Oil Wealth and Economic Growth in Oil Exporting African Countries

By

Olomola Philip Akanni
Department of Economics
Obafemi Awolowo University

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Abstract

This study analyses the effect of oil rents on economic growth in oil exporting African countries. It also attempts to provide both theoretical and empirical analysis of the channels of transmission of resource curse of natural resources on growth in these countries. It adopts a panel data regression analysis for the period 1970 to 2000 for 47 oil exporting countries including Africa, and 13 non-oil exporting countries. The major findings are that there was evidence of resource curse in oil exporting countries, including oil exporting African countries, exchange rate and the Dutch disease syndrome do not explain the resource curse in these countries, including Africa, the absence of democracy in oil exporting countries hinders economic growth, and the despicable state of institutions in oil exporting countries encourage grabbing of public resources and oil rents through rent seeking hence retarding economic growth. The basic conclusion from this study is that for oil exporting African countries, as for other oil exporting countries, oil rents have failed to promote growth.

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1. Introduction

Among the important empirical findings in development economics in the twentieth century is that natural resource abundant economies have tended to grow more slowly than economies without substantial resources (Auty, 2001a; Rainis, 1991; Bulmer-Thomas, 1994; Sachs and Warner, 1995, 1997; Lal and Myint, 1996). Although the availability of natural resources does not necessarily imply a resource curse, on average resource abundant countries lag behind countries with fewer resources. Over the last four decades, for example, the Organization of Petroleum Exporting Countries (OPEC) as a whole experienced a negative rate of GDP per capita growth (Gylfason, 2001). Venezuela ranked among the ten wealthiest nations at the beginning of the nineteenth century, but despite its vast oil reserves, it is today downgraded to the level of a developing country. Similarly, Alaska is the only U.S. state with a negative growth rate over the last two decades, despite its extensive oil reserves and fishing industry (Lay and Mahmoud, 2004).

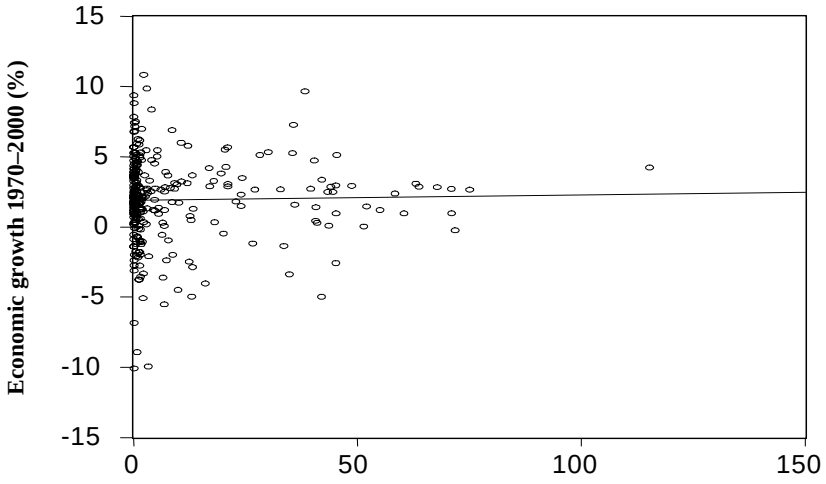
Auty and Mikesell (2000) found that Nigeria's oil notwithstanding, the country's GDP per capita of US$400 is far below the US$895 projected by the United Nations. Yet over the past 25 years, the country earned an estimated US$300 billion as oil rents.

In fact, it has been observed that of 65 countries that can be classified as natural resource rich, only four managed to attain both (a) long-term investment exceeding 25% of GDP on average from 1970 to 1998, equal to that of various successful industrial countries lacking raw materials, and (b) per capita GNP growth exceeding 4% per year on average over the same period. These four countries are Botswana, Indonesia, Malaysia and Thailand. The three Asian countries achieved this success by diversifying their economies and by industrializing; Botswana, rich in diamonds, without doing so. In East Asia, the countries with few raw materials (Hong Kong, Singapore, South Korea, and Taiwan) have done even better than the resource-rich ones, for example, Indonesia, Malaysia and Thailand (Gylfason, 2001).

