The second perspective is of scholars who perceive demographic indicators like population size and population growth rate as having a positive relationship with economic growth. The positivist demographic doctrine stems from Boserup (1965) in her agricultural economics work which challenged the Malthusian hypothesis. In The Conditions of Agricultural Growth, she observed that, *'...When a piece of land is to be cropped more frequently-under pre-industrial techniques it will usually be necessary to devote more agricultural labour to each crop hectare than before. Thus, total employment is likely to increase. With rapid population growth, the*

process of intensification would need to take place much more quickly.' (pp. 43-65)

Given the sustained increase in the agricultural labour force, output per head is likely to rise with a corresponding increase in economic growth. By implication, Boserup's theory assumes that the population is positively related to the growth of per capita output. In recent decades, empirical findings have substantiated Boserup's theory including the concept of the *'demographic dividend* [1]*'* notably in China, India, and the USA. Because of the demographic dividend in the abovementioned countries, the effects of demographic indicators on economic growth merit further economic research.

The third perspective is the neutral stance of demographic indicators on economic growth which follows the new institutional economic literature with the proposition that the key driver of growth is the quality of institutions. Scholars have argued that the impact of demographic indicators like population growth rate or a country's size on economic growth could be blur or indeterminate especially in countries with advanced technology to control population pattern. In a way, observable evidence demonstrates that evidence that rising population growth rate promotes the US economy is inconclusive for the presence of strong institutions in the US which drives growth.

One of the key reasons why scholars and relevant agencies focus on demographic indicators and economic growth is the likelihood of a direct correlation between population explosion or rapid population growth without a corresponding increase in output growth and poverty, especially in the developing countries of the world with their myriad socio-economic challenges. The eradication of poverty is one of the United Nation's *World Sustainable Development Goals* with a target date of 2030. An increase in population growth or an explosion in its size may induce a rise in the number of people living below the poverty line of \$1.90 per day. In light of this, the determination of whether demographic indicators influence economic growth is set to become a vital area of research. We hope to determine whether the implications are favourable for economic growth or adverse, as suggested by Neo-Malthusian scholars.

The motivation for the study : Our research interest on the effects of demographic factors is base on the possible interaction among demographic indicators, economic growth and the trajectory of the developing countries. One of the fundamental debates in economic literature is the linkage between demographic indicators like population growth rate and poverty. The presumption is that a potential restricting factor for the growth of per capita output would

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[1]The demographic dividend implies that a rise in the share of the working population or the productive labour force would lead to an increase in output per capita, ceteris paribus. The hidden assumption is that an increase in population growth rate is positively associated with an increase in the working population.

necessarily cause poverty in the long run, all things the same. Given the above deduction, does a rapid population growth rate inhibits economic growth? The first inspiration for the theme of this chapter is to unravel the seeming controversy surrounding the position that rapid population growth rate hinders economic growth given the cross-country empirical evidence about the impact of demographic indicators on economic growth especially in developing countries.

Secondly, the United Nations report on World Population Prospect (2019) specifically argued that the accelerated increase in the world population calls for caution because '......These trends will have far-reaching implications for generations to come'. Given this concluding remark of the United Nations report (2019), there is a likelihood for differentiated effects of population growth and population size on economic growth in the long run. Therefore, the second motivating point for this chapter is to determine the validity of the presumption that demographic indicators like population growth rate and population size have both negative and positive effects and that these implications vary over the short and the long term.

Furthermore, the determinants of economic growth are relatively large in number. We have investigated the implications of some of these growth determinants in the previous two chapters. For the avoidance of doubt, neither of the two demographic indicators (population growth rate and population size) have been utilised as an explanatory variable in the preceding chapters. Empirical literature shows the existence of some developed economies with large population sizes and 'demographic dividend' like China, India and the US and conversely, the existence of some developing economies with large population sizes like Nigeria, Ethiopia and Democratic Republic of Congo to mention but few with relatively no demographic dividend, all thing the same. Given this dichotomy, do demographic indicators like population size matter for economic growth and if it matters, for the good or the opposite? Therefore, the capstone of our motivation for this chapter is to examine whether large population size is potentially detrimental to economic growth and by extension a contributing factor to the associated growth restrictions ravaging the developing countries with large population sizes mostly in Sub-Saharan Africa, the fastest-growing continent according to the World Population Prospects (2019). The aggregate of the above motivating factors is the driving force behind the utilisation of the 216 countries as the sample population for this study, leading us into the research objectives as crafted below.

In the remainder of this chapter, Section 4.2 sets out the research objectives; we outline the main contributions to the literature in Section 4.3; Section 4.4 appraises demographic indicators in perspective; Section 4.5 reviews related literature; the nature and sources of data are presented in Section 4.6; the descriptive statistics output are given in Section 4.7; the research method, estimation technique and the analysis of the endogeneity concerns as explained in

Section 4.8; Section 4.9 presents the specification tests and our empirical results; Section 4.10 discusses our findings; Section 4.11 summarises the chapter and policy recommendations are presented in Section 4.12.

4.2 The research Objectives

The broad research objective of this chapter is to empirically investigate the effects of demographic factors, natural resource rents and the political institutions on economic growth. Specifically, we seek to address the following research questions:

1. Given the divergent empirical positions about the impact of demographic indicators on economic growth, we seek to investigate the implications of population growth rate on economic growth and examine the effects of population size on economic growth, thereby compare and contrast the signs of both effects on economic growth.

2. The demographic transition model (DTM) shows that economic growth is associated with demographic changes like the population dynamism. Therefore, this chapter seeks to determine the measurement of demographic transition model and its likely effects on economic growth.

The first two research questions above constitute the principal objectives of this chapter followed by other objectives as set out below:

3. Institutional qualities, especially the political institutions, are likely to be crucial as co-determinants of economic growth . For the dynamics in the political institutions, we seek to determine the possible effects of political institutions on economic growth.

4. To align this chapter with the assumption that natural resource is likely to be crucial for economic growth , we seek to determine the effects of the total natural resource rents on economic growth.

The response to the above research questions are the basis of this chapter as we delve into the paper.

4.3   Main contributions of the chapter to the literature

This chapter contributes to the literature in three important ways:

[**1**]. Simultaneous use of population growth rate and population size as regressors- To the best of our knowledge, this is the first attempt to utilise both population growth rate and population size as explanatory variables in empirical research work on the effects of demographic factors on economic growth. Previous research has been on the application of just one of the two demographic variables. Interestingly, some authors have applied the net birth rate which is the difference between the crude birth rate and crude death rate per 1000 population as a proxy for the population in order to investigate the impacts of demographic indices on economic growth. None of these techniques is a holistic demographic measurement, unlike the application of both population growth and population size as regressors, adopted here.

In modelling the population growth rate and population size as co-determinants of economic growth in this chapter, we observe that the two demographic indicators have an asymmetric impacts of economic growth which suggests some form of validation of the presumption that large population size may not be detrimental after all. Observable evidence from China, India and US economies with large population sizes demonstrates the relevance of large population for a rapidly growing economy. Therefore, this chapter's distinctive approach to the effects of demographic factors on economic growth is an innovative contribution to the literature.

[**2**]. Wider scope of coverage- This chapter, to the best of our knowledge, is the first attempt to use a sample of 216 economies in addressing the research questions on demographic indicators and economic growth, and taking into consideration the impact of resource rents and political institutions. Previous attempts by Jane and Zheng (2015), Mihai (2009), Olomola et al. (2013), Vibha (1995), and Zhihao (2011) have considered a few continents, or at best a regional population research experiment. For instance, while Jane and Zheng (2015) confined their population research work to the Chinese economy, Olomola et al. (2013) in their empirical work on population growth focused on the Sub -Saharan African economies, with no control variable for the impact of resource rents and institutions on economic growth. The limitations of their study are three-fold: the study did not consider all the 54 African countries which share possible similarities in term of population explosion. Rather, it limited the number of countries studied to 35. The exclusion of other African countries from their sample population arguably hinders the external validity of their findings to the entire continent of Africa.

Olomola et al. (2013) employed primary school enrolment to control for the effects of human capital. We question their control variable for human capital. Not all pupils enrolled in school

necessarily graduate, and therefore, school enrolment is a doubtful proxy for human capita. Whilst the use of the primary school enrolment rate could be due to the dearth of data for their study, the challenge is addressed in this chapter by using the primary school completion rate as the proxy variable in this study.

Furthermore, we use a revised dataset (1967 to 2017) which pre-dates Olomola et al.'s (2013) dataset from 1970 to 2005. From 2005 and 2017, various changes have taken place in the economy and in demographic factors, which warrants the expansion of our dataset.

[3]. Empirical evidence suggests that good institutions are important determinants of economic growth. As such, it is incumbent upon this research work to determine the possible influence of institutions, and therefore we expand the existing literature on the impact of institutions and demographic factors on economic growth such as Jones and Romer (2010) by modelling qualities of institutions and demographic indicators as determinants of economic growth. That is another significant contribution to the literature.

In this chapter, we apply the GMM system developed by Arellano and Bover (1995) and Blundell and Bond (1998) to investigate the effects of demographic indicators, resource rents, and political institutions on economic growth. Before using the GMM system, we use both pooled OLS [2] and fixed effects as preliminary estimators to guide our choice of explanatory variables and specification tests. This technique aligns our econometric method in this study with the theoretical stance of Bond (2001) on dynamic panel data. Bond (2001) argues that experimentation with a dynamic panel model should begin with the pooled OLS, follow by the fixed effects estimator (subject to the Hausmann specification test), before introducing a more sophisticated econometric method.

4.4 Demographic indicators in perspective: population growth and population size

The central focus of this chapter is on demographic indicators. Because of the application of the two demographic indicators as explanatory variables, there is a need to briefly explore the linkage between the two concepts before the review of related literature. Historically, the emphasis of scholars on the effect of a demographic factor on economic growth has almost being placed primarily on population growth rate. Although, theorists possibly recognise the difference between

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[2]Given the heterogeneity concern for the 216 economies (representing the global economy), otherwise known as inter-country differences, the pooled OLS approach would be a deficient empirical method. Hence, our alternative preliminary method is the fixed effects estimator before the application of the GMM system to mitigate endogeneity issues in our model.

the two, limited attention is on the combination of the two demographic indicators vis-a-vis there implications on economic growth in the past decades. The objective of this exposition is not to assume that the implications of population growth rate, for instance, is more important than the effects of population size on economic growth or vice-versa. However, in the interest of robustness of our findings, especially for the long term economic growth, there is a need to utilise both demographic indicators as explanatory variables in this chapter. Whilst population size is the aggregate number of people resident in a particular location or country within a period, and the population growth rate is the percentage change in the population of people resident in a country say in a year. In reality, population growth rate and population size are closely related and mathematically speaking, population growth rate appears to be a derivative of population size given that without the actual total population in a particular year, measuring the percentage change in the rate of growth of population could be difficult, all things the same.

Figure 4.1: World population growth rate and per capita real GDP growth :1967-2017
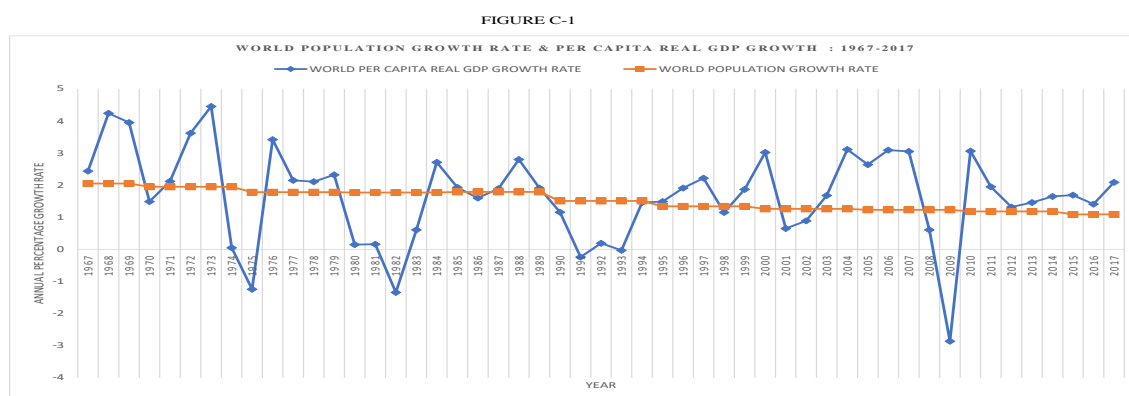
FIGURE C-1

WORLD POPULATION GROWTH RATE & PER CAPITA REAL GDP GROWTH : 1967-2017

Source: Author's Computation with data sourced from World Bank's World Development Indicators (2019).
*Population growth rate is the annual percentage change in the rate of countries population.
*Per capita real GDP growth is the proxy for economic growth for sample counties.

Given the enormous concern about the consequence of demographic indicators on economic growth, especially demographic induced poverty in developing countries, we demonstrate in this chapter that both variables (population growth rate and population size) are crucial in addressing the long term economic growth objectives. The UN Department of Economics and Social Affairs (Population Division - 2019) posited that the world population rose from 3.7 billion in 1970 to 4.5 billion in 1980. In 1990, the total world population was 5.3 billion, and it increased to 6.1 billion in the year 2000. In 2010 however, the total world population was 6.9 billion people, and as of 2017, the total world population was 7.6 billion people. Therefore, the expansion in the world population size call for an investigation of it impacts on the output

growth, all thing the same.

Accordingly, statistical evidence from the World Bank's World Development Indicators (2020) shows that about 10% (734 million people) of the world population live below $1.90 a day in the year 2015 whereas about 36% (1.9 billion people) live below $1.90 in 1990. Merging our observation in Figure 4.1 above with the statistical findings of the World Bank, the slight downward movement in the world population growth as shown in the chart is probably one of the underpinning factors for the reduction in the number of people living below the poverty line between 1990 and 2015. Conversely, such observation may be difficult to identify using only population sizes in billions. The world has experienced an increase in economic growth, albeit periods of recession between 1990 and 2015, as shown in Figure 4.1. Challenges are likely to be associated with the application of trends in population size alone to explore the phases of changes in the world economy in particular.

Figure 4.2: World Bank continent specific population sizes in thousand of millions at ten years interval :1967-2017
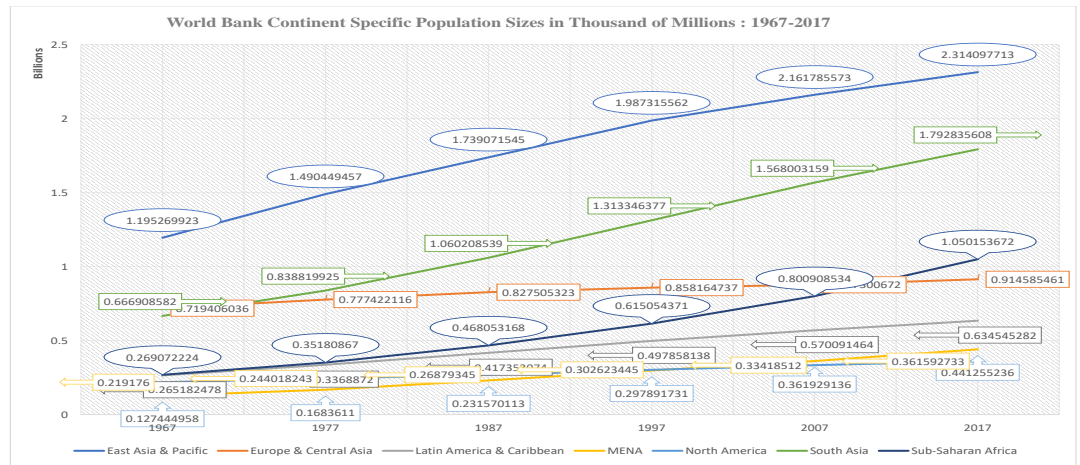
Source: Author's Computation with data sourced from World Bank's World Development Indicators (2019).
*Population sizes are the total number of people by headcount in the sample countries.

From this standpoint, one of the primary interests of this chapter is to ascertain the long term implications of the two demographic indicators (population growth rate and population size) on economic growth and the signs of their partial effects on economic growth. However, we would allow our empirical work to determine the outcome of our interest in this regard. Significantly, the likely impact of demographic factors on economic growth may also be related to other growth indicators like institutional qualities. The possibility of this assumption will

be analysed in this study.

Demographic evidence shows that the world consists of seven continents with varying level of population size and population growth rates. Base on that ground, a piece of dis-aggregated levels of the world population size into continental breakdown is likely to be relevant for our exposition on the distinction between population size and population growth rate as exemplified in Figure 4.2. From Figure 4.2 above which show the continental decomposition of population sizes in ten years interval, we can observe that East Asia and Pacific continent had maintained a consistent expansion in population size between 1967 to 2017 which made it the continent with the largest population size closely followed by South Asia. Interestingly, both continents are manufacturing and industrial hubs for various finished and semi-finished products. The need to fill the manufacturing sector with the required number of the labour force is likely the justification for the expansion of their population size. Therefore, sustained expansion in the population sizes of the two continents is likely justifiable if the goal is to increase the labour force participation rates to promote per capita output and enhance economic growth in the long run. The expansion in the size of the population of Sub-Saharan Africa, as shown in Figure 4.2, indicates that it was the third-largest continent in the world in 2017.

Contrary to the examples of East Asia and Pacific and South Asia continents as a manufacturing and industrial hubs, substantial evidence in the literature demonstrates that the Sub-Saharan Africa continent consists to a large extent of developing and least developed countries with relatively low manufacturing and industrial capacities. At best, the large segment of their population relies on the primary sector, like agriculture as a means of livelihood and economic activities. Therefore, an explosion in the population size of Sub-Saharan Africa without a corresponding increase in the growth rate of output is likely to be inimical to economic growth both in the short run and on the long run, all things the same. Empirical evidence from international agencies on demographic indicators show that the adverse consequences of population size explosion are more pronounced in Sub-Saharan Africa given weak institutions and low economic performances in contrast to East Asia and Pacific and South Asia. A reflection of income grouping of countries is perhaps observable in the continental dis-aggregation of population size in Figure 4.3.

Figure 4.3: World Bank categorization of countries population size by income groups in ten years interval:1967-2017
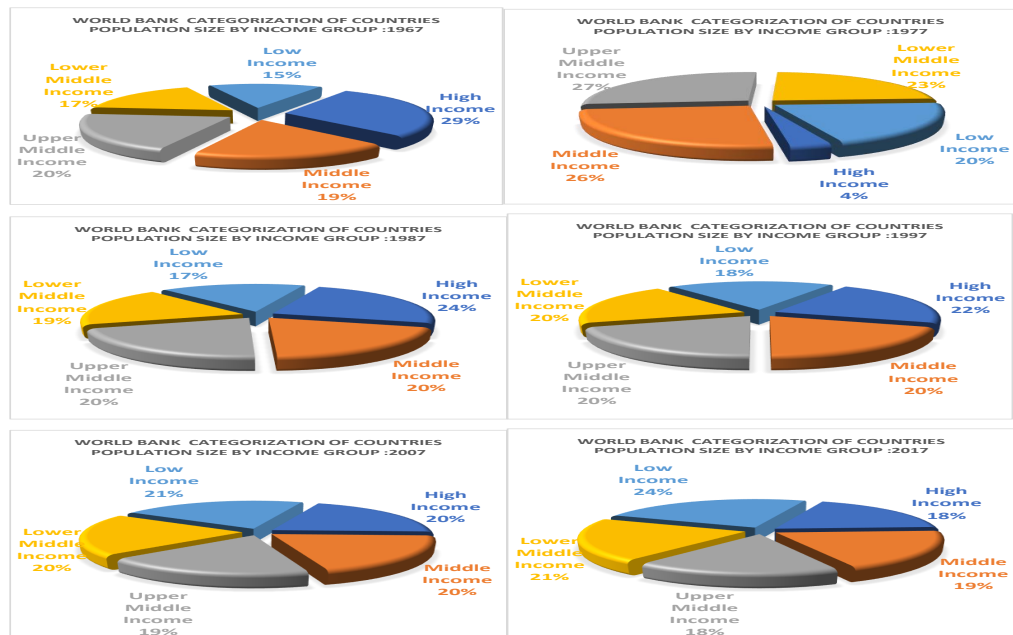
Source: Author's Computation with data sourced from World Bank's Development Indicators (2019).
* Countries population sizes and their respective income grouping from High income to low income.

As demonstrated in Figure 4.3 above, we show the percentage values of population sizes based on the five categorisations of countries by income grouping: low income, lower middle income, middle income, upper middle income and high-income countries in ten years interval. The low-income countries have had a sustained expansion in population sizes between 1967 and 2017, albeit slight fluctuation between 1987 and 1997. The lower middle income follows a similar pattern. One fundamental observation from Figure 4.3 is that although the high-income countries started in 1967 with relatively large population sizes, there has been a sustained decline in the population size of high-income countries from 24% of the world population size in 1987 to 22% in 1997, it further went down to 20% in 2007, and as of 2017, it declined further to 18% of the total population size by income grouping of the World Bank. The economic implication of this observation is that, within the last decades of the demographic transition process of the high-income countries, large population size probably accounted for a significant proportion of factors that influenced their economic growth. Substantial empirical evidence in the literature shows that Europe as a continent, for instance, has been experiencing a decline in its population size partly for the reduction in fertility rates, postponement of marriage and other factors.

More specifically, the high-income countries of Europe and North America are known to have transitioned from primarily manufacturing-based economy to service-based economy. Given this transitional process, there is a probability that large population size does not matter for such economies, all thing the same. For the breakthroughs in technology and science revolution experienced in Europe and North America, the need for sizeable human labour which primarily drives large population size appears to be gradually declining. As such, the justification for a large population size is becoming obsolete. This conclusion may be difficult to attain without subjecting it into empirical scrutiny as carried out in this chapter.

The middle-income countries as observed in Figure 4.3 appears to have experienced a stable expansion in population sizes with an average of about 20% of the world population size base on income grouping during the period of this study. It could be that countries in this group consistently requires a large number of the labour force, which has contributed to a sustainable level in their size of the population. The upper-middle-income countries follow slightly the same pattern with the middle-income countries. Given the above positions about the distinction between population size and population growth rate using relevant indicators, both population size and population growth rate are likely to be relevant in determining economic growth for the following reasons. Firstly, rapid population growth may have less implication for the service-based economies like the high-income countries and more developed countries (for their relatively low population) in contrast to the less developed countries which are more populated. Secondly, for the manufacturing-based countries, there is a need to augment the size of the labour force, which requires an expansion in population size, all things the same.

Because of the above and the combination of other relevant factors in the literature, the need to determine whether the two demographic indicators (population size and population growth rate) have effects on economic growth is justifiable as we delve into the review of related literature below.

4.5   The Related Literature

4.5.1   Theoretical literature perspectives

Economic literature shows the existence of about three crucial population theories that can potentially serve as a theoretical foundation for research work on demographic indicators and economic growth. This chapter draws support from two of the theories, namely, the Optimum population theory of Edwin Cannan (1924) and the demographic transition model credited to

Warren Thompson (1929) which have substantial implications for our empirical analysis as explore below:

4.5.2 The optimum population theory

The optimum population theory was propounded by Edwin Cannan (1924) in his essay titled *'Wealth'* and popularised by Carr-Saunders (1922) and Dalton Hugh (1928). Accordingly, the optimum population theory is a classic diversion from the earliest propositions about negative or perhaps positive impacts of population growth rate on economic growth. The primary interest of the proponents was not on the impact of population growth on resource allocations. Instead, they focused on the size of the population and wealth production. Lionel Robbins (1927) opined that *'the population which just makes the maximum returns possible is the optimum population or the best possible population'*. For Carr-Saunders (1922) optimum population is *'that population which produces maximum economic welfare'*. In the words of Hugh Dalton (1928), *'Optimum population is that which gives the maximum income per head'*. The optimum population theory connotes that there is a likelihood for an *'ideal'* population which ensures and guarantee the maximum output per head in the economy.

In retrospect, the Malthusian theory had earlier postulated that the food supply (resource) is in limited supply. An equilibrium level for the optimal allocation of scarce resources in an economy for all the inhabitant to be better off is probably required. Deviations from this point are likely to result in overpopulation with antecedence shortage of resources which lead to a problem in the society as posited by John Stuart Mill (1848). Tenet of birth control through the use of contraception stems from the deviations of the population dynamism from the *ideal* which is the optimum population.

Notably, the optimum population is not a fixed point, especially with the improvement in the techniques or factor of production. All things the same, an increase in the available resource or technological advancement through the introduction of a new method of production would shift the optimum population point. A good example is an argument of the United Nations Population Division report (2020) with the proposition that Europe and Central Asia continents' population are declining. Our empirical observation in this chapter affirms this proposition with our findings under the demographic transition model. In effects, the declining population in Europe and Central Asia might have contributed positively to economic growth, all thing the same.