Figure 1 is a scatter plot of per capita economic growth from 1970 to 2000 and oil rents as measured by the share of oil revenue in national wealth (GDP) for 47 oil exporting countries. The idea is to examine whether a given oil exporting country (with its other characteristics held constant) is more likely to grow as rents accruing from crude oil sales increase. As evidenced from the figure, countries that accumulate more oil rents show no greater tendency to experience economic growth.

The purpose of this study is to explore the association between oil wealth and economic growth through the various transmission channels. In doing so, the study will introduce two novelties.

Figure 1: Economic growth and oil wealth



First, while many empirical studies have been carried out on the effect of oil price changes on economic growth in oil exporting developing countries, few studies have yet to compare oil and non-oil exporting developing countries, and fewer still have yet to isolate the impact of oil price changes on growth in oil exporting African countries. Second, many studies have attempted to provide both theoretical and empirical analyses of the channels of transmission of the resource curse of natural resources on growth, but studies are yet few on a joint analysis of all the transmission channels in a single study focusing on oil exporting countries, and more so on oil exporting African countries. This study also intends to bridge these gaps.

Objectives of the study

Thus, the specific objectives of this study are to: examine the pattern of economic activities in the oil exporting African countries selected for the study; analyse the impacts of oil rents on economic growth of oil exporting African countries; and analyse and measure the magnitudes of the impacts of different transmission channels of resource curse on economic growth in these countries.

Policy relevance

Controversy characterizes the empirical relationship between oil rents and economic growth, particularly in oil exporting African countries. Therefore, the findings of the study are expected to have profound implications for policy. For example, if the quality of institutions were confirmed to retard growth in spite of oil rents, this would imply putting in place formidable institutions, enforcing of the rule of law and creating a producer-friendly environment so that the gains of oil rents can filter to economic growth.

2. Transmission channels between oil rents and poor performance

The resource curse has triggered a substantial amount of theoretical and empirical literature from both economic and political angles. Most of the existing studies establish a statistical connection between large resources and poor economic growth. Thus, the interesting question is, what is the transmission mechanism between the two variables? A number of factors have been identified in the literature. Here, however, we focus on the following: Dutch disease, rent-seeking, democracy and institutional quality.

Dutch disease

Economists W. Max Corden and J. Peter Neary developed the classic economic model describing Dutch disease in 1982. In the model, there is the non-traded good sector (this includes services and two traded good sectors: the booming sector and the lagging sector, also called the non-booming tradeable sector). The booming sector is in this case the oil sector.[1] The lagging sector generally refers to manufacturing. A resource boom will affect this economy in two ways: *resource movement effect* and *spending effect*. In the resource movement effect, the resource boom will increase the demand for labour, which will cause production to shift toward the booming sector, away from the lagging sector. Such an effect can be negligible, however, since the hydrocarbon and mineral sectors generally employ few people.

The spending effect occurs as a result of the extra revenue brought in by the resource boom. It increases the demand for labour in the non-tradeble, shifting labour away from the lagging sector. This shift from the lagging sector to the non-tradeable sector is called indirect deindustrialization. As a result of the increased demand for non-traded goods, the price of these goods will increase. Prices in the traded good sector are set internationally, however, so they cannot change. This is an increase of the real exchange rate. As illustrated in Figure 2, an appreciation of the real exchange rate may shrink manufacturing exports and reduce investment from firms, since firms will not invest if they are not sure what the future economic conditions will be. There are also many other harmful effects often associated with Dutch disease, such as corruption and protectionist policies for affected lagging sector industries. Hence the government may not be able to carry out effective and sound macroeconomic, social and industrial policies (Polterovich and Popov, 2006).