Whilst the Optimum population theory tried to address some of the limitations of earliest population hypothesis about an adverse effects of higher population growth rate , but for the

variations in optimum point, the theory according to some analysts is vague. What constitutes an optimum population point in a country or continent may be different from another. Secondly, the optimum population theory failed to take into consideration the institutional conditions and the political policies of the public authorities which may alter the demographic pattern as witnessed in China with the stale *One-Child policy.* Despite the associated shortcomings of the optimum population theory, empirical evidence suggests that moderate population size or its growth rate may be economically justifiable given the available scarce resource. Hence, there is a likelihood that the optimum population better serve the need of long term economic growth. The next related theoretical perspective for this chapter is the demographic transition model below.

4.5.3 Demographic transition model - DTM

The demographic transition model credited to a demographer, Warren Thompson in 1929 on the assumption that dynamism in the population occurs over some time through the changes in the birth rate and death rate which have implications on the total population. Contextually, the demographic transition model proposed that the pathway of the population begins with a period of an increasing population growth (occasioned by high birth rate and high death rate) which is followed by a slow path of population growth and consequently a declining rate of the population growth. The graphical chart of the demographic transition model is presented below in Figure 4.4, demonstrating the five stages. The 5th stage of the demographic transition model is subject of empirical dispute given the assumptions in the literature that no country is presently in that stage and that stage 5 is more of a utopia within the model. Presumably, these are countries in which the fertility rates have fallen significantly below replacement level (approximately two children per woman), and the ageing population is more than the youthful population.

The influence of fertility rate, birth rate and death rate on the population has been described in the economic literature as strongly correlated with economic growth (Tamura, 1996; Strulik, 2005). One of the determinants of the productive capacity of a country is the labour force. In the word of Bloom et al. (2003), *demographic transition creates a potential for economic growth in several ways.* By extension, the likelihood exists for a correlation between the labour force participation rate and the population growth perhaps the size of the population. An economy with a large productive workforce or working population is likely to be more developed with a high level of gross domestic product, all thing the same.

Figure 4.4: The stages of demographic transition model
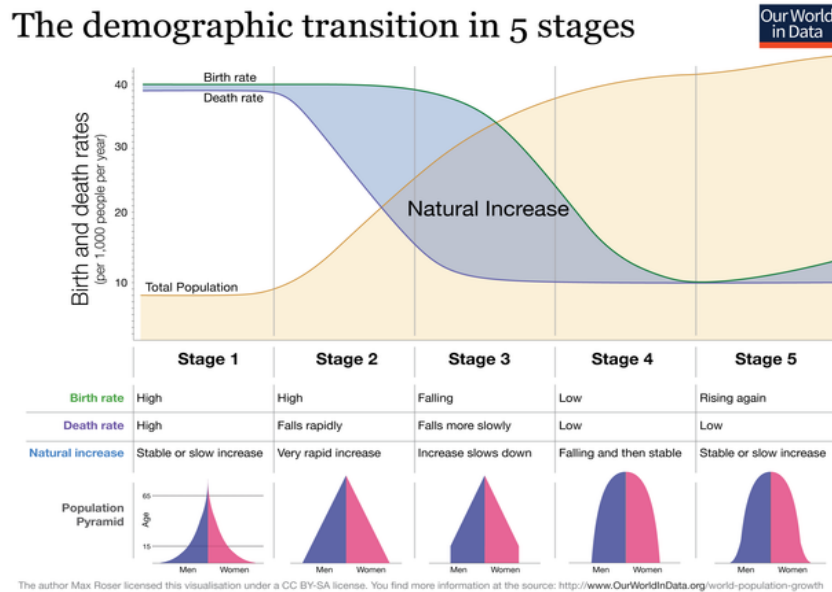
Source: Adapted from Max Roser et al. (2019): ourworldinData.org

Note: Stage 5 supposed to demonstrate full contraction of both the birth rate and the death rate, but the model is an adapted one from ourworldinData.org.

Theoretically, there exist four stages of the demographic transition model (although the adapted chart in Figure 4.4 shows five stages, the 5th stage ought to show drastic reduction in birth rates and death rates contrary to the position of the stage 5 in the adapted chart above. Some scholars have also argued that the 5th stage is an utopia which does not necessarily exists in reality), each of the stages is briefly discussed below:

Stage 1 of demographic transition model

The first stage of the demographic transition model consist of a relatively high population because of the balance between the prevailing birth rate and death rate in an economy. The growth rate of the population is low, given the dearth of necessities like food supply; the likely fluctuations in the population occurred because of famine, pandemic, diseases, and war. Population economics literature showed that no country is currently at this stage 1, but economies had experienced the stage until the late 18th century. Technically speaking, this stage 1 is the Pre-Industrial period. The defining characteristic of this stage 1 is that changes in the population growth were driven primarily because of the need to expand the subsistence living during the ages of working without machines and tools. Agricultural manual labour was rampant, and there was a need for a large size of labour which possibly compelled people to subscribed to

large family size. Another characteristic of this period was the ravaging pandemic and diseases due mainly to lack of modern techniques to detect, prevent and cure diseases.

Stage 2 of demographic transition model

The second stage of demographic transition model is characterised with a decline in death rate as a result of an improvement in food supply and sanitation, the result of which increases the life expectancy at birth and reduction in the prevalence of diseases. As observed in Figure 4.4, the death rate is falling rapidly whilst the birth rate remains high. Availability of modern medicine and scientific methods of addressing infant mortality led to a rapid decline in the infant mortality rates during the period. On average, people began to live longer than was obtainable during the pre-industrial era. The combination of the two gave credence to falling death rate and high birth rates. The second stage can also be called the industrial revolution period. Empirical evidence suggests that countries like Yemen, Niger, and Afghanistan are still in stage 2 of the demographic transition model. Countries like Ghana, Botswana, Kenya, Ghana, South Africa and Namibia are very close to stage 3 as shown in the population economics literature.

Stage 3 of demographic transition model

Stage 3 of the demographic transition model demonstrates a falling birth rate and low death rate. The main drivers of stage 3 are the improvement in economic conditions (increase in income level), modernity, women emancipation with the access to education both formal and informal; improvement in agricultural practice through mechanisation which required a fewer number of manual labourers and access to contraception. For instance, the reduction in birth rate began in the late 19th century in Europe. In other words, stage 3 is the Post-Industrial Revolution stage with changes in conditions of women. Examples of countries that are in stage 3 are economies that have experienced a reduction in fertility rates like Costa Rica, Jamaica, Egypt, Philippines, Ecuador and Azerbaijan.

Stage 4 of demographic transition model

Stage 4 is characterised with low birth and death rates which leads to stability in the population, and the total population appears to be at an optimum level. Herein, there is an increasing desire for relatively small family size; acceptance of child spacing as a standard practice through birth control. The primary drivers of stage 4 consist of the characteristics features of developed countries like higher income and output, standardised education quality, better healthcare delivery and the high proportion of women in the labour force with a reduced number of children which average around two per women. Stage 4 can also be called the Population stabilisation stage (Galor, 2005). Examples of economies in this stage 4 include Argentina, India, Turkey, Tunisia, Indonesia, Bangladesh and Mexico to mention but few.

Stage 5 of demographic transition model

Although the existence of stage 5 is debatable among scholars, however, the stage is said to involve a drastic reduction in the fertility rate below *"the replacement fertility levels"* as demonstrated in Figure 4.4.

Whilst the demographic transition model is a useful technique to understand the trend in population growth; the model has been attacked for the utilisation of the population history of Western Europe and North America to generalise the world population. The population experience of the developing countries, for instance, differs from that of the advanced world which makes the universal application of the model to be debatable. So, the generalisation of the population theory through the demographic transition model could be misleading. In another way, the demographic transition model also failed to take into account the political institutions which potentially determine population and possibly alter the transmission process of various stages within the model.

As observed from the above analysis, each of the five stages of the demographic transition model probably has implications for economic growth. The fourth stage of the demographic transition model which is characterised with low death rates and declining birth rates is likely to yield an optimum population point which potentially leads to moderate economic growth in an economy. Given this assumption, we use the first stage as our reference category among the five dummy variables created to illustrate the stages of the demographic transition model as we shall see under our empirical result. Economic literature showed that the demographic transition model impacts economic growth, given its effects on child mortality. Cutler et al. (2006) opined that a strong negative association exists between the per capita GDP of countries and child mortality. The fertility rate is likely to have direct effects on economic growth as enshrined in the Barro-Becker model (Becker,1981; Barro and Becker,1989). The model emphasises that the opportunity cost attached to the reproductive choices of the population rises as wages increase significantly for women. By implication, less time spent on childbearing implies more opportunity to partake in productive economic activities which has multiplier effects on the growth of output (Strulik,2005). Statistical evidence showed that an increase in money supply probably yields better healthcare outcomes and better healthcare outcome enhances quality productive workforce (Heckman and Walker,1990). Bloom et al. (2001) in their propositions about the implications of age structure on economic growth argued that an increase in the demographic indicators like net birth rate or population growth rate is likely to have a positive effect on economic growth, all things the same.

The deduction from the theoretical stand of the demographic transition model is that there could be a nexus between the demographic transition model and economic growth. The potential benefit of a large labour force or working population for countries like China, India, and the US might have contributed to the growth and development of these economies. In another way, countries with relatively small population sizes can overcome the possible shortcoming of the dearth of the skilled labour force with the option of an open economy especially through the influx of international migration of skilled labour force. Therefore, it becomes imperative to review the related empirical literature about the effects of demographic indicators on economic growth as explored below.

4.5.4 Empirical Literature Review

Population growth and economic growth

The literature concerning the effect of population growth on economic growth is mixed. There are three strands of literature concerning the impact of population growth on economic growth. The first is the pessimistic view of the neo-Malthusian scholars; the second is the positivist or optimistic population growth perspective, and the last one is a neutral stance. Whether an economy with rapid population growth can convert human resources to capital, as in China, India and the US, is a subject of intense debate in economic literature (Kelly, 1988; Prichett, 1996).

According to the IMF's special report *'2020 Population'* (2020: 6), population growth is one of the primary demographic variables that determine economic growth. The report further contends that forces that shape population growth across the world include mortality rate, fertility rate and international migration to mention but few. The report states that *'These forces vary considerably across countries and can help account for key differences in economic activity and performance, such as physical capital, labour, and human capital accumulation; economic wellbeing and growth; and poverty and inequality. These forces generally respond to economic shocks; they may also respond to political developments such as the beginning and end of wars and governance crises. In many developing economies, population growth has been associated with a phenomenon known as the demographic transition — the movement from high to low death rates followed by a corresponding movement in birth rates'* Against this backdrop, the world population has risen considerably in recent decades.

The rapid increase in the world population varies across continents, as we shall see in this study. Some scholars argue that the relationship between population growth and economic growth is positive (Simon, 1990; Jones, 1999; and Strulik 2005). Simon (1989: 168), for

instance, contends that rapid population growth leads to an increase in the *'stock of useful knowledge'* and a corresponding rise in per capita growth of output. The conclusion of some of the above scholars endorses the positivist population view in the literature. Although more considerable population growth may be needed to stimulate growth, what is the optimal rate of population growth to yield an optimal rate of economic growth, as posited in the optimum population theory? From another perspective, using cross-country evidence from the literature as reference categories, Sethy and Sahoo (2015) identified positive effects of population growth on real per capita output in India. Also, Tumwebaze and Ijjo (2015) focusing on the economies of African sub-regions found a positive effect of population growth on the economies of East and South Africa. In the words of Simon (1977: 305):

'Positive population growth produces considerably better economic performance in the long run (120 to 180 years) than does a stationary population, though in the short-run (60 years), the stationary population performs slightly better. A declining population does very badly in the long run'.

From Simon's perspective, it is evident that rising population growth could be a blessing if we control for other economic growth indicators, ceteris paribus.

In contrast, there is substantial empirical evidence of a negative relationship between population growth and economic growth. For instance, Banerjee (2012) found a negative association between population growth and real output per capita in Australia. Similarly, Yao et al. (2013) identified a negative association between population growth and the growth rate of the Chinese economy. Rising population growth without a corresponding increase in resource development, both human and non-human, is likely to have adverse effects on economic growth (Klasen and Lawson, 2007).

For example, Nigeria has an average annual population growth rate of about 2.6%, according to World Bank Development Indicators (2019). It is the 7th most populous country in the world, the most populous economy in Sub-Saharan African and the most populous black nation in the world. However, Nigeria represents a classic case of the economic paradox of poverty amid plenty. The country has abundant natural resources, including oil, gold, cocoa, cobalt, and clay, and tremendous human resources with her skilled workforce in virtually all the advanced economies. Yet, in terms of poverty, Nigeria is one of the poorest countries in the world with a high level of illiteracy, particularly in the northern part of Nigeria. Ethnic and religious unrest has undermined the economic policy blueprint of her government. Whether population growth has impeded the growth of its economy is unclear as empirical evidence is mixed.

Dao (2012), using the least-squares estimation procedure for a sample population of 43 developing economies to determine the correlation between population growth and per capita GDP, argued that the association between population growth and economic growth is negative and linear. Given the endogeneity problem associated with the application of the OLS regression technique, it could be argued that Dao's conclusion may be flawed, as it does not control for variables that might impact economic growth other than population growth. Vital institutions in the form of responsible governance that promotes the health and wellbeing of the population, are likely to stimulate a high birth rate and guarantee labour force participation. For example, the National Health Services (NHS)-in England, Wales and Scotland is known to provide good maternal care for the population which in turn enhances the low maternal mortality rate and promotes reproductive health.

The World Bank special report (2018) *'Changing World Population'* estimated that there were over 3 billion people in the world in 1960. Over 40 years, the population of the world has risen to 7.5 billion. The report notes that *'since 1975, the global population has grown by one billion about every 12 years'*. This report underscores the rate at which the world population has been rising. Clark et al (1985: 120) argued that the theoretical stance of the neo-Malthusian model represents a *'doom day hypothesis of population growth'* which has been widely criticised and proven to be invalid when subjected to empirical evaluation. For instance, the reduction in the fertility rate is due to changes in family size and childbearing education. Based on the proposition that food supply and resources were likely to fall short of rapidly increasing population, the Malthusian model has given rise to other neo-Malthusian theorists like Ehrlich (1968) in his book *The Population Bomb* in which he predicted *'famines of unbelievable proportions'*, with *'hundreds of millions of people starving to death'* in the 1970s and 1980s as a consequence of overpopulation.

Ehrlich (1968) was emphatic that foreign aid to countries with a large population, specifically India, would have a negligible effect if there were no programmes to curtail population growth. Other notable neo-Malthusian theorists published *the Club of Rome: The Limits to Growth* (Meadows et al., 1972) which predicted an exponential growth in population, industrialisation, and pollution, but slower growth in food production. The Club of Rome further argued that resources like petroleum would be exhausted by 1992 and iron by 2065. India, however, has averted mass famine, especially in the period since Ehrlich's (1968) prediction. According to Sen (1981), the cause of the Bengal famine of 1943 in India, which led to the death of about 3 million people, was people's lack of access to available food but not due to lack of food relative to population.

According to the World Bank's World Development Report (1984) which examined the linkage between rapid population growth and economic growth, moderate population growth could increase demand, advance new technological breakthroughs and curtail investment risks. On the other hand, the report identified rapid population growth as an impediment to economic growth. Without controlling for the impact of both human and materials resources in some of the highly populated countries, the report is arguably flawed. The US, with a population growth rate of 0.63% in 2017 (World Development Indicators, 2020), is a model economy in terms of the advance of human and material resources and the use of such resources to serve an increasing population. For example, Shale oil, which represents an alternative platform for the oil sector, has created thousands of jobs since its advent in the US. Another important sector that requires a constant supply of labour is the agricultural sector, especially in the southern part of the US. An increase in the population growth rate of residents in the agricultural states is likely to better serve the needs of the agricultural labour force permanently, in contrast to the seasonal migrant workers, mostly from South America.

Contrary to the US illustration above, the population growth rates of countries such as the Democratic Republic of Congo (3.3%), Ethiopia (2.7%), Uganda (3.8%) and Angola (3.3%), - all in Sub-Saharan Africa - suggest that enormous population growth has induced economic backwardness. Chronic developmental challenges confront all of the listed economies, and are partly attributable to the impact of rapid population growth rate.

Therefore, it is possible to argue that population growth is a limiting factor to economic growth, given the above cross-country experience. Several factors contribute to a rising population growth rate including the fertility rate, low mortality rate, migration, healthcare delivery, and income (Brander and Dowick, 1994; Hongbin and Junsen, 2007). Some of these factors may have played negative roles in the trajectory of population growth in the examples listed above as in several other economies. The dynamic between fertility and mortality rates determines to a considerable extent the corresponding level of population growth. Alho and Spencer (1985) for instance demonstrated that fertility, mortality, and migration are the principal variables that determine such population changes.

To buttress the strength of our arguments in support of negative implications of population growth on economic growth, we draw on Kuznets' (1975) model for selected countries in the post-second World-War period where he argued that:

'The implication is that the rate of population growth among the underdeveloped countries

has no uniform effect on growth in per capita product-a denial of the hypothesis discussed above that assumed that high rates of population growth would be particularly limiting on the growth of per capita product in the underdeveloped countries.'

Kuznets (1975) concludes that population growth may not yield uniform effects on economic growth. We can observe a similar pattern within the Sub-Saharan Africa sub-regions, although this is not sufficient to be generalised in other continents. In addressing this pattern, Simon (1989) contends that many studies have failed to prove a causal effect of population growth on the growth rate of the economy. The notable shortcomings in some previous work include the presence of feedback effects and/or reverse causation which leads to endogeneity issues. Therefore, this chapter applies the GMM system to overcome the risk of perceived bias estimates associated with endogeneity challenges.

Having reviewed the literature regarding the effects of one (population growth rate) of the demographic indicators on economic growth, we proceed below to review the literature on the impact of population size on economic growth.

Population Size and Economic Growth

There is limited literature on the effects of population size on economic growth. Some analysts maintain that the effects of population growth rate presuppose that of population size on economic growth. However, we demonstrate that size matters for economic growth in this chapter. Regarding the variations in population size of countries across the world, there is a likelihood of varying impacts of population size on economic growth, ceteris paribus. For instance, the following are the ten most populous countries globally in 2017 with their respective population sizes according to World Bank Development Indicators (2020): China (1.4 billion), India (1.36 billion), USA (330 million), Indonesia (267 million), Pakistan (221 million), Nigeria (209 million), Bangladesh (169 million), Russia (147 million) and Mexico (128 million). At the continental level, the following are the population sizes of the seven continents around the globe in 2017 (World Development Indicators, 2020): East Asia and Pacific (2.314 billion), South Asia (1.793 billion), Sub-Saharan Africa (1.05 billion), Europe and Central Asia (914.6 million), Latin America and Caribbean (635.4 million), Middle East and North Africa (441.3 million) and North America (361.6 million). It is clear that given the inter-country and inter-continent differences in the population size, it is likely that the impact of population sizes on economic growth varies in the above-mentioned examples.

Arthur Lewis (1955: 320) in *'The Theory of Economic Growth'* succinctly argued that:

'Other things being equal, the size of the population determines the rate at which mineral resources are used up. The more we consume of oil, or coal, or iron, or tin, or other minerals, the less there is left in the earth's surface for future use. Can we establish a 'right' rate at which these resources should be consumed?'

Given this assertion, population size possibly has implications for economic growth. Such implications could be damaging, as in Sub-Saharan Africa, among countries with large populations or positive as in China and India. One of the global reference points for the positive effects of a large population size is China, with a population of about 1.4 billion people (World Development Indicators, 2019), which has one of the lowest labour costs among all the industrialised economies around the globe.

Economic literature shows that one of the factors responsible for China's growth is the import of industries and corporations from highly developed economies such as the US, UK, Canada, and others, into the Chinese economy due to the relatively cheaper labour costs and the attractive industry-friendly environment. Auto manufacturing plants like Toyota in Japan and General Motors in the US have functional manufacturing plants in China, established to reduce labour and associated costs considered to be inimical to profitability ratios in their respective home countries. Paul and Jackson (1995) argue that there is a significant relationship between population size [3] and economic growth which creates an opportunity for a higher labour participation rate and workforce, increasing the rate of specialisation and division of labour through technology transfer (Bloom et al., 2010; Cai and Wang, 2005; Wang, 2005; Wei and Hao, 2010). The Chinese economy in the last two decades has emerged stronger despite a sustained large population. Whilst the Chinese government in the past implemented the fertility reform policy known as *'China One Child Policy'*, to curtail the expansion of the size of her population, the policy has now been suspended partly because the country's large population is probably not an impediment to economic growth.

Elsewhere, the classic rebuttal of the view that small population promotes economic growth is illustrated by some countries with a relatively low population like Malawi (17.6 million), Mali (18.5 million), Chad (15 million) and Sri Lanka (21.4 million). None of these economies falls within the top fifteen most heavily populated economies globally. However, the assumed economic transmission mechanism of growth for a relatively low population economy is lacking in many of the economies mentioned above (Klasen and Lawson, 2007). For example, whilst the population growth rate of Sub-Saharan Africa has been the highest among the seven continents of the world, especially from the early 1990s, the entire population of the region was less than

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[3]China's large population is a 'demographic dividend'- see Bloom and Williamson, 1998

the population of China or India in 2017. The total population of Sub-Saharan Africa, India, and China in 2017 were 1.05 billion, 1.339 billion, and 1.386 billion, respectively (World Development Indicators, 2020). Some scholars have argued that an excellent institutional framework has a fundamental role to play in stimulating economic growth in a sparsely populated economy. This assertion has underpinned the neutral school of population theory in economics which focuses solely on the impact of good institutions on economic growth.

Higgins and Williamson (1997) in considering the economy of East Asia, in particular, found that much of the higher savings which led to economic growth and development in East Asia occurred because of the early and increasing demographic transition in the form of an increase in population via migration and the fertility rate. In addition to this submission on savings and population, Mason and Miller (2000) argued that changes in the mortality and fertility rates are likely to have diverse effects on savings culture. They suggest that, in an economy with a relatively large population *(ceteris paribus)*, the probability of an increase in saving is higher compared to a country with a stagnant or declining population.

We challenge the conclusion of Mason and Miller (2000) based on the realities of Sub-Saharan Africa. If savings are a necessity for investment, the volume of savings within the Sub-Saharan Africa countries with large populations are relatively low. For example, gross savings as a percentage of GDP in Nigeria in 2017 were 18.3% and in Ethiopia, 30.6% in 2017, whereas in Norway, with a population of fewer than 8 million people, gross savings were 34.1% of GDP for the same period. This suggests that a large population is probably not a condition for an increase in savings.

In appraising countries with large populations and relatively advanced economies, Indonesia and Brazil readily come to mind. Brazil's population is close to 300 million, with an abundance of resources like oil and an efficient manufacturing sector for cars and aviation. Brazil's population size suggests that a large population can be used as a source of strength for economic growth. It is one of the most developed economies in Latin America (Jane and Zheng, 2015). The combination of all the above shows that a large population is not detrimental to Brazil's economic growth. Indonesia is also an excellent example of an economy with a large population and strong output growth, distinguished by its industrial capacity and economic policy. In light of the above, the assertion that population size positively impacts economic growth could be plausible (Bloom et al., 2000; Savas, 2008). Having reviewed literature concerning the two principal demographic indicators above, we proceed to literature relating to international migration and economic growth.

International migration and economic growth

One of the driving factors of demographic change in the literature is international migration, which has far-reaching implications for economic growth (Brander and Dowick, 1994; Hong-bin and Junsen, 2007). International migration, by definition, involves the movement of skilled, semi-skilled, and non-skilled populations across international boundaries. Migration contributes to the development of human capital as noted by Stark and Wang (2002). However, the traditional view of international migration is that it involves both net gainers and net losers. For instance, Beine et al. (2001) examined the effects of international migration. They argued that international migration drives population growth, and might affect economic growth. Regardless of whether the implications of international migration rate for population growth and, by extension, economic growth are positive or negative, the consensus is that international migration is related to population dynamism.

For quite some time, *'the push and pull factors'* of international migration have been of interest to scholars and its impact on economic growth. For developing economies, in particular, *the push factor* have been largely responsible for migration into the advanced and developed states, given the existence of favourable opportunities to advance their innate abilities and secure employment in the productive sectors of the recipient countries. Many international migrants from developing countries assume that a substantial improvement in their standard of living would allow some form of positive remittance to their home countries. Evidence in the literature suggests that because of the *'brain drain syndrome'*, the net effect of such an improvement in the standard of living is unproductive for their home countries, but mostly positive for the host countries through the payment of tax, their contribution to the developed economies' growth through consumption expenditure, and their skills. Stark and Wang (2002) for instance observed that migration increases the return on human capital which in turn improves the average level of human capital in the host countries.

Evidence suggests that international migrants may assume that the movement to a *'better country'* is equivalent to an *'Eldorado'*. Migration has a strong linkage with uncertainty as demographic analysts observe. This uncertainty may be associated with increases in the cost of living in cities, the megacity unemployment problem, and other social vices in the cities. It arises when people move from rural areas to the cities in search of better opportunities. Richardson (1987) using data from four developing countries showed that moving from a small city to a megacity raises per capita investment costs per family in urban infrastructure three-fold. Some scholars like Duranto and Puga (2004), Henderson and Wang (2005) and Sato and Yamamoto (2005) describe these adverse effects of migration as *'congestion diseconomies or congestion costs'*. Living costs in remote, rural and less developed countries are on average

considerably lower than in developed economies. Thus, one of the unseen congestion costs for potential migrants, especially from the developing countries is the probability of an increase in the cost of living, in contrast to their home countries. The combination of the above factors has far-reaching implications for demographic conditions and perhaps economic growth in both the short and the long run. Despite some of the gains from transnational flows of goods and capital-driven primarily by globalisation and migration to the developed countries, practical evidence suggests that many developed countries have significant legal barriers to prevent aliens seeking work or residency from entering their national borders. Immigration policies across countries have changed dramatically with strict rules that aim to curtail the economic, cultural, and security impacts of the transnational movement of people across international boundaries.

Empirical literature shows that population dynamism, especially among the densely populated countries of the world like China, India and the US, has been shaped by the movement of people, especially the skilled labour force via the international mobility of labour, which has an indirect effect on the fertility rate, and perhaps the demographic transition model. The combination of all these effects of international migration on demographic factors shows that this is a key area of debate. Nonetheless, perceptions regarding international migrants in developed countries vary across international boundaries, despite the likelihood of positive contributions of such migrants to the host countries. These variations in the relationship of host countries to international migrants are dependent to a large extent on domestic and foreign policies.

There has been an increase in the complexity of immigration, with positive and negative feedback to the economy. The various attempts by many governments to redefine their migration policies are partly responsible for such complexities. Some countries in Europe such as Italy, the UK and France have had to accommodate a large number of migrants, which has sometimes brought challenges to already stressed domestic economies. The direct consequence of the absorption of such migrants, especially from crisis zones, like the refugees from Syria, Iraq and other war-torn countries, is an increase in the population of host countries in Europe. An indirect economic impact is that the government must cater for the needs of the refugees or migrants. In light of this, the implications of international migration are multifaceted, but the consensus in the literature is that international migration expands and contracts demographic dynamism. Therefore, the effects of international migration must be controlled for when considering the impact of demographic indicators on economic growth.

From the review of the literature above, it can be argued that evidence about the implications of demographic indicators (the size and growth rate of the population) for economic growth is inconclusive, given the identified gaps. Hence, there is a need to investigate the

effects of demographic factors, natural resource rents and political institutions on economic growth with a new and enlarged dataset, widening the base of our study to a global scale.

4.6   The nature and sources of data

This chapter applied a yearly panel[4] dataset from 1967 to 2017 for 216 countries as sampling group. Within the framework of World Bank's World Development Indicators, there are other categories of economies or countries which are like appendage countries to the existing countries or notable economies which does not have a definite international boundary. However, this study utilise only the 216 economies with known international boundaries for robust clarification. In effect, the emphasis of this chapter is on the empirical investigation of the effects of demographic indicators, natural resource rents and political institutions on economic growth. The sampled economies cut across all the seven continents of the world in line with the World Bank categorisation of economies base on continental membership: Sub-Saharan Africa, East Asia, and the Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, North America and South Asia (See Table 5.11 to 5.16 in the appendices section for the comprehensive list and relevant information about all the 216 sample economies).

The real GDP per capita proxy economic growth for its ability to measure well being in an economy. We source the GDP per capita (the dependent variable) data from the World Bank's World Development Indicators (2019). We derive the data for population growth rate and population size data from the World Bank's World Development Indicators (2019) and ditto for the following variables: the life expectancy at birth, mortality rate per 1000 live birth, the fertility rate ,demographic transition model, [5] and total natural resources rents. The source for the political institutions quality (democratic institution) is from the Polity IV regime characteristics, Mashall and Jagger (2019). Data for the political right of the population is obtained from the Quality of Governance Institute, Teorell et al.(2019). We derive the data for international migration rate as a percentage of the total population from the United Nations (UN) Department of Economics and Social Affairs, population division (2020). Table 4.1 presents a comprehensive analysis, derivation, measurement, and sources of these datasets .

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[4]We use a balanced panel, implying that the data set is a set that contains all elements observed in all time frame. On the other hand, an unbalanced panel is a set of data where specific years, the data category is not observed.

[5]Demographic transition model is proxy by the estimated difference between the crude birth rate and crude death rate in an economy. Population size is dependent in part on the following variables: fertility rate, birth rate, death rate and or mortality rate, international migration, and to some extent the national output which can be categorised as reverse causation between the national output and population size. All things the same, an economy with strong and robust national output is likely to create an incentive for more fertility and marriage. Furthermore, such an economy is likely to attract international migrants for the prevailing success in the national output.

Table 4.1: General description of variable and notation with source.

Table 4.1 : The General Description of Variable and Notation with Source.				
Notation	Variable	Description and Measurement	Unit of Measurement	Source
GRO	Economic Growth proxy by Per capita real GDP growth Rate	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars.	Annual Percentage	World Bank Development Indicator,2019
$POPS$	Total Population Size	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.	Millions	World Bank Development Indicator,2019
$POPG$	Population Growth Rate.	Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. It takes into account all residents regardless of legal status or citizenship.	Annual Percentage	World Bank Development Indicators,2019
REN	Total Natural Resource Rent as a Percentage of GDP	Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	Percentage	World Bank Development Indicators,2019
DEM	Democratic Institution Quality.	Institutionalised democracy indicator which differentiate among varying system of governance with -10 as the lower bound and +10 as the upper bound & Polity IV Index (US)-2018	Numerical Value	Polity IV Index (US), Marshall and Jaggers - 2019
$DTMI$	Demographic Transition Model Proxy	Proxy variable which is an estimated difference between the crude birth rate per 1000 population and the crude death rate of the population. It is applied in this study as proxy variable for the likely impact of demographic transition model in this study.	Numerical Value	The World Bank Development Indicator, (2019)
$D_1.DTMI$	D. Stage 1 Demographic Transition Model	Dummy Variable created for stage 1 of demographic transition model. This is the reference category. In stage 1, the difference between crude birth rate and crude death rate is 0.	Numerical Value	The World Bank Development Indicators (2019)
$D_2.DTMI$	D. Stage 2 Demographic Transition Model	Dummy Variable created for stage 2 of demographic transition model. The estimated difference between crude birth rate and crude death rate is less than or equal to 13.	Numerical Value	The World Bank Development Indicators (2019)
$D_3.DTMI$	D. Stage 3 Demographic Transition Model	Dummy Variable created for stage 3 of demographic transition model. The estimated difference between the crude birth rate and crude death rate is greater than 13 but less than or equal to 23.	Numerical Value	The World Bank Development Indicators (2019)
$D_4.DTMI$	D. Stage 4 Demographic Transition Model	Dummy Variable created for stage 4 of demographic transition model. The estimated difference between the crude birth rate and crude death rate is greater than 23 but less than or equal to 33.	Numerical Value	The World Bank Development Indicators (2019)
POI	Political Right Institution Quality.	Political Right institutional indicator fall under one of the categories of quality of government indices. "Political Rights Rating - Political rights enable people to participate freely in the political process, including the right to vote freely for distinct alternatives in legitimate elections, compete for public office, join political parties and organizations, and elect representatives who have a decisive impact on public policies and are accountable to the electorate. Countries are graded between 1 (most free) and 7 (least free)".	Numerical Value	Teorell et al (2020). The Quality of Government Standard Dataset, University of Gothenburg: The Quality of Governance Institute. http://www.qog.pol.gu.se doi:10.18157/qogstdjan20
$MIGR$	International Migration Rate.	International migrant rate is the number of foreign born in a country in which they live or reside. It also includes refugees. The data used to estimate the international migrant rate at a particular time are obtained mainly from population censuses. The dataset presents estimates of international migrant by age, sex and origin at mid-year.	Thousands Value	United Nations (UN), Department of Economic and Social Affairs. Population Division (2019).
$EDUC$	Education Attainment Proxy	Primary completion rate is the number of new entrants (enrolments minus repeaters) in the last grade of primary education, regardless of age, divided by the population at the entrance age for the last grade of primary education.	Percentage	The World Bank Development Indicators, (2019)
$LIFE$	Life Expectancy at Birth	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	Years	The World Bank Development Indicators, (2019)
$GDPR$	The Real GDP Per Capita- Real Gross Domestic Product Per Capita	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the country plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2017 international dollars.	Monetary Value-US Dollar	The World Bank Development Indicators, (2019)

Per capita real GDP growth rate -economic growth proxy [GRO]

The per capita real GDP growth measures the rate of growth of the population's wellbeing. According to the World Bank's World Development Indicators (2020), 'GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Calculation of real GDP per capita

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is without the deductions for depreciation of fabricated assets or depletion and degradation of natural resources', according to the World Bank's World Development Indicators (2019). We utilise the dataset to proxy economic growth.

Population growth rate [POPG]

The population growth rate is the percentage change in the growth of the population of the 216 countries utilised in this chapter. The annual population growth rate for year t is the exponential rate of growth of the midyear population from year t-1 to t, expressed as a percentage according to the World Bank Development Indicators (2019) which we utilise for the population growth rate data.

Population size [POPS]

The population size data for this study is the total of the population in all the 216 economies in our study. The World Bank's World Development Indicators (2020) posited that *'Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates'*. The total population data, according to the World Bank's World Development Indicators (2020), is sourced mainly from :(1) United Nations Population Division. World Population Prospects: 2019 Revision. (2) Census reports and other statistical publications from national statistical offices, (3) Eurostat: Demographic Statistics, (4) United Nations Statistical Division. Population and Vital Statistics Report (various years), (5) U.S. Census Bureau: International Database, and (6) Secretariat of the Pacific Community: Statistics and Demography Programme. The primary interest of this study is to examine how demographic indicators, political institutions, and resource rents determine economic growth within the 216 sample economies.

Total natural resources rents [REN]

The natural resource rents in this study imply the total rents from all the natural resources inherent in the sample economies like gold, diamond, oil, gas, bitumen, uranium, cocoa, timber, and others. World Bank Development Indicators (2020) posited that *'Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents'*. One of the implications for the utilisation of the total natural resource in this study is that unlike the previous two substantive papers, not all the 216 sampled economies in this study can be fully categorised as an oil-producing economy. Because of this, we bring into focus all the natural resource rents.

Democratic institutional quality [DEM]

Institutions matter for growth and economic development is a popular presumption in economic

literature. In taking cognisance of the position, we introduce the political institution quality in the form of a democratic institution quality into our model. The data for the democratic institution quality is sourced from the Polity IV index of regime characteristics by Marshall and Jagger (2019). One of the advantages of the Polity IV dataset is that it covers our entire study period from 1967 to 2017. Secondly, the measurement of democratic institution is in a range of number which allows various form or system of governance and democracy to be fully illustrated. Thirdly, it is one of the most acceptable metrics of political institution in economic literature.

Political right institutional quality [POI]

The political right institution index is one of the metrics of the quality of government by the Quality of Governance Institute. It means political freedom which enables people to participate in political activities freely and a contest for elective positions and influences the political policies positively by making the public elected officers accountable to the citizen or population. We utilise the dataset provided by the Quality of Governance Institute, the University of Gothenburg for the political right institution. It ranges from 1 numerical value as the freest country to 7 as the least free country.

Life expectancy at birth [LIFE]

The data for life expectancy at birth is from the World Development Indicators (2019). The World Bank Development Indicators (2020) defined life expectancy at birth as 'the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life'.The variable in question is one of the control variables for the impact of population size or population growth rate in an economy in this study. We assumed that aside from the population size or growth, several other factors are likely to be correlated with the total population, as shown in economic literature. Therefore, it becomes imperative to include the life expectancy at birth for our model development purpose.

Demographic transition model [DTMI]

For this chapter, the demographic transition model is proxy by an estimated difference between the crude birth rate per 1000 of the sample population and the crude death rate per 1000 of the sample population.The data is from the World Bank's World Development Indicators (2019). The World Bank Development Indicators (2020) wrote that the *'Crude birth rate indicates the number of live births occurring during the year, per 1,000 population estimated at midyear'*. Given the five stages of the demographic transition model, we create four dummy variables to detect the likely impacts of each of the four stages of demographic transition model on economic growth. The reference category among the four stages is the dummy stage 1.

The components of demographic transition model is included in our model development as potential explanatory variables because likelihood exists for a correlation between the stage of demographic transition and economic growth. For instance, the countries in the pre-industrial stage are likely to be open to large family sizes increases the rate of growth of the population and facilitate the improvement in human labour.

International migration rate [MIGR]

Economic literature showed that one of the fundamental determinants of population growth is international migration. Migration is the movement of people along with geographical areas. International migration involves the movement of people from one country or continent to the other. The data for the International migration stock is from the United Nations (UN) Department of Economic and Social Affairs, Population Division (2020). According to the World Bank's World Development Indicators (2020), *'International migrant stock is the number of people born in a country other than that in which they live. It also includes refugees'*. For the possible implication of international migration on population size, we use the international migration rate as one of the control variables for population size.

4.7 The descriptive statistics

The descriptive statistics for this chapter is presented below in Table 4.2

Table 4.2: The descriptive statistics

VARIABLES (Measurement) [NOTATION]	(1) MEAN	(2) SD	(3) MIN	(4) MAX	(5) N
Per Capita GDP Growth Rate (Percentage) [GRO]	2.05	6.23	-64.9	140.4	10953
Population Size in Millions (1 billion = 1000 millions) [POPS]	25.3	105	49.2	1390	10953
Population Growth Rate (Percentage) [POPG]	1.74	1.69	-10.9	28.1	10953
Total Natural Resources Rents as a Percentage of GDP [REN]	7.03	11.32	0	89	10953
Democratic Institution (Numerical Value) [DEM]	0 .99	17.138	-8	10	10953
Political Right Institution (Numerical Value)[POI]	4.26	0.36	3.8	5.1	10953
International Migration Rate (Thousands)[MIGR]	10.77	4.73	4.7	34.1	10953
Education Attainment Proxy (Percentage) [EDUC]	75.95	10.77	58.3	92.8	10953
Life Expectancy at Birth(Years) [LIFE]	65.14	10.88	18.9	85.4	10953
GDP Per Capita (US dollar) [GDPR]	12391.3	19312.6	144.9	194188	10953
Demographic Transition Model(Numerical Value) [DTMI]	17.53	10.89	-13.2	42.2	10953
D. Stage 1 Demographic Transition Model [$D_1.DTMI$]	-	-	-	-	-
D. Stage 2 Demographic Transition Model [$D_2.DTMI$]	0.363	0.481	0	1	10953
D. Stage 3 Demographic Transition Model [$D_3.DTMI$]	0.246	0.431	0	1	10953
D. Stage 4 Demographic Transition Model [$D_4.DTMI$]	0.349	0.477	0	1	10953

Our descriptive statistics table above shows the mean, standard deviation, minimum, max-

imum values and the number of observation for each of our variable of interest. For instance, the per capita GDP growth rate in our sample population has a mean score of 2.05 during the period of study. Overall standard deviation is 6.23, a minimum value of -64.9 and maximum value of 140.37. Number of observation is 10953 as shown in Table 4.2.

4.8 The research method and estimation technique

The estimation method for this chapter follows the rule-of-thumb in Bond (2001) with the application of the Pooled OLS as our preliminary estimation procedure, followed by the fixed effects estimator which overcame the shortcoming of the Pooled OLS. However, for the endogeneity concern in our model, a more superior econometric method of the system GMM estimator, which addresses the associated endogeneity concerns is applied. The literature of econometric showed that the Pooled OLS estimator is deficient for a dynamic panel model as developed for this study. The application of Pooled OLS approach for this study is flawed because it does not account for inter-country differences, otherwise known as heterogeneity issues (Wooldridge, 2016). Pooling all the cross-section data together would not take into cognisance the inherent differences among the 216 economies utilised for this chapter. One of the best practices for the panel data estimation is, to begin with, the choice of the estimator to be utilised between the fixed effect estimator and the random effect estimator through the statistical application of the Hausmann specification test of choice. For this study, the outcome of our Hausmann specification indicates that fixed effect is preferred.

4.8.1 The fixed effect estimator

The fixed effects estimator is applied in an empirical work if the primary interest is to analyse the impact of variables that vary over time or space. Fixed effects analyse the correlation between the predictor and the outcome variables within an entity like country, person, corporation; in our case of 216 sample economies. Recall that among the cross-section, there could be differentiated characteristics which are likely to influence the independent variable in one way or the other. Furthermore, the fixed-effects techniques assume that individual heterogeneity in a specific country among the 216 countries may bias the independent or dependent variables. As such, the fixed-effects model is likely to be most suitable to control for the bias estimates as mentioned above. The fixed-effects model extricates the impact of those time-invariant characteristics in a panel data like ours.

The fixed effects models cannot be utilised if the country (time-invariant) characteristics

are correlated with other country characteristics and are not unique to a particular entity or country. The application of fixed effects is on the assumption that each country is different and therefore the country or entity's error term and the constant term (which captures specific country characteristics) should not be correlated with the others. To do this, we need to apply the Hausmann specification test and testing whether to apply fixed-effects or random-effects.

Contrary to the fixed effects model, the random-effects model is useful when the variation across countries is assumed to be random and uncorrelated with the explanatory variable. According to Greene (2008:183) *'.... the crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not'*. If there is a likelihood that differences across countries have any implication on the explained variable, then fixed effects models would not be used, but the random-effects model becomes the most suitable technique.

For the random effects models, all the time-invariant characteristics are taken into account when the panel data are being analysed. Nevertheless, with the fixed-effects models, such time-invariant characteristics are included in the intercept. Based on the above analysis and given the outcome of our Hausmann specification test which indicated that the fixed effect is the appropriate model, we present the fixed-effect model for this chapter as :

$$\text{GRO}_{it} = \beta_0 + \beta_1 \text{POPG}_{i_t} + \beta_2 \text{POPS}_{i_t} + \beta_3 \text{REN}_{i_t} + \beta_4 \text{DEM}_{i_t} + \beta_5 POI_{it} + \beta_6 MIGR_{it} + \beta_7 \text{EDUC}_{it} + \beta_8 DTMI_{it} + \beta_9 \text{GRO}_{it-1} + \mu_{it} ......(1)$$

For i=1,....N and t=1,2,......T

By interpretation, i = entity and t = time.

The stochastic error component in equation 1 is further decomposed into: $\mu_{it} = \varepsilon_{it} + v_i + \delta_t ....(2)$

Where GRO_{it} is the dependent variable and our regressors are $POPG_{it}$, $POPS_{it}$,REN_{it}, DEM_{it}, POI_{it}, $MIGR_{it}$, $EDUC_{i_t}$, $DTMI_{i_t}$, and GRO_{it-1} .

Note that $POPG_{it}$ is the population growth rate for each of the 216 countries in our sample population ,$POPS_{it}$ is the population size , REN_{it} represents the total natural resources rents as a percentage of GDP for the 216 economies, DEM_{it} is the democratic institution quality, POI_{it}, is the political right institutional quality, $MIGR_{it}$ is the international migration rate, $EDUC_{i_t}$, is the educational attainment , $DTMI_{it}$ is the demographic transition model. In addition, we create 4 dummy variables for the stages of demographic tran-

sition model, and GRO_{it-1} which is the lag one of dependent variable , per capita real GDP growth rate. The inclusion of lag one of dependent variable is one of the econometric techniques to reducing the potential drawbacks of autocorrelation due to the likelihood of mispecification error in our model. On a fundamental note, with our eventual application of the consistent estimator, the system GMM to correct for the endogeneity problem , it turn out that we do not need to bother about lag specification order for our variable of interest. The system GMM has an in-built mechanism to determine and utilise lag components of variable as necessary. Therefore, we utilise the lag components for the system GMM estimator as explained under the description of the system GMM estimator.

From the above equation (2) which consists of the decomposition of the stochastic error component, ε_{it} denotes error terms for the 216 economies, whilst v_i is the unknown intercept for each country. The δ_t component is the coefficient of time effects. The mechanism for the choice of the fixed effect model is base on the application of Hausmann test procedure. The null hypothesis of Hausmann specification test implies that the random -effect model is the appropriate model for our panel data, whilst the alternative hypothesis indicates that the fixed -effect model is the appropriate model at 5% critical value. In this study, our Chi-square probability value for our Hausmann specification test is 0.0000, which implies that we reject the null hypothesis which is our justification of our choice of fixed effect model in contrast to the random effect.

Although the fixed effects model overcame the shortcomings of the Pooled OLS approach as previously explained, the fixed effect estimator has its shortcomings which probably renders it as an imperfect estimation method for this chapter. The fixed-effects model cannot address the endogeneity concerns which lead to bias or inconsistent estimates in a panel data as explained in our case below:

4.8.2   The endoegenity sources and concern

Endogeneity concern is one of the most vital issues to be addressed in an empirical study on economic growth. Endogeneity occurs in regression models whenever there is a correlation between or among the right-hand side variable (explanatory variables) and the stochastic error terms. Formally speaking, some of the known sources of endogeneity in economic literature includes, errors-in-variable otherwise known as measurement error, omission variable bias, reverse causation or simultaneity. The existence of any of the combination of these endogeneity effects in growth regression leads to bias or inconsistent estimates which are often associated with the application of the OLS estimator. The test procedure to determine the presence of endogeneity in a regression model is Wu-Hausmann test procedure. For this chapter, the ex-

planatory variables with potential for endogeneity issues are three: population size, democratic institution and natural resource rents as a percentage of GDP. One of the standard features of the three potential endogeneity variables above is the existence of error-in-variable or measurement error. The effect of measurement errors in variable is significant because it potentially lead to a bias estimates and misleading conclusion are drawn from such empirical exercise, especially an inconsistent conclusions. Furthermore, reverse causation also has some form of significant implications for the identified endogenous variables, it is particularly more endemic with natural resource rents and institutional qualities . We proceed below to explain in detail the sources of endogeneity among the three explanatory variables from [a] to [c]:

[a] Error-in-Variable problem with the estimation of population size

Error-in-variable is one of the avenues in which population size risks endogeneity problem in this study. To a large extent, the domestic policies of each of the 216 countries in this study determine the computation of demographic data like population size. In the context of developing nations, in particular, population size is seen as one of the determinants of the distributions of national wealth which exposes the computation and measurement of population size to distortions and manipulations especially by the domestic reporting agencies. Given the above conditions and inaccurate measurement of population size in many of the developing countries, probabilities exist for error-in-variables or measurement error. As such, there is a correlation between the observable errors in the computation of population size and the error term which leads into an endogeneity issue in growth regression analysis which utilises demographic indicators as obtainable in this chapter.

[b] Reverse causation of economic growth on population size

From another ground, there exists the problem of reverse causation between per capita GDP growth rate and population size, given the debate about *demographic dividends* among the large population countries. If the existence of demographic dividends holds, there is a likelihood that an increase in per capita GDP growth rate possibly induces large population size (instead of the reverse), all things equal as obtained in China. Empirical evidence suggests that one of the reasons for the implementation of China *One Child Policy* was occasioned by an accelerated increase in population size driven by higher per capita GDP growth rate. In this wise, the reverse causation problem indicates that instead of our dependent variable in our regression equation to be determined by population size as an explanatory variable, the reverse potentially holds now which potentially lead to a correlation with the error term. In order to address the associated endogeneity challenge, an estimator that addresses such a problem is required which is the first justification for the system GMM in this chapter.