Institutions and democracy

A major hypothesis of this study is that within the set of oil exporting (African) countries, changes in revenues from oil affect political freedom. In particular, we test the hypothesis that when oil wealth increases, democracy suffers. This is examined within the purview of the rentier state theory. Rentier states are generally understood to be economies that derive a large portion of their revenues from external rents. Such rents accrue directly to the state and its leaders (Beblawi and Luciani, 1987). We examine the proposition that oil rentier states have specific features that make them unlikely to become liberal democracies, where the rule of law prevails. First, rentier states tend to be autonomous, because states with large natural resource endowments are more detached and less accountable, thus they do not need to levy taxes (Wantchekon, 1999; Ross, 2001; Smith, 2004). The experiences of Saudi Arabia (Chaudhry, 1997) and of Iran during the Pahlavi regime (Skocpol, 1982) in dismembering tax bureaucracy are pointers to the persistence of authoritarian regimes in most oil exporting Arab and other non-democratic oil exporting countries. Second, the state spends oil revenues on placating and repressing its population, and third, the social structure in rentier states leaves very little room for democratic opposition.

The key question is, why would increases in oil rents influence political regimes and, hence, economic performance? Figure 2 illustrates the transmission mechanism of oil wealth to economic growth though political and economic institutions. Economic institutions are crucial to rapid economic growth because they shape the incentives of key economic actors in society; in particular, they influence investments in physical and human capital and technology, and the organization of production. It has been documented that differences in economic institutions are the major source of cross-country differences in economic growth and prosperity. Economic institutions not only determine the aggregate economic growth potential of an economy, they can also determine the distribution of resources in the future. Following Acemoglu et al. (2004), we assume that the prevailing economic institution is determined by political power, which is in turn determined by the prevailing political institutions and distribution of existing resources. Political institutions can be described as the existing form of political regime – democracy, autocracy or dictatorship. Political institutions depend on de jure or institutionally given political power. But a group of individuals, even if they are not allocated power by the political institutions, may possess de facto political power. They use any means, including the military, to impose their wishes on the society. This powerful group arises because of their access to economic resources in the society and because that access can determine their ability to use or misuse existing political institutions.

Political institutions and the distribution of resources determine economic institutions and economic performance both directly and indirectly. For the purpose of this study, political institutions can be liberal democracy, illiberal democracy, autocracy or dictatorship. Furthermore, following Mehlum et al. (2005) we again distinguish between producer-friendly institutions (where rent-seeking and production are complementary activities) and grabber-friendly institutions, where rent-seeking and production are competing activities. More natural resources push aggregate income down when the institution is grabber-friendly, while more natural resources raise aggregate income when the institution is producer-friendly.[2]