[c] Measurement error with the political institutional quality

Under the political institution quality as an explanatory variable in this chapter, endogeneity

occurs primarily because of the associated inconsistencies and ranging controversy in the determination of what constitutes institution on the one hand and its measurement on the other hand. Essentially, political and institutional qualities are prone to error-in-variables, given there computational techniques and selection bias as a functional variable determining economic growth. All thing the same, countries with strong political institutions are likely to generate higher and consistent economic growth, whilst countries with poor institutional qualities are likely to have slow and deficient economic growth. Alternatively, an unobserved variable may jointly determine both high levels of institutional quality and high levels of economic growth. Principally, an observational data as often utilised in an institutional measurement, is usually not randomly assigned. If institutions were randomly assigned, establishing whether a democratic institution drives economic growth would be as easy to determine, all thing the same. This shortcoming of institutional measurement is more pronounced with political institutions as determined from the following sources: the Polity IV Index of regime characteristics, Worldwide Governance Indicators, International Country Risk Guide (ICRG) and the Transparency International to mention few. For instance, the Polity IV index of democratic institution ranges from -10 as the lower bound to +10 as the upper bound which appears to be arbitrary or not randomly assigned.

Notably, the consensus among economic scholars is that none of these acclaimed sources of institutional qualities is entirely free from controversy ranging from the index used to denote political or democratic institution to the measurement of what constitutes an institution from the standpoint of definition. Empirical evidence suggests that until now, there is no universally accepted definition of an institution. However, each scholar or sources of institutional quality adapt its definition to entail the position of North (1991a : 3) that institution *'is the rule or more formally speaking as the methods through which the society is being organised'*. Above all, there are several observed, and unobserved factors that lead to the determination and measurement of institutions across countries, and these factors are correlated with economic growth, either directly or indirectly. Given the potential of selection bias and the likelihood of an error-in-variables for the political institutions, there exists a possibility of a correlation between the selection bias and error term or measurement error of the political institution and error terms which potentially leads into endogeneity bias and calls for the application of an estimator that corrects the endogeneity bias like the system GMM.

[d] Measurement error with the estimation of natural resources rents

There are challenges of measurement error with the estimation techniques of natural resources rents among the sample countries. The occurrence of measurement error with resource rents estimation is associated with an error term, which leads to potential endogeneity bias. In specific term, the determination of natural resources rents within the 216 countries in our empirical

model call for caution in the sense that rents from natural resources entail the deduction of the associated production costs from the world price of natural resources at a particular point in time. The estimation of the actual cost of production of solid minerals like coal, diamond, uranium and others is subject to controversy. On another ground, the total production cost of oil in many of the oil-producing economies is esoteric- only the government of the oil-producing economies probably know the costs. Although variations exist in the production cost of crude oil and other natural resources vary across countries, the implications of differential costs of producing crude oil depends on the degree of oil rents in any of the resource-producing economies. Resource production in many of the developing economies involves rent-seeking behaviour which consists of both monetary cost and non-monetary cost. Over the years, the computation of these resource costs of production have anomalies or estimation error with possible correlation with the error term. The aggregate of the above indicates potential endogeneity bias in our model development necessitating the application of a consistent estimator.

[e] Reverse causation of economic growth on resource rents

Empirical evidence suggests that countries with a high growth rate of per capita GDP are likely to effectively manage and realise higher resources rents in contrast to countries with low per capita GDP growth rate, all thing the same. The implication of the above is that, instead of natural resources rents to promote economic growth, the reverse now holds which bias our regression equations (for its correlation with the error term) if only the preliminary estimators like an OLS is utilised. Therefore, given the above conditions of how endogeneity issues arise in our regression equation, it is salient to seek for the solution to endogeneity concern to avert the bias estimates problem in our empirical analysis. As such, the application of the system GMM becomes essential in this regard. A note of caution: not all our explanatory variables are endogenous, but we statistically confirmed the above three explanatory variables via a formal test procedure of the Wu-Hausmann test to be endogenous. Whereas the fixed-effect model overcome the heterogeneity issue with Pooled OLS estimator, but in addressing the endogeneity challenges of a dynamic panel model as seen in this study, the application of the fixed-effect model is inadequate.

The econometric solution to the endogeneity concern in this study involves the application of an estimation procedure that have known instruments which control for the possible bias associated with the correlation of our right-hand variables with the error term. The first approach is the panel instrumental variable technique, and the other technique is the Generalised Method of Moment (GMM) estimator. Both techniques apply instruments to correct the challenges of endogeneity, but we opt for the GMM in this chapter with its detail discussion next.

4.8.3 The generalised methods of moments-GMM Estimator

The generalised methods of moments (GMM) is a generic technique for estimating parameters in statistical models credited to Manuel Arellano and Stephen Bond econometric works in 1991. The GMM estimator for dynamic panel data uses moments condition which are functions of the model parameters and the data, such that their expectation is zero at parameters actual values. As such, the application of moment conditions by the GMM also make it a reliable technique to correct endogeneity issues. The GMM estimators utilise partial information among all estimators which makes it to be consistent, asymptotically normal and efficient (these three conditions constitute the properties of the GMM). From this brief description of the GMM, we consider below the justifications for the GMM estimator for our model development in this chapter.

Justifications for the GMM estimator

Firstly, the GMM model is particularly useful for a dynamic panel data especially when there is a large number of observations, N and relatively small time period, T in an econometric experiment. In chapter 4, the N is 216 sample population of countries, and our T is 51 years. Therefore, it makes the application of GMM estimator to be justifiable in the first instance as an estimation procedure for our model.

Secondly, GMM estimator addresses the challenges of endogeneity in dynamic panel data. Some of the known sources of endogeneity in economic literature include measurement errors, omitted variables/ selection bias and simultaneity, among others. Measurement error occurs whenever an explanatory variable cannot be directly measured or measured correctly to determine its impacts on the explained variable. Its occurrence makes the estimates in the model to be inconsistent and such error possibly affect other variables in the model (See Antonakis et al.,2014 and Deshon ,1998). The omitted variable bias is associated with non-inclusion of the important explanatory variable in the construction of a regression model which makes the validity of findings from such model to be invalid and unreliable. Economic theories should, therefore serve as a guide in the determination of explanatory variable as suggested by Antonakis and Dietz (2011), Ketokivi and Mclintosh (2017). Simultaneity occurs if two variables simultaneously impact or affect each other and lead to feedback effects through reciprocity. We can utilise an instrumental variable estimator to solve this problem in the first instance, but finding an instrument variable is challenging or sometimes impossible for some model. The GMM becomes useful in this sense since it mainly employs moment condition. Recall that we have addressed in detailed the endogeneity concerns for this study in subsection 4.8.2 above which relates with measurement problem of population variable and political institutions, among others.

4.8.4 The theoretical analysis of the GMM Estimator

Theoretically, there are two types of GMM estimator: the difference GMM and the system GMM. Although, both the difference GMM and system GMM correct for endogeneity, the difference GMM check endogeneity by transforming all the explanatory variables through differencing and removes the fixed effect. The weakness of the first difference is that it removes the former observation from the contemporaneous one, thereby increasing gaps in an unbalanced panel. The system GMM overcome the shortcomings of the difference GMM by introducing more instruments for efficiency gains, and transform the instruments to become exogenous, uncorrelated with the fixed effects. Moreover, the system GMM utilise two equations, the first in level or the original equation and the second in first difference, the transformed equation and applies orthogonal deviation [6]. The system GMM employs the lagged of the regressand as an explanatory variable. Specifically, the system GMM uses a combination of regression equations in levels and in first-difference. The application of first difference permits us to control for unobserved inter-country differences among the 216 sample economies, otherwise known as the heterogeneity condition. Besides, it also take care of the measurement errors and reverse causation associated with our model.

Technically speaking, the system GMM utilises instrumental variables which permit parameters to be estimated consistently in a regression model which includes endogenous right-hand-side variables like population, political institution and natural resource rents as seen in this chapter in our model development. The utilisation of instruments probably permits consistent estimation even if measurement error exists in the model (See Bond, Hoeffler and Temple,2001).

Technical Analysis of the system GMM : Given the below dynamic panel model:

$$y_{it} = \alpha \ + \lambda^* y_{it-1} \ + \phi K_{it} + \delta_t \ + \eta_i \ + v_{it} \ ....(i)$$

For i = 1,.......N; t=1,2,......T. N= 216 Countries and T= 51years (1967-2017). Therefore, N >T condition is satisfied.

Where the dependent variable y_{it} is the per capita GDP growth rate which proxy economic growth for country i at time time t, y_{it-1} is the lag one of per capita GDP real growth rate which proxy economic growth. K_{it} denotes the vector of explanatory variables across the 216 economies and over time, η_i is an unobserved country specific effect, δ_t is the time effect and

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[6]It subtracts the mean of all future observations of a variable. It is therefore applicable for all observation but the last of each individual which limit data loss, however massive the gaps in the data

v_{it} is the error term. The subscript 't' and 'i' represent time period and country respectively.

Note that $\lambda^* = (\lambda + 1)$

In order to eliminate η_i the individual or country specific effects in equation (i) above, we take the first differences and this process enable us to derive the consistent estimate of λ^* as N $\longrightarrow \infty$ for fixed T (See Hansen, 1982) which result into:

$$(y_{it} - y_{it-1}) = \lambda^*(y_{it-1} - y_{it-2}) + \phi(K_{it} - K_{it-1}) + (v_{it} - v_{it-1}) ....(ii)$$

Equation(ii) above is equivalent to:

$$\Delta y_{it} = \lambda^* \Delta y_{it-1} + \phi \Delta K_{it} + \Delta v_{it} ....(iii)$$

To derive a consistent estimate of λ^* , there is need for valid instruments to be identified for Δy_{it-1}. Our assumptions are that the stochastic error components are independent across the global economy (216 economies utilised) and are serially uncorrelated. Secondly, the regressors are weakly exogenous, that is, the regressors are assumed to be orthogonal to future realizations of the stochastic error component.

By implication :

$E(v_{it} \quad v_{is}) = 0$ for s $\neq$ t.

and that the initial conditions satisfy

$E(y_{it} \quad v_{it}) = 0$ for t $\geq$ 2.

Therefore, the values of y_{it} with two or more lags are valid instruments in the first difference equation, since y_{it-2} and former values are mostly correlated with Δy_{it-1} but not with Δv_{it}. Although, η_{it} are not strictly exogenous and there is likelihood of feedback effects where the previous shocks to the economy are correlated with other explanatory variable. That is,

$E(K_{it} \quad v_{it}) \neq 0$ for s < t and

$E(K_{it} \quad v_{it}) = 0$ for s $\geq$ t

By implication, the values of predetermine η with one lag period or more as valid instruments in the first difference growth equation. Implying that:

$$\text{E}(\text{K}_{it} \quad v_{it}) \neq 0 \text{ for } s \leq \ t \text{ and}$$

$$\text{E}(\text{K}_{it} \quad v_{it}) = 0 \text{ for } s > t \text{ only}$$

In this chapter , the valid instruments in the difference equations are values of the endogenous η_{it} with two lags or more. There exists statistical and estimation shortcoming with the application of difference estimator. Blundell and Bond (1998) argued that if explanatory variables are persistent over time, the lagged levels of these variables make weak instruments for the regression in differences and instrument weakness also affect the asymptotic and the small-sample performance of the difference. In effect, the variance of the coefficients will increase, and in a small sample. To correct the above shortcoming of difference estimator, Blundell and Bond (1998) and Arellano and Bover (1995) suggested a system of combination of two equations. The first regression equation is in differences, and the second regression equation is in levels. The instruments for the regression equation in difference does not change, but the instruments for regressions in levels will be the lagged differences of the variables in question. Because of the above, the empirical work of this chapter utilises the estimator, which combines regression equation in difference with the regression equation in levels to curtail the challenges associated with difference GMM as explained above. The additional moment conditions for the second segment of the system, the regression in levels are:

$$\text{E}(\ \Delta K_{it} \ \eta_i) = 0$$

$$\text{E}(\ \Delta y_{i2} \ \eta_i) = 0$$

The additional moment conditions as shown above, are used, and the system GMM procedure is utilise to derive the consistent and efficient estimators (Bond et al., 2001).

For our system GMM empirical output in column 3 of Table 4.3, we make the following general assumptions: the lag one of regressand (lag one of per capita GDP growth rate) is the predetermined variable [7]. Population size and or growth, political institution and natural resource rents are the potential endogenous variables. Because of the application of additional

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[7]Predetermined variable is correlated with the past stochastic disturbance, but not with the current and future errors.

moment conditions by the system GMM as illustrated by Bond et al. (2001), the system GMM can produce consistent estimates. The moment conditions permit the use of the lagged difference of the explanatory variables as the instruments in level regression, including the lagged level that satisfy the moment conditions in equations above to be the instruments in difference equation. Blundell and Bond (1998) recommend the application of second or higher lags for the regressand as instruments to prevent endogeneity bias. However, for the challenge of overfitting bias, that is, if the number of the instrument is more significant than the number of observation, Eicher and Schreiber (2010) argued for the use of a single instrument variable for each of the endogenous variable and restriction should be placed on lagged-variable instruments to one. Also, Bond (2002) argued for the introduction of more lag, which prevents measurement error and endogeneity. Given this condition, we utilise lag one of population size, lag two of regressand, life expectancy at birth and GDP constant value as instruments[8] for the potential endogenous variables.

Diagnostic tests for the system GMM

The consistency of the GMM estimator is dependent on the validity of the instruments that the error components are not serially correlated. As pointed out by Arellano and Bond (1991) and Areallano and Bover (1995), the specification tests of validity for an instrument are two, namely: the Sargan or Hansen test of overidentifying restrictions which determine the overall validity of the instruments, with the null hypothesis that all the instruments as a group are exogenous. The second test is AR(2), with the null hypothesis that the stochastic error component of the differenced equation is not serially correlated at the second order. Expectation holds that the null hypothesis should not be rejected in either of the two specification tests.

4.9   The empirical result

Table 4.3 below contains the output of our empirical work with the system GMM (column 3), the consistent estimator for this chapter. The findings of this chapter are based on the output of the utilised system GMM in column 3 of Table 4.3 which overcome the challenges of endogeneity with the pooled OLS. However, we present the output of the pooled OLS (column 1) and the fixed effect (column 2) for visual comparison (See Bond et al,2001). The discussion of diagnostic tests perform to determine the robustness of the system GMM follows after Table 4.3. The analysis of the long-run equilibrium solution of the system GMM comes after the discussion of the diagnostic tests before the discussion of various findings .

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[8]We carried out series of regression experiment to arrive at the best combination of lag instruments utilised. Dynamic panel GMM regression can identify valid and relevant instruments from the endogenous variables' lagged values, but the optimal results obtained from our regression analysis is maintained as the final result

4.9.1 The empirical result - Consistent estimator and preliminary estimators

Table 4.3: The empirical result - Preliminary estimation output
Dependent Variable: Per Capita Real GDP Growth Rate- Economic Growth Proxy [GRO]

VARIABLES[Notation]	(1) OLS	(2) FE	(3) SYS. GMM
Population Growth Rate in Percentage [POPG]	-0.535***	-0.640***	-0.731***
	(0.110)	(0.154)	(0.146)
Population Size -in Millions [POPS]	-1.987***	17.449***	0.297***
	(1.906)	(-1.715)	(10.795)
Demographic Transition Model [DTMI]	0.0556***	0.0726	0.163***
	(0.0213)	(0.0485)	(0.047)
D. Stage 1 Demographic Transition Model [$D_1.DTMI$]	-	-	-
	-	-	-
D. Stage 2 Demographic Transition Model [$D_2.DTMI$]	0.741	0.206	2.396
	(0.731)	(1.127)	(1.728)
D. Stage 3 Demographic Transition Model [$D_3.DTMI$]	0.0144	-0.469	-0.349
	(0.575)	(0.844)	(1.222)
D. Stage 4 Demographic Transition Model [$D_4.DTMI$]	-0.430	-0.357	-0.633
	(0.486)	(0.647)	(0.794)
International Migration-in Thousands [MIGR]	-0.0276***	-0.0285	-0.00294
	(0.00945)	(0.0683)	(0.009)
Democratic Institutional Quality-in Numerical Value [DEM]	0.0673	0.771	0.152**
	(0.0431)	(1.462)	(0.064)
Political Right Institutional Quality-in Numerical Value[POI]	-0.131	-5.346	2.323***
	(0.286)	(19.80)	(0.584)
Total Natural Resource Rents as Percentage of GDP[REN]	0.0294**	0.110***	0.0657***
	(0.0139)	(0.0366)	(0.023)
Education Attainment Proxy-in Percentage[EDUC]	0.00371	0.00824	0.0210***
	(0.00461)	(0.00864)	(0.008)
Per Capita GDP Growth Rate(-1)-in Percentage[GRO]	0.329***	0.232***	0.326***
	(0.0323)	(0.0414)	(0.046)
Constant	1.440	753.6	0
	(1.543)	(1,750)	(0)
Observations	4,150	4,150	3978
R-squared	0.156	0.170	
Year Dummy	Yes	Yes	Yes
Number of Countries	216	216	216
Wald Test Joint P value			0.000
Arellano-Bond test for AR(1) P Value			0.000
Arellano-Bond test for AR(2) P Value			0.914
Hansen Test Statistics			1.000

Source: Author's Computation.
D_1 to D_4 are dummy variables.
D_1. Stage 1 Demographic Transition Model=Reference Category.
Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

4.9.2 Discussion of diagnostic tests-The system GMM

From column 1 of Table 4.3, the Wald Joint test for the system GMM model is significant, with 0.000 at 5%, which justifies the inclusion of our explanatory variables in the model. We uphold the homoskedasticity assumption in the model for the application of robust standard error.

AR(2)

The rule of thumb of AR(1) and AR(2) show that we could reject the null hypothesis of at AR(1) but not at AR(2) for serial correlation. The null hypothesis for AR(2) is that no second-order serial correlation, while the alternative hypothesis says otherwise. In column 1 of Table 4.3, our AR(2) P-value is 0.914, which implies that we cannot reject the null hypothesis. By implication, there is no second-order serial correlation in our model. With this outcome, our GMM is consistent since we cannot reject at order two in column 3 of Table 4.3 (Olomola et al, 2007).

Hansen test

The Hansen test for overidentifying restrictions in our system GMM model in column 1 of Table 4.3 is 1.000. The null hypothesis is that our instruments as a group are valid, while the alternative hypothesis says otherwise. Given the Hansen tests result for our system GMM in column 1 of Table 4.3, which is greater than the 5% critical value, we cannot reject the null hypothesis. It underscored the validity of the instruments utilised, in other words, we did not reject at 5% critical value the hypothesis that population moment conditions are correct .

4.9.3 Analysis of the long run solution

Previously in Table 4.3, we present the parameter estimates for our system GMM (which is the preferred estimator) showing the short run estimates of all our estimated parameters.Therefore, we present below the long-run equilibrium solution for the system GMM with an emphasis on the statistically significant variables:

The long run form- system GMM model -The preferred estimator:
GRO = -1.08[POPG] + 4.81[POPS] + 0.24[DTMI] + 0.22[DEM] + 3.46[POI] + 0.09[REN] + 0.31[EDUC]

4.10   The discussion of findings

4.10.1   Demographic indicators (population growth rate and population size) and economic growth

From column 1 of Table 4.3, our point estimate with the pooled OLS is -0.535*** for population growth rate, but -0.640*** with the fixed effect estimator. We observe that both point estimates for the population growth rate are statistically significant with negative signs. For our consistent estimator, the system GMM in column 3 of Table 4.3, the point estimate is about -0.196 percent point difference from the pooled OLS parameter estimate. Specifically, the parameter estimate for the population growth rate with the system GMM is -0.731***. Meaning that holding all other factors the same, a unit increase in population growth rate decreases economic growth by -0.731 percentage point value in the short run, at 1% significant level. In the long run, the estimated coefficient is -1.08 indicating a negative association with economic growth. This finding is consistent with some of the assumptions in Hoeffler and Collier (2000) about the relationship between population growth and economic growth. Furthermore, our finding aligns with the proposition of the pessimist school of thought of population studies in economic literature. The neo-Malthusian assumptions in Klasen and Lawson (2007); Kelley and Schmidt (1995) offer empirical support for our finding in this chapter about the impact of population growth on economic growth [9].

For the estimated parameter of population size with the pooled OLS, we have -1.987**. Its point estimate with the fixed effect approach is 17.449***. Although both point estimates of our preliminary estimators, the pooled OLS and the fixed effects are statistically significant, the sign of the pooled of OLS is negative while the sign of the fixed effect estimator is positive. Contrary to the impacts of population growth on economic growth in column 3 of Table 4.3 with the system GMM, the parameter estimate of population size is 0.297*** in column 3 of Table 4.3 with the same system GMM, which indicates that a change in the level of population size by one million increases economic growth by an approximate of 0.297 per cent point in the short run at 1% level of significance. Besides, the sign of our point estimate for the population size with the pooled OLS is negative, but we have positive sign for the point estimate with the application of the system GMM.

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[9] The sign in front of the parameter estimate of population growth corresponds with the signs in front of the Pooled OLS and fixed effects estimates which partly reinforce our finding as seen in appendices subsection 5.3.7

In the long run, the estimated coefficient of population size using the system GMM is 4.81, showing a positive sign. Our finding partly supports the conclusion in Bloom et al. (2001) about the impact of population size on economic growth. From the preceding, the relationship between population growth and population size with economic growth is asymmetric given that a change in population growth induces a negative effect on economic growth, whereas the change in population size causes positive effects on economic growth. In a way, both population growth and population size appear to be essential for economic growth and depending on the nature of the economy under consideration, either the service-based economy or manufacturing-based economy. For example, the population size of China in the past decades has been one of the contributing factors to its growth rate. The efficiency of labour in China, given the relatively lower labour cost has attracted many foreign manufacturing corporations to China which promotes productivity and contributes to its aggregate GDP growth rate. Moreover, the open immigration policy in the US has led to the influx of millions of migrants into the United States which has expand her population size and maintain the US status as the third most populous country in the world. Because of the above, its plausible as deduce from our findings on the effects of demographic indicators on economic growth, that demographic factors advance productivity, improves technical know-how and encourage capita investment in the states.

4.10.2 Demographic transition model proxy and economic growth

In column 1 of Table 4.3, the parameter estimate of demographic transition model with the pooled OLS is 0.0556***, but 0.0726 with the fixed effect estimator in column 2. While the two point estimates have positive signs, the point estimate of pooled OLS is statistically significant, but the fixed effect is not. From column 3 of Table 4.3 with our system GMM, the parameter estimate of the demographic transition model is 0.163*** (same positive sign with the signs of the two preliminary point estimates and higher than the point estimate of the pooled OLS) in the short run and 0.24 in the long run. Both estimates are positive and statistically significant.

For the dummy variables created, none of the point estimates of our estimators is statistically significant. Focusing on the system GMM point estimate, the parameter estimate for dummy stage 2 of demographic transition model is 2.396 meaning that stage 2 has a mean effect value on economic growth that is 2.936 above the reference category but statistically insignificant. For the dummy stage 3, the estimated parameter is -0.349, indicating that stage 3 of the demographic transition model has a mean effect value on economic growth which is -0.349 below

the reference group but statistically insignificant. The parameter estimate of dummy stage 4 is -0.633, meaning that stage 4 has a mean effect value on economic growth that is -0.633 below the reference category but statistically insignificant. The policy implication of our finding with the demographic transition model is that likelihood exists that it is directly related to economic growth.

4.10.3 Political institution qualities and economic growth

In column 1 of Table 4.3 with the pooled OLS, our point estimate is 0.0673 for the democratic institution quality, and 0.771 with the fixed effect. The two point estimates are positive, but statistically insignificant. In column 3 of Table 4.3 with our system GMM, the parameter co-efficients of the democratic institution quality are 0.150** in the short run (higher than the point estimate of the pooled OLS in magnitude) and 0.23 in the long run. By interpretation, an increase in the democratic institutional quality by one unit leads to a corresponding increase in economic growth by 0.152** per cent point in the short run at 5% level of significance (all things the same). The sign of the long-run parameter estimate for the democratic institution is positive (0.22). On the whole, this implies that there is a likelihood of a direct relationship between democratic institutional quality and economic growth, especially in the long run. This position aligns with our a priori expectation of the possible association between the democratic institution and economic growth. It also aligns with empirical findings in Acemoglu et al. (2019) which provided a piece of empirical evidence that democratic institutions improve economic growth. Furthermore, Roberts (2004) showed that the democratic institution has a positive effect on economic growth and by extension a curtailing impact on the fertility rate.

For the finding of the impact of political right institution on economic growth in column 1 of Table 4.3, we observe a point estimate of -0.131 with the pooled OLS, but -5.346 with the fixed effect estimator. Both point estimates of our preliminary estimators have negative signs, but statistically insignificant. Using our system GMM in column 3 of Table 4.3, the parameter estimate of the political right institution quality is 2.323***, which is positive and statistically significant unlike our preliminary point estimates. Besides, it is higher in magnitude than our two initial point estimates (pooled OLS and fixed effect). Indicating that (all thing the same), a unit change in the political right institutional quality increases economic growth by an approximate of 2.323 per cent point in the short run, at 1% level of significance. In the long run, the parameter estimate is 3.46, which retains the initial positive sign with the short-run

estimate. The political economics literature shows that political right, political participation and political education or consciousness are relevant for the development of the superstructure layer of an economy. Empirical evidence pointed in the direction of a strong positive correlation between the political right and the participation of the population in the electoral process or democratic institution. By implication, the political right institution is intricately related to the democratic institution, or it is a complement of a democratic institution. Therefore, the higher the political right institution quality, the higher the likelihood that such an economy will grow as identified in this chapter.

4.10.4 Total natural resource rents and economic growth

The point estimate of the effect of total natural resource on economic growth, we have 0.0294** for the pooled OLS in column 1 and 0.110*** for the fixed effect estimator in column 2 of Table 4.3. For our consistent estimator as shown in column 3 of Table 4.3, the estimated parameter for the total resource rents as a percentage of GDP is 0.066** in the short run. One of our principal observations from Table 4.3 is that all the point estimates are positive and statistically significant. By implication, a change in the total resource rents share of GDP increases economic growth in the short run by an approximate of 0.066 per cent point, all other factors the same at 5% level of significance. In the long run, the parameter estimate is 0.09 with a positive sign. This finding is consistent with the assumption in the literature that resource availability and rents from resource spur economic growth given the presence of relevant factors (Rosser, 2006; Acemoglu et al., 2005).

4.10.5 Education attainment and economic growth

Our point estimate for the education attainment in column 1 of Table 4.3 is 0.00371 with the pooled OLS, and 0.00824 with the fixed effect estimator. Interestingly, both point estimates are positive but statistically insignificant. From column 3 of Table 4.3, the parameter estimate of education attainment rate is 0.0210***, which is higher than the point estimate of the pooled OLS in the same Table 4.3. It indicates that an increase in the educational attainment rate by one percentage point increases the aggregate economic growth by an approximate of 0.0210 per cent point in the short run, all thing the same and at 1% level of significance. In the long run, the parameter estimate is 0.31, which is positive. This finding concurs with the endogenous

theory, ditto for our a priori expectation. Meaning that all thing the same, the relationship between education and economic growth should be positive (Romer, 1990). In a sense, this study validates the empirical finding of the endogenous growth literature and human capita development theories. According to Mark Montgomery (2015:1), a professor of Economics and researcher with the Population Council, *'......One of the most powerful tools in stemming population growth will be education..... We have seen some astonishing transitions, especially in the 1970s in what were then poor countries where fertility rates fell when levels of education went up'*. To corroborate the assertion of Mark Montgomery(2015), Lutz and Samir (2010: 2779-91) in their empirical work on demographic indicators, found that *'... On average, uneducated Malian women gave birth to almost seven children. For the better-educated, the number was about four. Education leads to lower birth rates and slows population growth..... This makes it easier for countries to develop. A more-educated workforce also makes poverty eradication and economic growth easier to achieve'*. The significant deductible from the above positions of scholars is that education and human development are vital to the changes in the configuration of demographic indicators.

4.11 Summary of Chapter Four

This chapter examines the effects of demographic indicators (population growth rate and population size), natural resource rents, and political institutions on economic growth between 1967 and 2017. The study identifies a long-run negative statistically significant relationship between population growth and economic growth and a positive long-run relationship between population size and economic growth, indicating an asymmetric relationship between demographic indicators and economic growth. This chapter's finding is not a pre-modern assertion concerning the inverse association between population growth and economic growth. In this case, the conclusion is consistent with a new proposition in the economic literature about the impact of population growth rate on economic growth.

In some way, our findings align with the neo-Malthusian propositions about the inherent challenges of a high rate of population growth for economic growth (Brander and Dowrick, 1994; Kelley and Schmidt, 1995). Also, empirical evidence suggests that long-run economic growth is dependent on the changes in population growth (Galor and Weil, 2000; Jones, 2005, Kremer, 1993; Kortum, 1997; and Segerstrom, 1998).

Moreover, our findings of the positive impact of population size on economic growth may have a linkage with the *demographic dividend*, especially in the first three most populous countries in the world. China, India and the USA have large populations. However, their respective economies are driven by service industries, especially the USA and India. The Chinese economy, on the other hand, is dominated by the manufacturing sector and a growing service sector.

The World Population Prospects report (2019) argues that the demographic transition model is associated with population growth and that economic growth is partly dependent on population dynamism. For the attainment of economic growth, there is a need for a growing labour force to increase productivity in the economy. With this in mind, this chapter finds that the demographic transition model is statistically significant for economic growth, aligning with the view of Bloom et al. (2003) that the demographic transition model *creates the potential for economic growth in several ways*.

This chapter also identifies that political institutions have positive long-term effects on the economy's growth. Qualities of political institutions like democratic qualities and the population's political rights show a positive and significant impact on the economy's growth. Our conclusion on the effect of political institutions on economic growth corresponds with the contemporary thoughts about institutions' influence on the economy's growth (Acemoglu et al., 2019).

The endogenous theory with specific reference to Romer's (1990) work underscored the importance of human capital, R and D, innovation, and education as contributors to economic growth. In a related development, this chapter identifies a positive long-run relationship between education attainment and economic growth. In the endogenous theory of growth, the emphasis is on human capital and technology. Education has many roles to play in stabilising population growth through fertility education, child spacing, and procreation, all of which impact economic growth.

Finally, this chapter identifies positive long-run effects of natural resource rents on economic growth. Despite the arguments that scholars have advanced concerning the relevance of natural resource rents for economic growth, our study shows that natural resource rents are positively associated with economic growth in the long run if we control for relevant factors particularly

institutional qualities.

In essence, contrary to Boserup's conclusion about the positive effect of population growth on economic growth, this chapter shows that the population growth rate has a negative statistically significant impact on economic growth.

4.12   Policy recommendations

Demographic changes especially population growth rate in the advanced and developing world can cause an array of problems, which including *deficiencies in health care programs, lack of resources, pollution, criminality partly for overpopulation or social vices occasioned by the crowd, malnourishment due to food shortages which may spark related crises, such as outbreaks of disease.* Given the findings in this chapter about the negative long-run relationship between population growth and economic growth, the following are the policy recommendations for the public authorities, international and multilateral organisations and development agencies, and corporations:

[1]. The high rate of increase in population is perhaps a pointer to the economic challenges associated with the population explosion. The economic justifications for a sustained geometric increase in population growth, especially in less developed countries, appears to be blurred or somewhat controversial. A policy framework should be put in place to educate the identified countries or continents with a high rate of population growth about the need to moderate, control, or limit the growth of their population for their own good. The policies to address the high rate of population growth might appear controversial, especially for the countries or continents with a strong cultural and historical affinity to large families. A practical example of this proposal occurred in the northern part of Nigeria with the dethronement of a first-class Emir (traditional ruler) Sanusi Lamido Sanusi in March 2020 over his consistent campaign to control the practice of extensive family size and the impending population explosion vis-a-vis chronic poverty in the region. The controversy surrounding population control is also prevalent in the Arab world. These factors notwithstanding, the multilateral agencies should continue to educate, campaign and assist in raising awareness of the challenges to economic growth associated with a high rate of population growth.

[2]. The continuous development of political institutions is necessary. Economic growth has a significant linkage with the political fibre of society, and therefore an enabling environment must be put in place to promote political education and address the prevailing political deficiencies among countries.

[3]. Natural resources have important implications for economic growth, as demonstrated in this chapter. Natural resource rents have played significant roles in the evolution of the advanced and industrialised countries, and therefore there is a need for thorough development plans for the identification, processing, commercialisation and judicious use of natural resource rents to foster economic growth.

[4]. Empirical evidence suggests a linkage between literacy rates (education) and population growth and, by extension, economic growth. As observe in this study, the continents or countries with moderate population growth are known to have a high literacy rate with good education facilities and infrastructure. Because of this, the public authorities, multilateral agencies and international organisations like the UN, UNESCO, the World Bank, the AFDB, the IMF, and others should continue to promote the goal of education for all and the eradication of illiteracy especially in the developing economies across the world.

The higher the level of education of the population, the greater the understanding of the implications of a large population or accelerating rate of population growth. Efforts should be put in place by governments and international agencies to fund education, with a sustained increase in the budgetary allocation to education to address demographic challenges. Education funding is relatively low in many of the developing countries with known demographic problems. If possible, there is a need to determine the optimal monetary allocation to education to yield the best human capital outcome, in the long run, and a long term development plan for education put in place similar to the *sustainable development goals* of the United Nations Development Program.

Chapter Five: Summary and Conclusions

5.0.1 Key findings of the thesis

This thesis contributes to the literature by investigating the effects of resources rents, institutions and demographic factors on economic growth. The highlights of the thesis include the examination of the impacts of oil rents, institutions and diversification on the growth of the Nigerian economy in Chapter Two. Through the application of an instrumental variable estimator, we identify that oil rents have favourable long-term implication for the growth of the Nigerian economy, conditional upon good institutions. One of the significant implications of our findings in relation to the positive relationship identified between oil rents and economic growth, is that it refutes segments of the literature which assert that oil rents have negative effects on economic growth. This thesis argues that with the existence of strong institutions, oil rents can positively impact economic growth. The trajectory of economic growth in, for example, the UK, Norway and perhaps Saudi Arabia and the United Arab Emirates arguably demonstrates that with good institutions, resources like oil can contribute meaningfully to the growth of an economy. Thus, with judicious use, oil rents can be a blessing to the Nigerian economy. Oil rents should be used for developmental projects including infrastructure, and adequate savings of oil windfalls held in a separate account, like a sovereign wealth fund, to address future developmental needs.

As evident in our findings on the significance of institutions in Nigeria, democratic institutions, in particular, are recognised as an essential driver of economic growth. A substantial body of literature shows that political institutions and the economy are interrelated, which aligns with our findings on the favourable influence of democratic institutions on economic growth in Nigeria. The country's democratic institutions have continued to develop since the return to democratic government in 1999. Chapter Two of the thesis acknowledges that challenges abound with the democratic process in Nigeria. However, there is evidence in the literature of some improvements,

albeit from a low base.

Chapter Two also identifies diversification as yielding benefits to Nigeria's economic growth. Although agriculture constitutes the primary segment of the economy, our findings are optimistic that, with full commitment to the development and mechanisation of the sector, substantial gains could be derived to complement the contributions of the oil sector. Developed countries such as the US, the UK, the Netherlands and emerging economies like Brazil have robust agricultural sectors which have continued to generate production and employment, and thereby contributing to output growth. From a policy perspective, the positive contribution of the agriculture sector to the Nigerian economy in the pre-oil era could be experienced once more, if the government is committed to diversification, focusing on the areas of comparative advantage. Nigeria appears to have a lower opportunity cost in agricultural produce, but factors militating against agricultural development such as rural-to-urban migration, lack of agricultural support loans, ageing infrastructure and outdated agriculture methods must be addressed.

Despite the positive relationship between oil rents and economic growth, conditional upon good institutions, Nigeria is likely to face growing economic challenges, from our observations. It is suggested that the problem, increasingly, is not about oil rents, but rather concerns institutional factors. Evidence shows that other developed oil-producing economies have done better with oil rents, implying that oil rents are not the problem per se in Nigeria but rather the management of oil rents and weak institutions.

In Chapter Three, the outcome of our extension of the debate on the impacts of oil rents and institutions with data on the 14 OPEC economies proved to be different from the results of the time-series research experiment on the Nigerian economy in Chapter Two. Firstly, our results, in line with the literature, underscore the perception that oil rents have adverse effects on economic growth in OPEC economies. With the exception of two or three members of OPEC, the reality in most other OPEC economies appears to justify our findings regarding the adverse effects of oil rents on economic growth. Given the uncertain future of oil rents faced by the OPEC economies, our findings on the negative relationship between oil rents and OPEC economies' growth is plausible. Moreover, the economic challenge of COVID-19 has exacerbated the problem associated with volatility in the flow of oil rents to the total revenue of OPEC economies. Also, US shale oil is another threat to the realisation of the goal of *'oil rents for economic growth'* in OPEC countries. These factors combine to signal that future flows of oil rents in OPEC economies are uncertain or perhaps negative.

Also in Chapter Three, results show that institutional qualities such as the legal institutions, anti-corruption institutions and government effectiveness have positive long-term impacts on the growth of OPEC economies. However, democratic institutions are demonstrated in our result to have negative implications for OPEC economic growth, contrary to our a priori expectation. For one thing, the Arab members of OPEC do not appear to embrace democratic institutions. Also, empirical evidence suggests that most of the developing economies among OPEC, notably, Nigeria, Angola, Congo, Equatorial Guinea, Libya, Venezuela and Gabon are *'pseudo-democratic states'*. Perhaps, oil rents have provided an incentive to governments in some of the abovementioned countries to become anti-democratic and buy patronage from the population either to rule without term limit or to become autocratic. This implies that democratic states do not necessarily have better economic growth than non-democratic ones. Substantial evidence in the literature shows that many of the developing countries that have recently democratised have not experienced an optimal democratic dividend.

OPEC incorporates several developing economies such as Venezuela, Nigeria, Angola, Libya, Congo, Iraq, and Gabon. Empirical evidence suggests that democratic institutions, as developed in these countries do not conform to widely accepted democratic standards. Some theorists have argued that democracy in the listed countries is *pseudo-democracy* as observed earlier. Although *the rentier states* in OPEC such as Saudi Arabia and the United Arab Emirates do not have important democratic institutions, using the metrics of growth and development, they outperform many of the developing economies with democratic institutions. Given this disparity, it could be argued that democratic institutions are neither a necessary nor sufficient condition for economic growth. However, they represent an *'ideal'* institutional quality which may facilitate economic growth if adopted and developed. Evidence in the literature suggests that democracy is *'elitist'* in approach to some extent, which tends to create an economy where the majority of the population do not realise the dividend of democracy. This may indeed be the experience of countries such as Venezuela and Nigeria in particular. This *dual faceted* outcome of democratic institutions is another key observation of this thesis.

The policy implication of Chapter Three is that OPEC should recognise that with increasing competition for oil rents, effective management thereof is essential. The development of strong institutions to complement economic growth strategies is perhaps a pre-condition for OPEC's goal of *'oil rents for economic growth'*. There are also exogenous factors militating against the stabilisation of oil prices by OPEC such as the challenge of COVID-19 pandemic and shale oil for these reasons, there is a need for an appraisal of the domestic economic policies in OPEC to determine alternatives to oil rents, through economic diversification into other sub-sectors, whether in the

immediate future or the long run.

Chapter Four suggests that size matters for economic growth. In the past, the focus on the effects of demographic factors on economic growth has mainly been on the population growth rate. This thesis, however, considers both population growth rate and population size as explanatory variables, and these two demographic indicators are demonstrated to have varying implications. Specifically, our findings indicate that the population growth rate harms economic growth. However, population size has positive impacts on economic growth which shows an asymmetric impact of the two demographic indicators on economic growth. We identify the demographic transition model, political institutions (democratic and political rights), total natural resource rents as a percentage of GDP and educational attainment as having positive effects on economic growth.

Our finding regarding the demographic transition model is crucial because the population trajectory of countries requires the historical transition of a country's population from one stage to another. The demographic transition model sets out how societies transform in terms of population in four stages. This transition process has various characteristics with each potentially having distinct impacts on economic growth. Having considered some of the key findings in this thesis, likely areas for further research are outlined below. Research is a continuous exercise which requires constant examination and empirical testing to expose research findings to a contemporary spotlight, both internally and externally.

5.1   Further research suggestions and plans

The main idea of this thesis is to investigate the effects of resource rents, institutions, diversification, and demographic factors on economic growth. Research is an evolving process which requires continuous growth and expansion in depth and width. Therefore, areas of further research work in our view include the following:

[a] Given our findings on the effects of diversification via the agricultural sector in Nigeria, there is a need to consider other diversification options. Successive governments have considered diversification, but there is a need for further research on the effects of solid mineral rents on the Nigerian economic growth. The economy's solid minerals sector - including gold, bauxite, bitumen, coal, uranium and limestone to mention a few - is one of the unregulated sectors where the government loses large proportions of its rents to corruption and wastage. Many of these solid Minerals remain largely untapped, with few or no rents accruing to the government, as the

economic emphasis is on the rents from oil. There is scope for further research on the impact of democratic institutions in Nigeria from 1999-2019. Democratic government was restored in 1999, and various government blueprints and solid minerals development templates have been instituted by successive governments. However, solid mineral rents have not been optimised for economic growth. Therefore, there is scope for examining the influence of solid mineral rents and democracy on economic growth from 1999 to 2019, the first twenty years of sustained democratic governance in Nigeria.

[b] One possible area of further research work under chapter Three should be the forecasting of the long-term implications of the COVID- 19 pandemics for OPEC. The second chapter demonstrates that OPEC's oligopoly power is waning for various reasons, including the influence of shale oil, production of crude oil by non-OPEC members, and the global shift from fossil fuels like oil to renewable energy sources. A combination of all these factors, together with international political policies, have weakened OPEC. Countries have been reconsidering their membership of OPEC, given the loose cartel's fragile nature, and Qatar withdrew in 2019.

[c] In addition to the above, an area of further research arising from the fourth chapter is a comparative empirical analysis of the effects of population on economic growth across the seven continents of the world. One of the possible challenges to our empirical findings in the fourth chapter is the likelihood that such results may have slight variation at the continental level. The fourth chapter identifies a negative effect of population growth rate on economic growth on the one hand and a positive relationship between population size and economic growth. It may be necessary to test the efficacy of the research outcomes across the world's seven continents.

5.1.1 Final remarks and conclusion

The capstone of this thesis is that natural resources can promote economic growth, contingent upon some fundamental changes in the institutional arrangements of an economy. In this regard, the existence of natural resources in an economy is not an *end* in itself. Instead, it is a *means* to an end which perhaps differs from the economic realities of developing countries characterised by misuse of resources rents. Substantial evidence in this thesis shows that the advanced and industrialised countries of the world have used and continue to use natural resources to fuel economic growth supported by strong institutions.

Shale oil in the US is one of the discoveries which has become crucial for the US economy in curtailing its dependence on crude oil imports. There are multiple benefits of shale oil despite its

associated environmental challenges: it has created jobs; it has saved money on imports; it has opened a new door to oil research and development; it has increased the voice of the US in the global energy market. It is clear that research and development into natural resources are vital to the *future* of countries whose growth depends on rents from natural resources.

This thesis has explored the literature on how institutional changes have varying consequences that may be controversial. Political institutions, such as democratic institutions, have continued to evolve, producing both positive and negative results across the globe. However, this thesis observes that the generalisation that democracy spurs economic growth across countries is contentious. Whilst democratic institutions may have complemented economic growth in the developed countries, this is not necessarily the case in the developing countries, as explored in this thesis. Therefore, while domestic adaptations of democratic institutions in each economy may be necessary, therefore , the application of a single template for democratic institutions in all countries may be challenging.

Overall, regarding the impact of demographic factors on economic growth, this thesis demonstrates the need to determine the level of population growth or size that matters for a country's economic growth. Regardless of the controversy surrounding the trends in population growth or size, we demonstrate in this thesis that there is an *ideal* level of population growth and size for economic growth. Resource allocation is one of the core targets of economic growth. Therefore, the public authorities, international and multinational agencies should observe with caution the demographic trends in various countries. This thesis could serve as resource material for future researchers interested in the debates surrounding the effects of natural resources rents, institutional qualities and demographic indicators on economic growth.

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5.3 Appendices

5.3.1 Comparison of the World Bank and IMF per capita real GDP growth rate of Nigeria for Chapter 2

A brief look at Figure 5.1 showing the per capita real GDP growth rate of Nigeria from the World Bank's World Development Indicators (2019) and IMF World Economic outlook (2019) show similar pattern or trend in some respect. Though the statistical data differ for each of the two sources in some respect, it appears they follow a similar pattern in terms of trend. Our empirical work is further reinforced with the outlook of the chart in Figure 5.1 below:
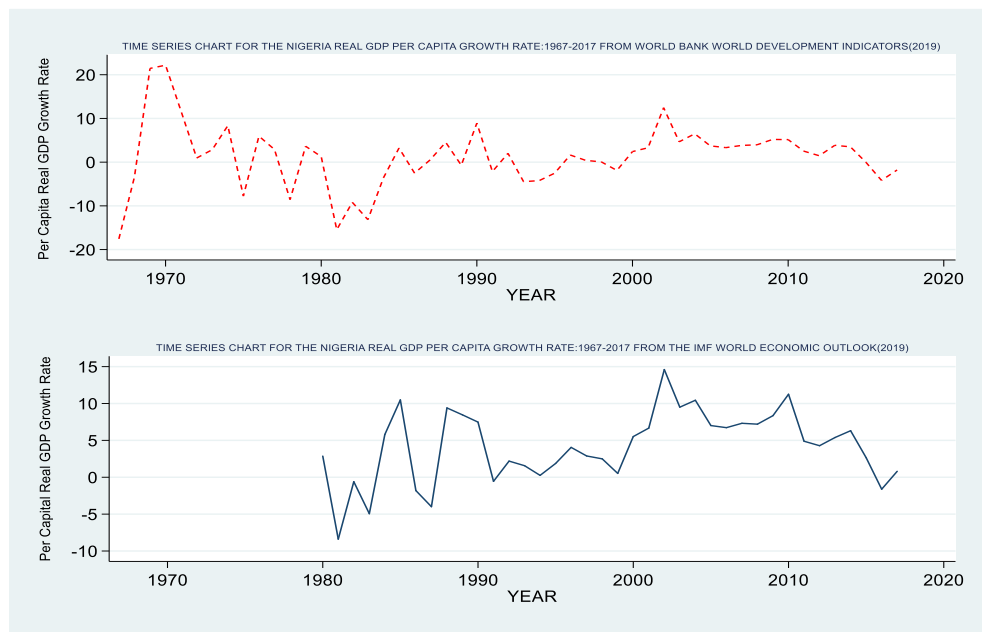
Figure 5.1: Comparison of the World bank and IMF Per Capita Real GDP Growth Rate of Nigeria

Source: Author's calculations.

5.3.2 The brief history of OPEC- for Chapter 3

Organization of Petroleum Exporting Countries otherwise known as OPEC was established in Baghdad in the year 1960 by Iran, Iraq, Kuwait, Saudi Arabia, and Venezuela with initial head-

quarters in Geneva, Switzerland within the first five years of existence and later moved into Vienna in Austria in 1965. The mission statement of OPEC as encapsulated in its statute involves the coordination and unification of petroleum policies among member states, price stability, regulation of supply, and ensuring fair returns on the investment of OPEC members. Specifically, it reads:

'to coordinate and unify the petroleum policies of its Member Countries and ensure the stabilisation of oil markets to secure an efficient, economical and regular supply of petroleum to consumers, a steady income to producers and a fair return on capital for those investing in the petroleum industry'.

OPEC has passed through various phases within the last fifty-two years of existence ranging from the period of boom for the sustained and incremental oil rents to the periods of oil price instabilities and fluctuations which led to an abysmally level of oil rents to OPEC. Since the inception of OPEC in 1965, countries have joined and exited the organisation in a few times. However, as of 2019, OPEC has fourteen members namely: Algeria, Angola, Ecuador, Equatorial Guinea, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Saudi Arabia, United Arab Emirate, Venezuela and Congo which joined in 2018. The combined impacts of these economies called OPEC is huge especially from the perspective of the volume of crude oil produced which is about 41% of the total world oil produced.

The implication of the above is that the 14 OPEC economies control 41% of the total world crude oil produced, which probably arrogates strong voice for OPEC in terms of oil politics and the oil economy globally. Therefore, membership of OPEC probably confers some form of advantage on an economy in terms of privileged status as an oil-producing economy. Within the literature of energy economics, some scholars have argued that countries join OPEC with the hope of an improved diplomatic advantage for international business within the global economy(Colgan, 2014). In term of the volume of crude oil reserve, Venezuela has the highest reserve of crude oil globally with about 25%, closely followed by Saudi Arabia with an approximate volume of 22%.

5.3.3 The synopsis of OPEC economies

The synopsis of the Algerian economy

Algeria is a country in the northern part of Africa, with a population of 43.4 million (IMF, 2019) and a projected real GDP growth of 2.3% for 2019. The Algerian real GDP value is $199.171 billion, constant at the 2010 US dollar in 2017 (World Bank development indicator, 2018). Oil

was discovered in commercial quantity in Algeria in 1956, but production did not start until 1958. Algeria became a member of OPEC in 1969. Daily crude oil production capacity stood at 1,040.1 million barrels per day (OPEC Statistical Bulletin, 2019). Natural gas is one of Algeria's leading export commodities with reserves of 4,504 billion cubic meters (OPEC Statistical Bulletin, 2019). Sonatrach, founded in 1963 is the Algerian state-owned oil company with about 154 subsidiaries responsible for oil and gas which regulates the production, distribution, and sales of crude oil in Algeria.

On the geographical front, Algeria is bordered by Niger and Mali on the southern part, Morocco and the Mediterranean Sea on the north, Libya on the East and Mauritania and Mali on the West. The capital of Algeria is Algier.

The Freedom House argue that Algeria is 'not free' since 1972 for its assumption that Algeria is an authoritarian state though with a President. The former President, Abdelaziz Bouteflika resigned early 2019 after 20 years in office due to ill-health and massive statewide protests about misrule. Algeria is an Upper Middle-Income economy by World Bank categorisation. The Algerian economy is dependent on petroleum rents, with over 80% of the total volume of export from the oil sector. The current Governor of OPEC for Algeria is Engineer Mohammed Hamel. The life expectancy at birth in Algeria is 76 years (World Bank Development Indicators, 2018).

The synopsis of the Angola economy

Zambia borders Angola located in South-Central Africa , Namibia on the South, the Atlantic Ocean to the west, and the Democratic Republic of Congo on the north. Angola's capital is Luanda and the largest city.

The population of Angola is 30.128 (IMF World Economic Outlook, 2019) with projected real GDP growth of 0.4% for 2019 and GDP (constant at 2010 $) of $101.673 billion in 2017 (World Bank development indicator, 2019). Apart from oil, other natural resources in Angola include Diamond, Gold, and Copper. The Angolan economy is driven primarily by crude oil production, with about 1,473 million daily crude oil production (OPEC Statistical Bulletin, 2019). The OPEC Governor for Angola is Mr Estevao Pedro. Angola started oil production in Cuanza Basin in 1955 and joined OPEC in 2007. Oil production accounts for about 50% of the GDP and more than 80% of export earnings (OPEC Statistical Bulletin, 2019). The life expectancy at birth is 60 years (World Bank Development Indicators, 2018).

Angola has had its share of autocratic rule with ex-president Jose Eduardo Dos Santos who ruled the country between 1979 and 2017. The Polity IV index of regime characteristics describe Angola as 'not free' for the pervasive authoritarian regime.

The synopsis of the Republic of Congo economy

The Republic of Congo with a population of 5.24 million (World Bank Development Indicators, 2018) is the newest member of OPEC having joined in 2018. The estimate of Crude oil production in Congo is at 323.5 thousand barrels per day (OPEC Statistical Bulletin, 2019) with proven crude oil reserves of 2,982 million barrels and 285 million proven natural gas reserves according to OPEC, 2019. The GDP (constant 2010 US dollar) of Congo is $13.765 billion and per capita GDP growth rate of -5.559 in 2017 (World Bank Development Indicators, 2019).

Oil contributes approximately 80% of the national governmental income and more than 50% to the aggregate GDP in the Republic of Congo. The Governor of OPEC for Congo is Mrs Teresa Goma. Geographically, Congo is on the western coast of Central Africa, the Democratic Republic of Congo borders it to the Southeast, Atlantic Ocean, and Gabon to the Southwest, Cameroon to the north- west and the Central Africa Republic to the northeast, with capita at Brazzaville.

The synopsis of the Ecuador economy

Ecuador is a country in South America with the capital in Quito. Peru borders it on the east and South, Colombia on the north, and the Pacific Ocean on the west. Ecuador has a population of 17.081 million people (World Bank Development Indicators, 2019) with a life expectancy at birth of 77years (World Bank Development Indicators, 2019).

The real GDP of Ecuador is (constant at 2010 US dollar) $87.381 billion in 2017 (World Bank Development Indicator, 2019) and a projected real GDP growth rate of -0.5% (IMF World Economic Outlook, 2019).

Ecuador became an OPEC member in 1973 and suspended its membership in 1992 only to re-joined in 2007. Ecuador Governor for OPEC is HE Roberto Betancourt Ruarles. Ecuador is an Upper-Middle Income country, with oil accounting for about 50% of the export's earnings.
On governance, Ecuador has experienced military rule between 1972 and 1979 and returned to democratic government in April 1979.

The synopsis of the Equatorial Guinea economy

Equatorial Guinea is a country in the Western part of Central Africa which is very close to the Gulf of Guinea and the smallest country within OPEC in terms of the population of 1.31 million (World Bank Development Indicators, 2018). The life expectancy at birth in Equatorial Guinea is 58 years as of 2017. The real GDP (constant 2010 US dollar) of Equatorial Guinea is $14.3 billions (World Bank Development indicator, 2019) and projected real GDP growth rate of -4.0 (IMF World Economic Outlook, 2019). Equatorial Guinea became a member of OPEC in 2017, and the Governor of OPEC for Equatorial Guinea is Mr Agustin Mba Okomo. Equatorial Guinea is a low-middle-income country base on the World Bank categorisation of countries by income group.

Transparency International has described Equatorial Guinea as one of the most corrupt countries, with the Polity IV project of regime characteristics (2018) describing the President, Teodoro Obiang as an authoritarian ruler. Oil rents account for a large proportion of the governmental income in Equatorial Guinea. Equatorial Guinea has had a share of military rule since the current President got to power via coup detat before his transposition into a democratic president.

The synopsis of the Gabon economy

Gabon is a country in West Africa with a population of 2.080 million (IMF World Economic Outlook, 2019) and its capital and the largest city is Libreville. Cameroun to the north, Congo to the east and south. Equatorial Guinea to the north-west, and the Gulf of Guinea to the west. Gabon became a member of OPEC in 1975, withdrew its membership in 1995, and re-joined in 2016. Gabon GDP (constant 2010 US dollar) is $19.005 billion according to World Bank Development Indicator, 2019, and a projected real GDP growth rate of 3.1% (IMF World Economic Outlook, 2019). The life expectancy at birth is 66 years.

The Governor of OPEC for Gabon is Mr Etienne Lepoukou. Gabon is an upper-middle-income country base on the World Bank categorisation of countries by income group. Gabon gained independence in 1960 from France and has had only three presidents. The current President, Ali Bongo Ondimba, succeeded his father in 2009. Oil accounts for almost 50% of Gabon's governmental income and more than 80% contributions to the export earnings. The Project IV index of regime characteristics lists Gabon among the 'not free' economies.

The synopsis of Iran economy

The Islamic Republic of Iran is a founding member of OPEC with a population of 81.80 million (World Bank Development Indicators, 2019). Turkmenistan borders Iran on the northeast, Afghanistan, and Pakistan to the east, the Persian Gulf and Oman to the south, Turkey and Iraq to the west, Armenia to the northwest and Azerbaijan to the north. The life expectancy in Iran is 76 years (World Bank Development Indicators, 2019) and a projected real GDP growth rate of -6.0% (IMF World Economic Outlook, 2019). The real GDP of Iran (constant 2010 US dollar) is $560.881 billion in 2017 (World Bank Development Indicator, 2019).

The Governor of OPEC for Iran is Mr Hossein Kazempour Ardebili. Iran is an Upper middle-income economy with oil contributing substantially to the governmental income (about 45%). Iran also has a functioning manufacturing sector which contributes to the GDP. Iran is described as an undemocratic state for poor human rights records and her governance structure which appears to be authoritarian in the literature.

The synopsis of Iraq economy

Iraq is a country in western Asia that bordered Kuwait to the east, Saudi Arabia to the south, Turkey to the north, Jordan to the southwest, and Syria to the west. The city of Baghdad is the capital. Iraq is one of the founding members of OPEC and oil production began in 'Baba dome' Iraq in 1927. The Governor of OPEC for Iraq is Mr Alaa K. Alyasri. According to the World Bank Development Indicator (2019), Iraq's population stood at 38.43 million people, and the life expectancy at birth is 70 years (World Bank development indicators, (2019). The real GDP (constant 2010 US dollar) of Iraq in 2017 was $210.467 billion (World Bank Development Indicator, 2019) and a projected real GDP growth rate of 2.8% (IMF World Economic Outlook, 2019). Iraq is an upper-middle-income country by World Bank categorisation of economies on income group. From the governance angle, Transparency International (2016) contends that the country's government is the eight most corrupt government in the world with unstable governance and institutions. Iraq economy is highly dependent on the oil rents, with about 90% contributions to the foreign exchange earnings, but political turmoil and ethnic unrest have negatively impacted the economy.

The synopsis of Kuwait economy

Kuwait is one of OPEC's founding members, and the Governor of OPEC for Kuwait is Mr Haitham Al-Ghais. Oil discovery in Kuwait in commercial quantity occurred in the Al Burqan oilfield in 1946. Kuwait located in Western Asia, and it borders Iraq and Saudi Arabia. Kuwait has a population of 4.14 million people with a life expectancy at birth of 75 years (World Bank Development Indicator, 2019). With a real GDP (constant 2010 US$) of $137.057 billion (World Bank Development Indicator, 2019), Kuwait is a High-Income country by World Bank income group categorisation. The country runs an Emirate system of government. It derives legitimate support from the constitution of the country with the Emir as the Head of state. Kuwait's human rights record lacks transparency and fairness, as Transparency International and International Labour Organization (ILO) argued.

The synopsis of Libya economy

Libya is located in North Africa. Egypt borders it to the east, Sudan to the southeast, Niger on the southwest, Algeria to the west, and the Mediterranean Sea. The capital of Libya is Tripoli. Oil was discovered in large quantities in Libya in 1959 at Amal and Zelten (now known as Nasser). Libya has the largest crude oil reserve in Africa. It joined OPEC in 1962, and the Governor of OPEC for Libya is Mr Imad A.Salem. Libya has a population of 6.68 million people and life expectancy at birth of 73 years, according to the World Bank Development Indicators (2019). The GDP (constant 2010 US dollar) of Libya in 2017 was $48.628 billion (World Bank Development indicatosr, 2019).

Oil rents are the significant source of governmental income which contributes over 90% to the export earnings. The World Bank categorised Libya as an Upper Middle-Income country. Libya has had a share of authoritarian rule in the past. To a large extent, the country remains politically unstable with ethnic unrest in many parts of the country.

The synopsis of Nigeria economy

Nigeria is a country located on the west coast of Africa. Nigeria bordered by Niger and Chad to the north, Cameroun to the East, Benin to the west, and the Atlantic Ocean on the south. With a population of 200.964 million (IMF World Economic Outlook, 2019), Nigeria is the most populous country in Africa and the 7th most populous country in the world. Nigeria, in terms of the population, is the most populous economy in OPEC. Oil was discovered in Nigeria in 1956 at

Oloibiri in the present day Bayelsa state. Nigeria joined OPEC in 1971, and the current Governor for OPEC is Dr Omar Farouk Ibrahim.

Nigeria's real GDP (constant 2010 US dollar) is $460.457 billion (World Bank Development Indicator, 2019). According to the World Bank Development Indicators (2019), life expectancy at birth of Nigeria is 54 years. The Nigerian economy is the largest in Africa in terms of the re-based GDP figure. Oil rent is the dominant source of governmental income accounting for over 80% of the foreign exchange earnings and national income. Nigeria is categorised as a low middle-income country base on World Bank metrics of the country by income group. The Nigerian economy has experienced a military form of governance in the past. The democratic government returned to Nigeria in 1999.

The synopsis of Saudi Arabia economy

Saudi Arabia with a population of 33.70 million people (World Bank Development Indicators,2018) is located in west Asia and bordered by Kuwait to the north, the United Arab Emirates, Qatar and Bahrain to the east, Jordan and Iraq to the north, Oman to the southeast and Yemen to the south. Oil was discovered in Saudi Arabia in the Dammam oil field in the year 1938. The Governor of OPEC for Saudi Arabia is Engineer Adeeb Al-Aama.

Saudi Arabia's real GDP (constant 2010 US dollar) in 2017 was $684.952 billion (World Bank Development indicator, 2019). At birth, life expectancy is 75 years (World Bank Development indicators, 2019) and a projected real GDP growth rate of 1.9% (IMF World Economic Outlook, 2019).

Saudi Arabia is the 'swing producer' among OPEC members primarily in terms of crude oil volume produced in a million barrels per day. Saudi Arabia has the second-largest oil reserve in the world. Oil rents account for over 65% of the governmental income and foreign exchange earnings in Saudi Arabia. The country runs a constitutional monarchy system of government with the King as the Head of government. The human rights records of the country are not free from anomalies as argued by Human rights watch and Transparency International in the past. Saudi Arabia is a High-income economy by the World Bank metrics of countries by income grouping. Other notable natural resources in Saudi Arabia include gold, iron ore, copper and natural gas.

The synopsis of the United Arab Emirates economy

The United Arab Emirates (otherwise known as UAE) is a country in West Asia that bordered Iran to the north and Qatar to the west with 9.63 million people (World Bank Development Indicators, 2018). The country consists of seven emirates of Abu Dhabi, Ajman Dubai, Fujairah, Ras Al Khaimah, Sharjah, and Umm Al Quwain. The discovery of oil in commercial quantity was in 1958, and the country joined OPEC in 1967. The Governor of OPEC for UAE is Engineer Ahmed Mohammed Alkaabi.

With a projected real GDP growth of 2.8% (IMF World Economic Outlook, 2019), the real GDP (constant 2010 US dollar) of UAE in 2017 was $387.259 billion (World Bank Development Indicators, 2019). According to the World Bank Development Indicators, the life expectancy at birth in UAE was 78 years in 2018. Oil rents are the significant source of governmental income and for- foreign exchange earnings in UAE. The UAE runs constitutional monarchy. Human rights records have defects as argued by human rights watch concerning lack of transparency and weak governance in the past. By the World Bank metrics of the country by income group, UAE is a High-income country.

The synopsis of Venezuela economy

Venezuela is a country in South America bordered on the east coast by Guyana and on the west by Colombia, Brazil to the south, and Trinidad and Tobago to the north-east. Venezuela discovered oil in 1914, and it is one of the founding members of OPEC. With a population of 28.87 million people (World Bank Development Indicators, 2019). The life expectancy at birth is 72 years (World Bank Development Indicators, 2019). Oil production began in Venezuela in 1914.

The projected real GDP growth of Venezuela is -25.0 (IMF World Economic Outlook, 2019). The Governor of OPEC for Venezuela is Engineer Angel Gonzalez Saltron. Whilst the country is heavily dependent on the oil rents as a source of governmental income and foreign exchange earnings, the political turmoil and misgovernance have led to severe socio-economic unrest in the country. Venezuela, according to the World Bank metrics of countries by income group is High-income country.

5.3.4 Background information on qualities of institutions and the source variables

The thesis uses six categories of qualities of institutional variables which come under three main headings of qualities of institutions. Table 5.1 below shows the six categories and the three main types of institutions:

Table 5.1: List of all the qualities of institution variables in the Thesis

Table 5.1: List of all the Qualities of Institution Variables in the Thesis			
Main Qualities of Institution	Sub-Categories of Institutional Qualities	Notations	Chapters in the Thesis
Political Institutions	The Democratic Quality of Institution	DEM	Chapters 2,3 and 4
	The Political Right Quality	POI	Chapters 2 and 4
	The Effectiveness of Government Quality	GEFI	Chapter 3
Economic Institution	The Budgetary Quality Institution	BGT	Chapter 2
Regulatory Institution	The Legal Institution	LEGI	Chapter 3
	The Anti-corruption Institution	ACOI	Chapter 3
Source: Author's construction.			

As indicated in Table 5.1, we construct three dimensions of qualities of political institutions: the quality of democratic institution (DEM), the quality of the political right of the population (POI), and the effectiveness of government quality (GEFI). Under the economic institution, we create the budgetary institution's quality (BGT), which we use only in chapter 2. There are two segments of the thesis's regulatory institution: the quality of the legal institution (LEGI) and anti-corruption institution quality (ACOI). We proceed below to present the various background information about institutional qualities' sub-categories and their corresponding source information.

Background Information on Democratic Institution Quality (DEM) and Effectiveness of Government Quality (GEFI) : Polity IV Index of Regime Characteristics (2019)

The Polity IV[1], index of regime characteristics is one of the famous measurements of political institutions by researchers. The measurement indicators consist of an annual, cross-country, and time series construction and coding of variants of the government system, which differentiate between a democratic system of government and autocratic rule. The latest Polity IV dataset span from 1800 to 2018. It entails 'system of authority' in about 167 autonomous countries with definite international boundaries and an average of 500,000 population or more. Although Ted Robert

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[1]More information on Polity IV data available at http: www.systemicpeace.org/2019

Gurr conceived the initial idea and formulation of the Polity 1 data, the latest Polity IV regime characteristics dataset is being directed by Monty G. Mashall and Keith Jagger at the Centre for Systemic Peace in the US.

Given the pivotal role of institutions' qualities in this thesis, the Polity IV index of regime characteristics is crucial for our study because it covers all our study period (1967-2017). Importantly, it measures and determines the features of various forms of qualities of political institutions (democratic to autocratic) instead of an emphasis on a single form of governance. In chapter 2, for instance, the Nigerian state experienced variants form of government between 1967 and 2017, from military dictatorship to pseudo-democratic (interim national government) and to the democratic institution. For chapter 3, the OPEC economies have government variants: absolute monarchy, dictatorship, democracy and others. Given the dichotomy in the government system, there is a need to utilise the quality of the political institution that considers all the differences in government structure among various countries in our sample. That is the crucial advantage of the Polity IV index of regime characteristics as used in this thesis.

Polity IV index (2018) *'takes into consideration a spectrum of governing authority that spans from fully institutionalised autocracies through mixed, or incoherent, authority regimes (called 'anocracies') to fully institutionalised democracies'*. There are six dimensions of institutionalised democracy measurements by the Polity IV index. The six dimensions include Regulation of Chief Executive Recruitment, Competitiveness of Executive Recruitment, Openness of Executive Recruitment, Executive Constraints, Regulation of Political Participation, and Participation. Specifically, the Polity IV index mechanism focuses on the political executive recruitment and the barriers to becoming an executive authority, which is like a check and balance on the authority and promotion of competition among political office seekers. The Polity IV utilises the aggregates of six democracy dimensions to derive the institutionalised qualities of DEMOC, meaning institutionalised democracy and AUTOC, implying institutionalised autocracy. Polity IV regime characteristics' institutionalised scale ranges from a lower bound of -10 (autocratic regime) to a higher bound of +10 (a robust democracy).

According to Polity IV index (2018),*'a mature and internally coherent democracy, for example, might be operationally defined as one in which (a) political participation is unrestricted, open, and fully competitive; (b) executive recruitment is elective, and (c) constraints on the chief executive are substantial'*. In this regard, the Polity IV index of institutionalised democracy is widely use by the researchers to represent democracy and compare it with other forms of government like an autocratic regime.

In Chapters 2 to 4, one of the sub-categories of political institution is the democratic institution denoted as DEM. We utilise the Polity IV index of regime characteristics as explained above with the upper bound of +10 which measures a fully democratic state, 6 to 9 represents democracy,1 to 5 is for Open Anocracy. In open anocracy, democratic elections occur, but such elections are not free, and some rights are denied for the population. 0 to -5 represents Closed Anocracy. Closed anocracy is a mixture of some features of democracy and part of dictatorship or autocratic rule. -6 to -10 denotes autocracy; it implies government in which single person, the autocrat has supreme and absolute power. As an illustration, Table 5.2 below shows the Polity IV indicators of regime characteristics for all the 14 OPEC economies as of 2017. Chapter 2 uses the Polity IV regime index with numerical values for institutionalised democracy to construct a line chart of the democratic institution (DEM) for Nigeria with Figure 2.4 on page 31. The time series institutionalised DEM illustrates various dynamics in the government system in Nigeria between 1967 and 2017. It measures democratic institution in a range of Polity IV scale of -10 (autocratic regime) to +10 (a robust democracy), being the first attempt to do that in the literature for the Nigerian economy with time-series data (to the best of our knowledge). For the OPEC economies in chapter 3, we use the Polity IV's institutionalised DEM indicators for all the 14 OPEC economies as of 2017. We construct a time-series chart using the Eviews 10 SV for each of the 14 OPEC economies' regime characteristics. The Figure 3.1 on page 79 shows democratic institutions' trends in all the OPEC economies from an autocratic regime to a fully democratic state.

To determine the effectiveness of government quality in OPEC, we use another institutionalised variable from Polity IV called *EXREC. EXREC* is a quantitative measure of executive recruitment and technique of selecting public authorities in various countries, according to Polity IV. The scale ranges from 0 as the lower bound (meaning a state with no robust process for selecting executive) to 10 (the state with vital institution for the selection of public executives). In our view, the effectiveness of public and elected representative is partly correlated with the technique of choice. Therefore, we use the *EXREC* variable to proxy the institutionalised effectiveness of government institution (GEFI) in OPEC economies within chapter 3.

Table 5.2 indicates all the OPEC economies' regime characteristics, which we use to draw the specific time series institutionalised democracy chart for the 14 OPEC economies in chapter 3. Chapter 4 uses DEM, the institutionalised democracy index from Polity IV as one of the two political institutions variable.

Table 5.2:   Institutionalised democracy index for OPEC Economics: 1967-2017

Table 5.2:			Institutionalised Democracy Index -Polity IV Regime Characteristics for OPEC Economies (1967- 2017)											
Year	Algeria	Angola	Congo	Ecuador	E.Guinea	Gabon	Iran	Iraq	Kuwait	Libya	Nigeria	Venezuela	Saudi Arabia	UAE
1967	-9	-7	-7	-1	0	-7	-10	-5	-9	-7	-9	6	-10	-8
1968	-9	-7	-7	-1	0	-7	-10	-5	-9	-7	-9	6	-10	-8
1969	-9	-7	-7	-1	2	-7	-10	-7	-9	-7	-9	6	-10	-8
1970	-9	-7	-7	5	-7	-9	-10	-7	-9	-7	-9	6	-10	-8
1971	-9	-7	-7	0	-7	-9	-10	-7	-9	-7	-9	9	-10	-8
1972	-9	-7	-7	0	-7	-9	-10	-7	-7	-7	-9	9	-10	-8
1973	-9	-7	-7	-5	-7	-9	-10	-7	-7	-7	-9	9	-10	-8
1974	-9	-7	-7	-5	-7	-9	-10	-7	-7	-7	-9	9	-10	-8
1975	-9	-7	-7	-5	-7	-9	-10	-7	-7	-7	-9	9	-10	-8
1976	-9	-7	-7	-5	-7	-9	-10	-7	-7	-7	-9	9	-10	-8
1977	-9	-7	-7	-5	-7	-9	-10	-7	-10	-7	-9	9	-10	-8
1978	-9	-7	-7	-5	-7	-9	-10	-7	-10	-7	-9	9	-10	-8
1979	-9	-7	-7	-5	-7	-9	-10	-7	-10	-7	2	9	-10	-8
1980	-9	-7	-8	-5	-9	-9	-10	-9	-10	-7	7	9	-10	-8
1981	-9	-7	-8	9	-7	-9	-9	-9	-10	-7	7	9	-10	-8
1982	-9	-7	-8	9	-7	-9	-9	-9	-8	-7	7	9	-10	-8
1983	-9	-7	-8	9	-7	-9	-6	-9	-8	-7	7	9	-10	-8
1984	-9	-7	-8	9	-7	-9	-6	-9	-8	-7	7	9	-10	-8
1985	-9	-7	-8	9	-7	-9	-6	-9	-8	-7	-7	9	-10	-8
1986	-9	-7	-8	9	-7	-9	-6	-9	-8	-7	-7	9	-10	-8
1987	-9	-7	-8	8	-7	-9	-6	-9	-10	-7	-7	9	-10	-8
1988	-9	-7	-8	8	-7	-9	-6	-9	-10	-7	-7	9	-10	-8
1989	-9	-7	-8	8	-7	-9	-6	-9	-10	-7	-7	9	-10	-8
1990	-2	-7	-8	9	-7	-9	-6	-9	-10	-7	-5	9	-10	-8
1991	-2	-7	-4	9	-7	-6	-6	-9	-9	-7	-5	9	-10	-8
1992	-2	-7	5	9	-7	-4	-6	-9	-7	-7	-5	8	-10	-8
1993	-7	-7	5	9	-7	-4	-6	-9	-7	-7	-7	8	-10	-8
1994	-7	-7	5	9	-5	-4	-6	-9	-7	-7	-7	8	-10	-8
1995	-7	-7	5	9	-5	-4	-6	-9	-7	-7	-6	8	-10	-8
1996	-6	-6	5	9	-5	-4	-6	-9	-7	-7	-6	8	-10	-8
1997	-3	-6	5	9	-5	-4	-6	-9	-7	-7	-6	8	-10	-8
1998	-3	-3	-6	9	-5	-4	-6	-9	-7	-7	-6	8	-10	-8
1999	-3	-3	-6	9	-5	-4	3	-9	-7	-7	4	8	-10	-8
2000	-3	-3	-6	8	-5	-4	3	-9	-7	-7	4	8	-10	-8
2001	-3	-3	-6	9	-5	-4	3	-9	-7	-7	4	8	-10	-8
2002	-3	-3	-6	6	-5	-4	3	-9	-7	-7	4	6	-10	-8
2003	-3	-3	-5	6	-5	-4	3	-9	-7	-7	4	6	-10	-8
2004	-3	-3	-4	6	-5	-4	3	-9	-7	-7	4	6	-10	-8
2005	-3	-2	-4	6	-5	-4	-6	-8	-7	-7	4	6	-10	-8
2006	-2	-2	-4	6	-5	-4	-6	-6	-7	-7	4	5	-10	-8
2007	2	-2	-4	6	-5	-4	-6	-2	-7	-7	4	5	-10	-8
2008	2	-2	-4	7	-5	-4	-6	0	-7	-7	4	5	-10	-8
2009	2	-2	-4	5	-5	-4	-6	2	-7	-7	4	5	-10	-8
2010	2	-2	-4	5	-5	-4	-7	4	-7	-7	4	-3	-10	-8
2011	2	-2	-4	5	-5	3	-7	4	-7	-7	4	-3	-10	-8
2012	2	-2	-4	5	-5	3	-7	4	-7	-6	4	-3	-10	-8
2013	2	-2	-4	5	-5	3	-7	4	-7	-6	4	-3	-10	-8
2014	2	-2	-4	5	-5	3	-7	4	-7	-2	4	-3	-10	-8
2015	2	-2	-4	5	-5	3	-7	4	-7	0	4	4	-10	-8
2016	2	-2	-4	5	-5	3	-7	4	-7	0	4	4	-10	-8
2017	2	-2	-4	5	-5	3	-7	4	-7	0	4	4	-10	-8
Source: Polity IV Index Political Regime Characteristics, Centre for Systemic Peace (2019).														

Interpretations: Scale Ranges from -10 as the lower bound to +10, the higher bound.

+10 (Fully democratic institution or state).

6 to 9 (Elements of democracy).

1 to 5 (Open Anocracy)- Democratic elections are not free with denial of some electoral right.

0 to -5 (Closed Anocracy)- Mixture of features of democracy and part of dictatorship

-6 to -10 (Autocracy)- Absolute power of government in a single hand with supreme or absolute power.

Background information on political right institution quality (POI): The Quality of Government Institute[QOG] (2019)

In chapters 2 and 4, we use another form of political institution quality called the population's political right quality (POI). According to QOG (2018) , *'Political rights enable people to participate freely in the political process, including the right to vote freely for distinct alternatives in legitimate elections, compete for public office, join political parties and organisations, and elect representatives who have a decisive impact on public policies and are accountable to the electorate'*. Every political institution requires a participatory political system that promotes the population's rights to freely choose an elective representative(s) and perhaps contest for an elective position(s). The dynamics between the developed democracies and an autocratic state probably relates to the level of the political right of the population in the electoral process and governance.

Amongst the well-established sources of the political right institution is the Quality of Government Institute at the University of Gothenburg. The institute was established by Professor Bo Rothstein and Professor Sören Holmberg in 2004 as an independent research institute within the political science department of University of Gothenburg. According to QOG [2] (2018), *'the institute researches the causes, consequences and nature of Good Governance and the Quality of Government (QoG) - that is, trustworthy, reliable, impartial, uncorrupted, and competent government institutions. The institute promotes the measurement and quantification of high-quality political institution variables using several techniques, especially various theoretical and methodological perspectives'*. The Quality of Government Institute conducts theoretical and empirical research on political institutions and studies the impact of government quality on several key priority areas of the economy. In about 19 segments within diverse categories of government quality, the QOG utilises variables: the quality of government, political system, political parties and election, Judiciary, Conflict and military service. The Quality of Government dataset is derived from over 100 related quality of government indicators that began in 1960 and covered over 100 countries. By implication, the quality of government adequately takes care of our scope of coverage for chapters 2 and 4.

The scale of a political right institution by the Quality of Government Institute ranges from 1 (which implies free state) to 7 (which denotes least free state). In chapters 2 and 4, we utilise the political right of the population (POI) as one of the qualities of political institutions. In the context of the Nigerian economy, our approach of utilising the political right scores from the Quality of Government Institute is the first attempt to assess the significance of political right of the

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[2]More information on Quality of Government Institute is available on The Quality of Government Institute, http://www.qog.pol.gu.se doi:10.18157/qogstdjan20

population as co-determinants of economic growth with oil rents. Figure 2.5 on page 33 of chapter 2 shows the phases of the quality of the Nigerian population's political right from 1967 to 2017. We use the indices created by the QOG which ranges from 1, meaning a very free State and to 7, which is the least free state to construct the time series chart in Figure 2.5.

Background information on the quality of legal (LEGI) and quality of anti-corruption (ACOI) : The Political Constraints Index (POLCON)

The third chapter uses two regulatory institutions variables: the quality of the legal institution (LEGI) and anti-corruption institution quality (ACOI). We derive the two qualities of institutions: LEGI and ACOI from dataset sourced from the Political Constraints Index (POLCON)-2019.

Professor Witold J Henisz (2000) developed the political constraint index (POLCON), which represents a quantitative method of measuring political institutions and the governance styles around the world. The latest POLCON dataset span 1800 to 2018, an annual, time series and cross-country data patterned after the Polity IV index of regime characteristics and institutionalised democracy measurement. By implication, the POLCON dataset share similarities with the Polity IV index of regime characteristics.

To develop the quality of legal institution (LEGI) in OPEC economies in chapter 3, we interact two of the POLCON variables to create a composite institutionalised proxy variable called the quality of legal institution in OPEC economies. Using Algeria's economy as an example among the OPEC economies, Table 5.3 below shows the source variable and how we create the composite variable called LEGI.The two interacted variables are *'ALIGN12'* and *'LAWORDERFROMCRG'*. The individual scale for each variable ranges from 0 as the lower bound to 1 as the higher bound. For ALIGN12, a numerical value of 1 is assigned to a country in which the executive branch of government constitutes the majority party in the national assembly; otherwise, a score of 0 is assigned.

Under the scale of *'LAWORDERFROMCRG'*, countries with strong law and order will be assigned a numerical value of 10, whereas a state with a low level of law and order is assigned 0. To equalise the scaling system of the *'LAWORDERFROMCRG'* with the *ALIGN12*; we divide the numerical value by 10 which results into a scale of 1 as the higher bound and 0 as the lower bound. Chapter 3 multiply the numerical values of the two institutionalised variables from POLCON, *'ALIGN12'* and *'LAWORDERFROMCRG'* to form a composite variable.

To measure the quality of anti-corruption institution (ACOI) in OPEC in chapter 3, we use one

Table 5.3: Composite quality of legal institution for Algeria as an illustration for OPEC economies

Table 5.3 : Construction of Composite Quality of Legal Institution for Algeria Economy as an illustration for the OPEC economies.			
Year	Source Data for ALIGN12	Source Data for LAWORDERCRG	Composite Variable (LEGI)
1967	0	0	0
1968	0	0	0
1969	0	0	0
1970	0	0	0
1971	0	0	0
1972	0	0	0
1973	0	0	0
1974	0	0	0
1975	0	0	0
1976	0	0	0
1977	0	0	0
1978	0	0	0
1979	0	0	0
1980	0	0	0
1981	0	0	0
1982	0	0	0
1983	0	0	0
1984	0	0.2	0
1985	0	0.2	0
1986	0	0.2	0
1987	0	0.2	0
1988	0	0.2	0
1989	0	0.2	0
1990	0	0.2	0
1991	0	0.1	0
1992	0	0.1	0
1993	0	0.2	0
1994	0	0.3	0
1995	0	0.3	0
1996	0	0.3	0
1997	0	0.3	0
1998	1	0.2	0.2
1999	1	0.2	0.2
2000	1	0.2	0.2
2001	1	0.2	0.2
2002	1	0.2	0.2
2003	1	0.2	0.2
2004	1	0.2	0.2
2005	1	0.3	0.3
2006	1	0.3	0.3
2007	1	0.3	0.3
2008	1	0.3	0.3
2009	1	0.3	0.3
2010	1	0.3	0.3
2011	1	0.2	0.2
2012	1	0.2	0.2
2013	1	0.2	0.2
2014	1	0.2	0.2
2015	1	0.2	0.2
2016	1	0.2	0.2
2017	1	0.2	0.2

*Quality of legal Institution is a composite variable from the interaction of two variables: 'ALIGN12' and 'LAWORDERCRG' from POLCON (2018). The scale for 'ALIGN12' ranges from 0 as the lower bound to 1 as the higher bound. The scale for 'LAWORDERCRG' is from 0 to 10, we divide the scale by 10 to equalise it with the scale of 'ALIGN12', therefore the scale takes a value of 0 as the lower bound and 1 as the higher bound. By multiplying the two variables, we derive our composite institutionalised quality of legal institution called LEGI for the OPEC economies. The lower bound is 0 for economies with poor quality of legal institution and 1 for countries in OPEC with strong quality of legal institution.

Source: Author's Computation.

of the institutionalised executive constraints variables from the POLCON (2018) called *'XCONST'*. The variable *'XCONST'* is a quantitative institutionalised measurement of the constraints on the executive power of political office holders which seek to advance accountability and integrity in government. The aim of *'XCONST'* according to POLCON (2018) is to instil discipline into the executive arm of government by curtailing the executive's excesses to prevent the abuse of public trust and promote check and balance in government. The scale of *'XCONST'* ranges from 1 as the lower bound (unlimited authority of the executive which promotes abuse of office) to the higher bound of 7 (an accountable government with checks and balance). In Chapter 3, we use *'XCONST'* to proxy the quality of anti-corruption institutions in OPEC economies. Corruption is probably more prevalent among government executives, especially in oil-producing countries like OPEC. Given this, political constraints on the executive power as utilise in the chapter with the POLCON dataset, *'XCONST'* is justified.

Background information on quality of budgetary institution (BGT)

The World Bank assesses the quality of budgetary and financial management with an indicator of 1 as the low or weak quality of sound economic management in a country and 6 as the higher bound, denoting the highest quality of economic management. Chapter 2 uses the quality of budgetary and financial management scores of Nigeria from the World Bank to proxy the quality of budgetary institution for Nigeria (BGT). Figure 2.6 on page 34 of chapter 2 illustrates the phases of the budgetary institution quality in Nigeria.

Table 5.4: Summary of qualities of institution variables, conceptual definition and source.

Table 5.4 : Summary of Qualities of Institution Variable, Conceptual definition and Source				
S/NO	Variable name	Notation	Conceptual definition	Sources
1	Democratic Institution Quality	DEM	Democratic institution is a measure of the quality of responsiveness of government to the people. Democratic institution also measures the extent of peaceful change or transfer of power in a democratic state but violently in a nondemocratic state or an autocratic regime. We use the Polity IV Index of regime characteristics which differentiate between the democratic and autocratic government to measure the quality of democratic institution. The scale is from a lower bound of -10 to higher bound of +10.	Polity IV Index Project of Regime characteristics by Marshall and Jaggers (2019). Available at INSCR Data Page (systemicpeace.org)
2	Political Right Institution Quality	POI	Political right implies the freedom through franchise and the right of the population to partake in the electoral process, contest for elective positions and partake in governance within the state. It is measured within the lower bound of a score of 1 which represents strong governance and 7 which implies a weak governance.	The Quality of Government Institute, Teorell et al (2019)
3	Quality of Budgetary Institution	BGT	The budgetary institution is an assessment by the World Bank on the policy priorities of the government, effective management systems and accurate financial/accounting reporting with 1 as lower bound and 6 as the higher bound. We used it to analyse budgetary system of the Nigerian state as measurement of an economic institution in Nigeria	The World Bank Development Indicators, (2019).
4	Government Effectiveness Quality	GEFI	It measures the technique which the states adopt in the selection or election of the people in the executive arm of government. It is an assessment of the ability of government to carry out its stated policy programs and the tendency to remain in office based on criteria like unity of government of the executive arm with the legislative arm of the government.	Polity IV Index Project of Regime characteristics by Marshall and Jaggers (2019). Available at INSCR Data Page (systemicpeace.org)
5	Legal Institution Quality	LEGI	The extent of the rule of law, protection of property right, human right and accountability prevailing in the state. It determines equality of the population before the law and constitutionalism.	Centre for systemic Peace (2019) and POLCON dataset (2017), available at: The Political Constraint Index (POLCON) Dataset - Management Department (upenn.edu)
6	Anti-Corruption Institution Quality	ACOI	An institutionalised constraint on the decision power of the executives in government with a view to promote accountability. Anti-corruption is the technique to prevent the abuse of public or private trust in the system by making sure that people in position of authority especially in public office leave to certain laid down criteria and expectation.	Centre for systemic Peace (2019) and POLCON dataset (2017), available at: The Political Constraint Index (POLCON) Dataset - Management Department (upenn.edu)
Source: Author's Computation.				

5.3.5 Diagnostic Tests for our Preliminary estimation output with OLS for Chapter 2

In Table 5.5, we re-present the output of our preliminary or an initial estimation with the application of an ordinary least square approach (OLS) earlier shown in column 1 of Table 2.7 , page 63. To determine the robustness of our preliminary OLS estimator, we perform specific diagnostic tests and there corresponding output are shown in the Table 5.5. In our discussion of the various diagnostic tests for our OLS estimator (preliminary estimator) below, we re-present the point estimates in Table 5.5 to aid visual analysis.

Table 5.5: Preliminary estimation output with Ordinary Least Squares [OLS]
Dependent Variable : Real GDP per capita growth rate [GRO]

VARIABLES (Unit Of Measurement) [NOTATION]	(1) OLS Model
Oil Rents as a Percentage of GDP(Percentage)[REN]	0.555***
	(0.154)
Oil Rents as a Percentage of GDP(Percentage)[REN](-1)	-0.176
	(0.163)
Democratic Institution Quality (Numerical Value)[DEM]	0.246
	(0.362)
Political Rights Institution Quality (Numerical Value)[POI]	1.864
	(1.324)
Budgetary Institution Quality (Numerical Value)[BGT]	3.401
	(7.225)
Diversification Proxy by Agriculture Exports (Numerical Value) [ADV]	0.520
	(0.497)
Official Real Exchange Rate (US Dollar)[EXR]	0.0297
	(0.0264)
Gross Savings as a Percentage of GDP (Percentage)[VGS]	-0.158
	(0.107)
Health of the Population (Numerical Value)[HEA]	0.199
	(0.165)
Real GDP Per Capita Growth (Annual Percentage)[GRO](-1)	0.157
	(0.176)
Constant	-40.08
	(33.16)
Observations	34
R-squared	0.528
Jarque-Bera Normality Test	0.264
Heteroskedasticity Test- Pagan	0.418
Ramsey RESET Test	0.375
Breusch-Godfrey LM Test	0.574

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Diagnostic tests are in probability values .

Therefore, we proceed below to briefly discuss the specific diagnostic tests above, which are:

Jarque-Bera normality test, Heteroskedasticity test, Ramsey RESET test and Breusch-Godfrey LM test of serial autocorrelation.

Jarque-Bera normality test

To determine the normal distribution of our variables, we perform a formal normality test called the Jarque Bera normality test. The null hypothesis is the existence of a normal distribution of variables of interest, while the alternative hypothesis is that our variables are not distributed normally at 5% critical value. From our probability value for the normality test for OLS regression in column 1 of Table 5.5, we have 0.264. This suggests we cannot reject the null hypothesis in the regression equation, implying a normal distribution of our variables, which is good for our model development.

Heteroskedasticity test : Breusch-Pagan

The next diagnostic test that we perform is the heteroskedasticity test (non-constant variance). With the Breusch-Pagan test, the null hypothesis is the existence of homoskedasticity or constant variance, while the alternative hypothesis is the heteroskedasticity, or non-constant variance. The P value is 0.418 in column 1 of Table 5.5; as such, we cannot reject the null hypothesis. It indicates that our OLS model does not suffer from heteroskedasticity which confirm that our model meets a homoskedasticity assumption.

Ramsey RESET test

The Ramsey RESET test is the recommended test procedure to ascertain the existence of an omitted variable bias or misspecification error in our OLS model. The null hypothesis indicating that our model has no omitted variable, whilst the alternative hypothesis indicates the presence of an omitted variable or misspecification error at 5% level of significance. Our Ramsey RESET test probability value is 0.375 in column 1 of Table 5.5. Therefore, we cannot reject the null hypothesis, and we conclude that our OLS model is correctly specified with no omitted variable.

Breusch-Godfrey LM test of higher-order autocorrelation

We use the Breusch-Godfrey LM Test of higher-order autocorrelation to determine the existence of serial autocorrelation in our model. The null hypothesis is that there is no serial autocorrelation in our model, while the alternative hypothesis says that there is. Our probability value in column 1 of table 5.5 is 0.574. We cannot reject the null hypothesis , so we conclude that our model does not suffer from autocorrelation.

Table 5.6:   Spot prices of crude oil : 1967-2017

Table 5.8 : Spot Crude Oil Prices in US Dollar : 1967-2017			
YEAR	Dubai $/bbi	Brent $/bbi	Nigeria Forcados $/bbi	Western Texas $/bbi
1967	1.8	1.8	1.8	1.8
1968	1.8	1.8	1.8	1.8
1969	1.8	1.8	1.8	1.8
1970	1.8	1.8	1.8	1.8
1971	2.24	2.24	2.24	2.24
1972	1.9	2.48	2.48	2.48
1973	2.83	3.29	3.29	3.39
1974	10.41	11.58	11.58	11.58
1975	10.7	11.53	11.53	11.53
1976	11.63	12.8	12.87	12.23
1977	12.38	13.92	14.21	14.22
1978	13.03	14.02	13.65	14.55
1979	29.75	31.61	29.25	25.08
1980	35.69	36.83	36.98	37.96
1981	34.32	35.93	36.18	36.08
1982	31.8	32.97	33.29	33.65
1983	28.78	29.55	29.54	30.3
1984	28.06	28.78	28.14	29.39
1985	27.53	27.56	27.75	27.98
1986	13.1	14.43	14.46	15.1
1987	16.95	18.44	18.39	19.18
1988	13.27	14.92	15	15.97
1989	15.62	18.23	18.3	19.68
1990	20.45	23.73	23.85	24.5
1991	16.63	20	20.11	21.54
1992	17.17	19.32	19.61	20.57
1993	14.93	16.97	17.41	18.45
1994	14.74	15.82	16.25	17.21
1995	16.1	17.02	17.26	18.42
1996	18.52	20.67	21.16	22.16
1997	18.23	19.09	19.33	20.61
1998	12.21	12.72	12.62	14.39
1999	17.25	17.97	18	19.31
2000	26.2	28.5	28.42	30.37
2001	22.81	24.44	24.23	25.93
2002	23.74	25.02	25.04	26.16
2003	26.78	28.83	28.66	31.07
2004	33.64	38.27	38.13	41.49
2005	49.5	54.52	55.69	56.59
2006	61.5	65.14	67.07	66.02
2007	68.19	72.39	74.48	72.2
2008	94.34	97.26	101.43	100.06
2009	61.39	61.67	63.35	61.92
2010	78.06	79.5	81.05	79.45
2011	106.18	111.26	113.65	95.04
2012	109.08	111.67	114.21	94.13
2013	105.47	108.66	111.95	97.99
2014	97.07	98.95	101.35	93.28
2015	51.2	52.39	54.41	48.71
2016	41.19	43.73	44.54	43.34
2017	53.13	54.19	54.31	50.79
Source: BP Statistical Bulletin (2019)			

Table 5.7: OPEC volume of crude oil produced in million barrel : 1967-2017

Table 5.9 : OPEC Economies Volume of Crude Oil Produced in Million Barrel : 1967-2017							
YEAR	ALGERIA	ANGOLA	CONGO	ECUADOR	E.GUINEA	GABON	IRAN
1967	825.7	11	1	6	n/a	69	2603.2
1968	933	15	1	5	n/a	91.9	2839.8
1969	977	50	0	4	n/a	98.8	3375.8
1970	1052	103	0	4	n/a	108.8	3848
1971	809	116	0	4	n/a	114.6	4572
1972	1089	143	6	78	n/a	125.2	5059
1973	1111	166	41	209	n/a	150.2	5907
1974	1036	173	48	177	n/a	201.5	6060
1975	1003	158	35	161	n/a	223	5387
1976	1109	153	41	188	n/a	222.8	5918
1977	1188	143	32	184	n/a	222	5714
1978	1270	131	47	204	n/a	208.7	5302
1979	1271	146	54	216	n/a	203.4	3218
1980	1139	150	61	206	n/a	174.5	1479
1981	1049	145	80	213	n/a	151.4	1321
1982	1065	130	88	213	n/a	155.1	2397
1983	1047	178	104	240	n/a	155.4	2454
1984	1137	204	117	261	n/a	157.4	2043
1985	1151	232	115	286	n/a	171.7	2205
1986	1198	283	123	298	n/a	164.7	2054
1987	1231	355	136	176	n/a	154.5	2342
1988	1254	452	154	309	n/a	157	2349
1989	1280	460	156	286	n/a	204.3	2894
1990	1347	475	156	292	n/a	270	3270
1991	1351	498	156	307	n/a	295	3500
1992	1323	550	167	328	2	289	3523
1993	1329	504	185	353	5	305	3712
1994	1324	557	185	388	5	337	3730
1995	1327	633	180	395	7	356	3744
1996	1386	716	200	393	17	365	3759
1997	1421	741	225	397	60	364	3776
1998	1461	731	264	385	83	337	3855
1999	1515	745	266	383	100	340	3603
2000	1549	746	265	403	118	276	3852
2001	1534	742	248	410	194	262	3825
2002	1653	905	238	394	230	256	3618
2003	1826	870	217	420	266	274	4085
2004	1921	1106	225	528	351	273	4217
2005	1990	1269	247	534	380	270	4218
2006	1979	1401	278	538	364	242	4293
2007	1992	1656	224	513	374	246	4359
2008	1969	1876	237	507	369	240	4421
2009	1775	1754	276	488	332	241	4292
2010	1689	1812	314	488	306	249	4430
2011	1642	1670	301	501	301	246	4472
2012	1537	1734	281	505	320	242	3820
2013	1485	1748	250	527	282	226	3617
2014	1589	1668	264	557	284	226	3724
2015	1558	1772	247	543	260	225	3862
2016	1577	1755	250	548	223	220	4602
2017	1540	1674	291	531	199	200	4982
Source: BP Statistical Bulletin (2019)							

Table 5.8:   OPEC volume of crude oil produced in million barrel : 1967-2017

Table 5.10 : OPEC Economies Volume of Crude Oil Produced in Million Barrel : 1967-2017					
YEAR	IRAQ	KUWAIT	LIBYA	NIGERIA	SAUDI ARABIA	U.A. E
1967	1228.1	2522	1733	319.1	2825	382.1
1968	1503.3	2656	2599	141.3	3081	496.6
1969	1521.2	2819	3109.1	540.3	3262	627.8
1970	1548.6	3036	3357	1083.1	3851	779.6
1971	1694.1	3253	2750	1531.2	4821	1059.5
1972	1465.5	3339	2248	1815.7	6070	1202.7
1973	2018.1	3080	2211	2054.3	7693	1532.6
1974	1977	2603	1558	2255	8618	1678.6
1975	2271	2132	1514	1783.2	7216	1663.8
1976	2422	2199	1972	2067	8762	1936.4
1977	2358	2024	2108	2085.1	9419	1998.7
1978	2574	2182	2023	1897	8554	1830.5
1979	3489	2623	2139	2302	9841	1830.7
1980	2658	1757	1862	2058	10270	1735
1981	907	1187	1253	1439.6	10256	1540
1982	988	862	1176	1287	6961	1362
1983	1106	1117	1151	1235.5	4951	1293
1984	1228	1229	1022	1388	4534	1246
1985	1425	1127	1025	1498.9	3601	1211
1986	1899	1210	1064	1466.6	5208	1413
1987	2391	1072	1003	1323	4599	1471
1988	2782	1286	1051	1391	5720	1514
1989	2838	1408	1164	1776	5635	1819
1990	2149	964	1424	1787	7105	1985
1991	285.8	185	1439	1963	8820	2274
1992	531	1077	1473	2032	9098	2495
1993	455	1945	1402	2018	8962	2438
1994	505	2085	1431	1934	9084	2463
1995	530	2130	1439	1949	9092	2444
1996	580	2129	1452	1971	9244	2501
1997	1166	2137	1491	1978	9428	2522
1998	2121	2232	1480	2023	9449	2610
1999	2610	2085	1425	1895	8800	2414
2000	2613	2244	1475	2175	9470	2599
2001	2522	2186	1428	2158	9188	2541
2002	2116	2028	1375	1952	8907	2366
2003	1344	2370	1485	2300	10141	2722
2004	2030	2519	1622	2487	10458	2822
2005	1833	2668	1745	2483	10931	2945
2006	1999	2735	1815	2372	10671	3135
2007	2143	2660	1820	2208	10268	3094
2008	2428	2784	1820	2174	10663	3113
2009	2446	2499	1652	2212	9663	2783
2010	2469	2560	1659	2533	10075	2915
2011	2773	2913	479	2461	11144	3285
2012	3079	3169	1509	2413	11635	3430
2013	3103	3129	989	2279	11393	3543
2014	3239	3101	498	2278	11505	3599
2015	3986	3065	432	2204	11994	3973
2016	4423	3145	426	1900	12402	4020
2017	4520	3025	865	1988	11951	3935
Source : BP Statistical Bulletin (2019)					

Table 5.9:   World Bank continent categorization by GNI (Middle East and North Africa, North America) : 1967-2017

Table 5.11A : World Bank Continental Categorization by GNI: Middle East and North Africa (MENA)-2017			
ECONOMY	POPULATION SIZE	GNI GROUP	CONTINENT
Algeria	43	Upper Middle Income	Middle East and North Africa
Bahrain	1.4	High Income Economy	Middle East and North Africa
Djibouti	1	Low Middle Income	Middle East and North Africa
Egypt, Arab Rep.	92.3	Low Middle Income	Middle East and North Africa
Iran, Islamic Rep.	83.3	Upper Middle Income	Middle East and North Africa
Iraq	39.1	Upper Middle Income	Middle East and North Africa
Israel	8.7	High Income Economy	Middle East and North Africa
Jordan	7.1	Upper Middle Income	Middle East and North Africa
Kuwait	4.7	High Income Economy	Middle East and North Africa
Lebanon	4.5	Upper Middle Income	Middle East and North Africa
Libya	6.6	Upper Middle Income	Middle East and North Africa
Malta	0.4	High Income Economy	Middle East and North Africa
Morocco	34.9	Low Middle Income	Middle East and North Africa
Oman	4.1	High Income Economy	Middle East and North Africa
Qatar	2.7	High Income Economy	Middle East and North Africa
Saudi Arabia	33.9	High Income Economy	Middle East and North Africa
Syrian Arab Republic	16.91	Low Income Economy	Middle East and North Africa
Tunisia	11.3	Low Middle Income	Middle East and North Africa
United Arab Emirates	10.8	High Income Economy	Middle East and North Africa
West Bank and Gaza	4.53	Low Middle Income	Middle East and North Africa
Yemen, Rep	29.9	Low Income Economy	Middle East and North Africa
Population Sizes in Millions.			
Source: World Bank's World Development Indicators (2019)			

Table 5.11B : World Bank Continental Categorization by GNI: North America-2017			
ECONOMY	POPULATION SIZE	GNI GROUP	CONTINENT
Bermuda	0.06	High Income Economy	North America
Canada	36.6	High Income Economy	North America
United States of America	325.4	High Income Economy	North America
Population Sizes in Millions.			
Source: World Bank's World Development Indicators (2019)			

Table 5.10:   World Bank continent categorization by GNI(Sub-Saharan Africa): 1967-2017

Table 5.12 : World Bank Continental Categorization by GNI : Sub-Saharan Africa -2017			
ECONOMY	POPULATION SIZE	GNI GROUP	CONTINENT
Angola	30	Lower Middle Income	Sub-Saharan Africa
Benin	11.4	Low Income Economy	Sub-Saharan Africa
Botswana	2.2	Upper Middle Income	Sub-Saharan Africa
Burkina Faso	18.9	Low Income Economy	Sub-Saharan Africa
Burundi	9.9	Low Income Economy	Sub-Saharan Africa
Cabo Verde	0.5	Lower Middle Income	Sub-Saharan Africa
Cameroun	24.3	Lower Middle Income	Sub-Saharan Africa
Central Africa Republic	5	Low Income Economy	Sub-Saharan Africa
Chad	12.2	Low Income Economy	Sub-Saharan Africa
Comoros	0.9	Lower Middle Income	Sub-Saharan Africa
Congo, Dem. Rep	86.6	Low Income Economy	Sub-Saharan Africa
Cote d'Ivoire	24.9	Lower Middle Income	Sub-Saharan Africa
Equatorial Guinea	1.4	Upper Middle Income	Sub-Saharan Africa
Eritrea	6.7	Low Income Economy	Sub-Saharan Africa
Ethiopia	92.7	Low Income Economy	Sub-Saharan Africa
Gabon	2.1	Upper Middle Income	Sub-Saharan Africa
Gambia, The	2.1	Low Income Economy	Sub-Saharan Africa
Ghana	28.3	Lower Middle Income	Sub-Saharan Africa
Guinea	12.9	Low Income Economy	Sub-Saharan Africa
Guinea-Bissau	1.7	Low Income Economy	Sub-Saharan Africa
Kenya	46.7	Lower Middle Income	Sub-Saharan Africa
Lesotho	1.9	Low Income Economy	Sub-Saharan Africa
Liberia	4.5	Low Income Economy	Sub-Saharan Africa
Madagascar	25.6	Low Income Economy	Sub-Saharan Africa
Malawi	19.2	Low Income Economy	Sub-Saharan Africa
Mali	18.9	Low Income Economy	Sub-Saharan Africa
Mauritania	3.9	Lower Middle Income	Sub-Saharan Africa
Mauritius	1.3	Upper Middle Income	Sub-Saharan Africa
Mozambique	29.5	Low Income Economy	Sub-Saharan Africa
Namibia	2.3	Upper Middle Income	Sub-Saharan Africa
Niger	18.8	Low Income Economy	Sub-Saharan Africa
Nigeria	199.2	Low Income Economy	Sub-Saharan Africa
Rwanda	11.8	Low Income Economy	Sub-Saharan Africa
Sao Tome and Principe	0.2	Lower Middle Income	Sub-Saharan Africa
Senegal	16.1	Lower Middle Income	Sub-Saharan Africa
Seychelles	0.09	High Income Economy	Sub-Saharan Africa
Sierra Leone	6.6	Low Income Economy	Sub-Saharan Africa
Somalia	15.01	Low Income Economy	Sub-Saharan Africa
South Africa	56.5	Upper Middle Income	Sub-Saharan Africa
South Sudan	13.1	Low Income Economy	Sub-Saharan Africa
Sudan	40.8	Lower Middle Income	Sub-Saharan Africa
Tanzania	49.6	Low Income Economy	Sub-Saharan Africa
Togo	7.7	Low Income Economy	Sub-Saharan Africa
Uganda	37.7	Low Income Economy	Sub-Saharan Africa
Zambia	17.2	Lower Middle Income	Sub-Saharan Africa
Zimbabwe	14.9	Lower Middle Income	Sub-Saharan Africa
Population Sizes in Millions.			
Source: World Bank's World Development Indicators (2019)			

Table 5.11: World Bank continent categorization by GNI(Europe-Central Asia):1967-2017

Table 5.13 : World Bank Continental Categorization by GNI : Europe and Central Asia -2017			
ECONOMY	POPULATION SIZE	GNI GROUP	CONTINENT
Albania	36.8	Upper Middle Income	Europe and Central Asia
Andorra	0.08	High Income Economy	Europe and Central Asia
Armenia	2.9	Upper Middle Income	Europe and Central Asia
Austria	8.8	High Income Economy	Europe and Central Asia
Azerbaijan	9.6	Upper Middle Income	Europe and Central Asia
Belarus	9.5	Upper Middle Income	Europe and Central Asia
Belgium	11.42	High Income Economy	Europe and Central Asia
Bosnia and Herzegovina	3.9	Upper Middle Income	Europe and Central Asia
Bulgaria	7.1	Upper Middle Income	Europe and Central Asia
Channel Islands	0.17	High Income Economy	Europe and Central Asia
Croatia	4.2	High Income Economy	Europe and Central Asia
Cyprus	0.9	High Income Economy	Europe and Central Asia
Czech Republic	10.6	High Income Economy	Europe and Central Asia
Denmark	5.8	High Income Economy	Europe and Central Asia
Estonia	1.3	High Income Economy	Europe and Central Asia
Faroe Islands	0.05	High Income Economy	Europe and Central Asia
Finland	5.5	High Income Economy	Europe and Central Asia
France	64.9	High Income Economy	Europe and Central Asia
Georgia	3.7	Upper Middle Income	Europe and Central Asia
Germany	82.7	High Income Economy	Europe and Central Asia
Gibraltar	0.03	High Income Economy	Europe and Central Asia
Greece	10.8	High Income Economy	Europe and Central Asia
Greenland	0.06	High Income Economy	Europe and Central Asia
Hungary	9.8	High Income Economy	Europe and Central Asia
Iceland	0.3	High Income Economy	Europe and Central Asia
Ireland	4.8	High Income Economy	Europe and Central Asia
Isle of Man	0.08	High Income Economy	Europe and Central Asia
Italy	60.8	High Income Economy	Europe and Central Asia
Kazakhstan	18.2	Upper Middle Income	Europe and Central Asia
Kosovo	1.9	Upper Middle Income	Europe and Central Asia
Kyrgyz Republic	6.2	Lower Middle Income	Europe and Central Asia
Latvia	1.9	High Income Economy	Europe and Central Asia
Liechtenstein	0.04	High Income Economy	Europe and Central Asia
Lithuania	2.8	High Income Economy	Europe and Central Asia
Luxembourg	0.6	High Income Economy	Europe and Central Asia
Macedonia	2.1	Upper Middle Income	Europe and Central Asia
Moldova	3.6	Lower Middle Income	Europe and Central Asia
Monaco	0.04	High Income Economy	Europe and Central Asia
Montenegro	0.6	Upper Middle Income	Europe and Central Asia
Netherlands	17.1	High Income Economy	Europe and Central Asia
Norway	5.3	High Income Economy	Europe and Central Asia
Poland	37.9	High Income Economy	Europe and Central Asia
Portugal	10.3	High Income Economy	Europe and Central Asia
Romania	19.8	Upper Middle Income	Europe and Central Asia
Russian Federation	143.4	Upper Middle Income	Europe and Central Asia
San Marino	0.03	High Income Economy	Europe and Central Asia
Serbia	7	Upper Middle Income	Europe and Central Asia
Slovak Republic	5.4	High Income Economy	Europe and Central Asia
Slovenia	2.1	High Income Economy	Europe and Central Asia
Spain	46.3	High Income Economy	Europe and Central Asia
Sweden	10.2	High Income Economy	Europe and Central Asia
Switzerland	8.4	High Income Economy	Europe and Central Asia
Tajikistan	8.8	Low Income Economy	Europe and Central Asia
Turkey	80.6	Upper Middle Income	Europe and Central Asia
Turkmenistan	5.5	Upper Middle Income	Europe and Central Asia
Ukraine	42.3	Lower Middle Income	Europe and Central Asia
United Kingdom	66	High Income Economy	Europe and Central Asia
Uzbekistan	31.7	Lower Middle Income	Europe and Central Asia
Population Sizes in Millions.			
Source: World Bank's World Development Indicators (2019)			

Table 5.12: World Bank continent categorization by GNI(East Asia and Pacific):1967-2017

Table 5.14 : World Bank Continental Categorization by GNI : East Asia and Pacific -2017			
ECONOMY	POPULATION SIZE	GNI GROUP	CONTINENT
American Samoa	0.06	Upper Middle Income	East Asia and Pacific
Australia	24.8	High Income Economy	East Asia and Pacific
Brunei Darussalam	0.4	High Income Economy	East Asia and Pacific
Cambodia	16	Lower Middle Income	East Asia and Pacific
China*	1,390,848	Upper Middle Income	East Asia and Pacific
Fiji	0.9	Upper Middle Income	East Asia and Pacific
French Polynesia	0.28	High Income Economy	East Asia and Pacific
Guam	0.17	Upper Middle Income	East Asia and Pacific
Hong Kong SAR,China	7.4	High Income Economy	East Asia and Pacific
Indonesia	261.9	Lower Middle Income	East Asia and Pacific
Japan	126.7	High Income Economy	East Asia and Pacific
Kiribati	0.12	Lower Middle Income	East Asia and Pacific
Korea Dem. People's Rep.	51.5	Low Income Economy	East Asia and Pacific
Korea Rep.	51.64	High Income Economy	East Asia and Pacific
Lao PDR	6.7	Lower Middle Income	East Asia and Pacific
Macao SAR,China	0.6	High Income Economy	East Asia and Pacific
Malaysia	32.1	Upper Middle Income	East Asia and Pacific
Marshall Islands	0.05	Upper Middle Income	East Asia and Pacific
Micronesia, Fed. Sts	0.1	Lower Middle Income	East Asia and Pacific
Mongolia	3.1	Lower Middle Income	East Asia and Pacific
Myanmar	52.7	Lower Middle Income	East Asia and Pacific
Nauru	0.01	Upper Middle Income	East Asia and Pacific
New Caledonia	0.28	High Income Economy	East Asia and Pacific
New Zealand	4.8	High Income Economy	East Asia and Pacific
Northern Mariana Islands	0.06	High Income Economy	East Asia and Pacific
Palau	0.02	High Income Economy	East Asia and Pacific
Philippines	106.3	High Income Economy	East Asia and Pacific
Samoa	0.2	Upper Middle Income	East Asia and Pacific
Singapore	5.7	High Income Economy	East Asia and Pacific
Solomon Islands	0.6	Lower Middle Income	East Asia and Pacific
Taiwan, China	23.6	High Income Economy	East Asia and Pacific
Thailand	69.1	Upper Middle Income	East Asia and Pacific
Timor-Leste	1.2	Lower Middle Income	East Asia and Pacific
Papua New Guinea	8.1	Lower Middle Income	East Asia and Pacific
Tonga	0.1	Upper Middle Income	East Asia and Pacific
Tuvalu	0.01	Upper Middle Income	East Asia and Pacific
Vanuatu	0.3	Lower Middle Income	East Asia and Pacific
Vietnam	93.6	Lower Middle Income	East Asia and Pacific
Population Size in Millions. Only Chinese* Population Size in Billion			
Source: World Bank's World Development Indicators (2019)			

Table 5.13: World Bank continent categorization by GNI(Latin America and Carribbean, South Asia): 1967-2017

Table 5.15A: World Bank Continental Categorization by GNI: Latin America and Caribbean -2017			
ECONOMY	POPULATION SIZE	GNI GROUP	CONTINENT
Antigua and Barbuda	0.09	High Income Economy	Latin America and Caribbean
Argentina	44.1	Upper Middle Income	Latin America and Caribbean
Aruba	0.11	High Income Economy	Latin America and Caribbean
Bahamas, The	0.4	High Income Economy	Latin America and Caribbean
Barbados	163.2	High Income Economy	Latin America and Caribbean
Belize	0.4	Upper Middle Income	Latin America and Caribbean
Bolivia	11.1	Lower Middle Income	Latin America and Caribbean
Brazil	207.7	Upper Middle Income	Latin America and Caribbean
British Virgin Islands	0.03	High Income Economy	Latin America and Caribbean
Cayman Islands	0.06	High Income Economy	Latin America and Caribbean
Chile	18.4	High Income Economy	Latin America and Caribbean
Colombia	49.3	Upper Middle Income	Latin America and Caribbean
Costa Rica	4.9	Upper Middle Income	Latin America and Caribbean
Cuba	11.34	Upper Middle Income	Latin America and Caribbean
Curacao	0.16	High Income Economy	Latin America and Caribbean
Dominica	0.07	Upper Middle Income	Latin America and Caribbean
Dominican Republic	10.2	Upper Middle Income	Latin America and Caribbean
Ecuador	17.3	Upper Middle Income	Latin America and Caribbean
El Salvador	6.4	Lower Middle Income	Latin America and Caribbean
Grenada	0.11	Upper Middle Income	Latin America and Caribbean
Guatemala	16.9	High Income Economy	Latin America and Caribbean
Guyana	0.8	Upper Middle Income	Latin America and Caribbean
Haiti	10.9	Low Income Economy	Latin America and Caribbean
Honduras	8.3	Lower Middle Income	Latin America and Caribbean
Jamaica	2.8	Upper Middle Income	Latin America and Caribbean
Mexico	123.5	Upper Middle Income	Latin America and Caribbean
Nicaragua	6.2	Lower Middle Income	Latin America and Caribbean
Panama	4.1	High Income Economy	Latin America and Caribbean
Paraguay	6.9	Upper Middle Income	Latin America and Caribbean
Peru	31.8	Upper Middle Income	Latin America and Caribbean
Puerto Rico	3.4	High Income Economy	Latin America and Caribbean
Sint Maarten (Dutch part)	0.04	High Income Economy	Latin America and Caribbean
St. Kitts and Nevis	0.06	High Income Economy	Latin America and Caribbean
St. Lucia	0.2	Upper Middle Income	Latin America and Caribbean
St. Martin (French part)	0.04	High Income Economy	Latin America and Caribbean
St. Vincent, the Grenadines	0.11	Upper Middle Income	Latin America and Caribbean
Suriname	0.6	Upper Middle Income	Latin America and Caribbean
Trinidad and Tobago	1.4	High Income Economy	Latin America and Caribbean
Turks and Caicos Islands	0.04	High Income Economy	Latin America and Caribbean
Uruguay	3.5	High Income Economy	Latin America and Caribbean
Venezuela RB	28.1	Upper Middle Income	Latin America and Caribbean
Virgin Islands (U.S)	0.11	High Income Economy	Latin America and Caribbean
Population Sizes in Millions			
Source: World Bank's World Development Indicators (2019)			

Table 5.15B : World Bank Continental Categorization by GNI : South Asia -2017			
ECONOMY	POPULATION SIZE	GNI GROUP	CONTINENT
Afghanistan	36.8	Low Income Economy	South Asia
Bangladesh	163.2	Lower Middle Income	South Asia
Bhutan	0.8	Lower Middle Income	South Asia
India	1,316,896	Lower Middle Income	South Asia
Maldives	0.9	Upper Middle Income	South Asia
Nepal	29.2	Low Income Economy	South Asia
Pakistan	197.3	Lower Middle Income	South Asia
Sri Lankan	21.4	Upper Middle Income	South Asia
Population Sizes in Millions. Only India Population Size in Billion			
Source: World Bank's World Development Indicators (2019)			

Table 5.14: The list of 216 Economies for the empirical work in Chapter 4

TABLE 5.16:		**LIST OF 216 SAMPLED ECONOMIES WITH POPULATION SIZES IN MILLIONS OF MILLION (FOR CHAPTER 4)**					
Afghanistan	36.8	Djibouti	1.0	Lebanon	4.5	Rwanda	11.8
Albania	2.9	Dominica	0.07	Lesotho	1.9	Samoa	0.2
American Samoa	0.06	Dominican Republic	10.2	Liberia	4.5	San Marino	0.03
Andorra	0.08	Egypt, Arab Rep.	92.3	Liechtenstein	0.04	Sao Tome & Principe	0.2
Antigua & Barbuda	0.09	El Salvador	6.4	Lithuania	2.8	Senegal	16.1
Argentina	44.1	Eritrea	6.7	Luxembourg	0.6	Serbia	7.0
Armenia	2.9	Estonia	1.3	Macao SAR, China	0.6	Seychelles	0.09
Aruba	0.11	Eswatini	1.14	Madagascar	25.6	Sierra Leone	6.6
Australia	24.8	Ethiopia	92.7	Malawi	19.2	Singapore	5.7
Austria	8.8	Faroe Islands	0.05	Malaysia	32.1	Sint Maarten (Dutch part)	0.04
Azerbaijan	9.6	Fiji	0.9	Maldives	0.9	Slovak Republic	5.4
Bahamas, The	0.4	Finland	5.5	Mali	18.9	Slovenia	2.1
Bahrain	1.4	France	64.9	Malta	0.4	Solomon Islands	0.6
Bangladesh	163.2	French Polynesia	0.28	Marshall Islands	0.05	Somalia	15.01
Barbados	0.3	Gambia, The	2.1	Mauritania	3.9	South Africa	56.5
Belarus	9.5	Georgia	3.7	Mauritius	1.3	South Sudan	13.1
Belize	0.4	Germany	82.7	Mexico	123.5	Spain	46.3
Benin	11.4	Ghana	28.3	Micronesia, Fed. Sts.	0.1	Sri Lanka	21.4
Bermuda	0.06	Gibraltar	0.03	Moldova	3.6	St. Kitts and Nevis	0.06
Bhutan	0.8	Greece	10.8	Monaco	0.04	St. Lucia	0.2
Bolivia	11.1	Greenland	0.06	Mongolia	3.1	St. Martin (French part)	0.04
Bosnia Herzegovina	3.9	Grenada	0.11	Montenegro	0.6	St. Vincent & Grenadines	0.11
Botswana	2.2	Guam	0.17	Morocco	34.9	Sudan	40.8
Brazil	207.7	Guatemala	16.9	Mozambique	29.5	Suriname	0.6
British Virgin Islands	0.03	Guinea	12.9	Myanmar	52.7	Sweden	10.2
Brunei Darussalam	0.4	Guinea-Bissau	1.7	Namibia	2.3	Switzerland	8.4
Bulgaria	7.1	Guyana	0.8	Nauru	0.01	Syrian Arab Republic	16.91
Burkina Faso	18.9	Haiti	10.9	Nepal	29.2	Tajikistan	8.8
Burundi	9.9	Honduras	8.3	Netherlands	17.1	Tanzania	49.6
Cabo Verde	0.5	Hong Kong SAR, China	7.4	New Caledonia	0.28	Thailand	69.1
Cambodia	16.0	Hungary	9.8	New Zealand	4.8	Timor-Leste	1.2
Cameroon	24.3	Iceland	0.3	Nicaragua	6.2	Togo	7.7
Canada	36.6	India*	1,316.8 96B	Niger	18.8	Tonga	0.1
Cayman Islands	0.06	Indonesia	261.9	North Macedonia	2.08	Trinidad & Tobago	1.4
Central African Rep.	5.0	Ireland	4.8	Northern Mariana Islands	0.06	Tunisia	11.3
Chad	12.2	Isle of Man	0.08	Norway	5.3	Turkey	80.6
Channel Islands	0.17	Israel	8.7	Oman	4.1	Turkmenistan	5.5
Chile	18.4	Italy	60.8	Pakistan	197.3	Turks & Caicos Islands	0.04
China*	1,390,848B	Jamaica	2.8	Palau	0.02	Tuvalu	0.01
Colombia	49.3	Japan	126.7	Panama	4.1	Uganda	37.7
Comoros	0.9	Jordan	7.1	Papua New Guinea	8.1	Ukraine	42.3
Congo, Dem. Rep.	86.6	Kazakhstan	18.2	Paraguay	6.9	United Kingdom	66.0
Costa Rica	4.9	Kenya	46.7	Peru	31.8	United States	325.4
Cote d'Ivoire	24.9	Kiribati	0.12	Philippines	106.3	Uruguay	3.5
Croatia	4.2	Korea, Dem. People's Rep.	51.5	Poland	37.9	Uzbekistan	31.7
Cuba	11.34	Korea, Rep.	51.64	Portugal	10.3	Vanuatu	0.3
Curacao	0.16	Kosovo	1.9	Puerto Rico	3.4	Vietnam	93.6
Cyprus	0.9	Kyrgyz Republic	6.2	Qatar	2.7	Virgin Islands (U.S.)	0.11
Czech Republic	10.6	Lao PDR	6.7	Romania	19.8	West Bank and Gaza	4.53
Denmark	5.8	Latvia	1.9	Russian Federation	143.4	Yemen, Rep.	29.9
Zambia	17.2	Zimbabwe	14.9	Algeria	43.0	Angola	30.0
Congo	4.6	Ecuador	17.3	Equatorial Guinea	1.4	Gabon	2.1
Iran	83.3	Iraq	39.1	Kuwait	4.7	Libya	6.6
Nigeria	199.2	Saudi Arabia	33.9	United Arab Emirates	10.8	Venezuela	28.1
	Note: China and India Population Sizes in Billions						
	Source: IMF World Economic Outlook (2019)						