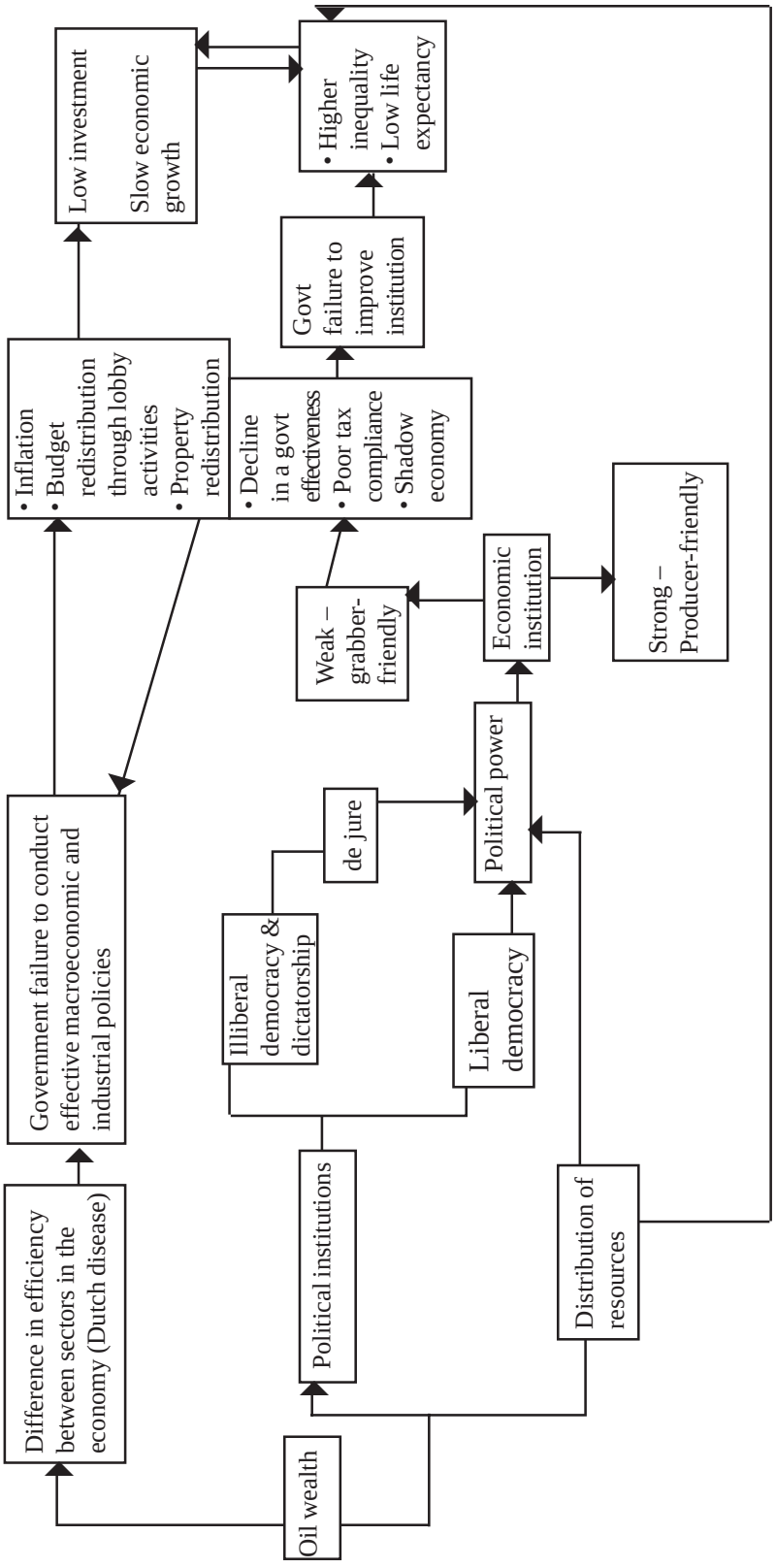


Figure 2: Transmission mechanism from oil wealth to economic performance

The direct effect can be seen from Figure 2. If political institutions place all political power in the hands of a single individual or a small group, or even in the hand of an authoritarian kind of representative democracy in which leaders and lawmakers are elected by the people but lack real liberties, economic institutions that provide protection of property rights and equal opportunity for the rest of the population are difficult to sustain. In many oil exporting developing countries, often characterized by poverty, low quality of education and lack of civil society, democracy becomes marketized and parliamentarians turn out to be representatives of vested interests, not the population, because all positions and decisions are bought and sold as commodities. Corruption at all levels of social, political, cultural and economic aspects of life becomes dominant and the increase in corruption, decreasing the level of the rule of law and the quality of governance, contributes to slowing down economic growth (Barro, 1996; Ross, 2001; Polterovich and Popov, 2006). Oil wealth may hinder democracy and the quest for democratic governance, particularly in the developing countries, because of the proclivity of powerful leaders to use repressive methods, as put forward by Ross (2001). In this case, huge oil revenues make it possible for regimes in oil exporting states to invest in repressive apparatuses that can keep them in power despite social opposition. Ross suggests that oil wealth is correlated with military spending, which in turn is associated with authoritarianism. In Republic of Congo in the 1990s, for example, increases in oil wealth allowed the government of the day to build up the army and train a special presidential guard to maintain order and indirectly prevent formation of social groups that would agitate for political change. In the developed and mature democracies, it is expected that democratic rule facilitates the formation and selection of growth-oriented laws and policies, selection of professional policy makers, and the effective control and timely change of ranking officials (Polterovich and Popov, 2006; Barro, 1996). The indirect effect works through the channels discussed above: political institutions determine the distribution of de jure political power, which in turn affects the choice of economic institutions.

Review of empirical literature

Many studies contribute empirical findings to the conclusion that natural resource abundant economies have tended to grow more slowly than economies without substantial resources (Auty, 2001a; Rainis, 1991; Bulmer-Thomas, 1994; Sachs and Warner, 1995, 1997; Lal and Myint, 1996). In a recent paper, Ding and Field (2005) continue the exploration of whether natural resource abundance leads to slower growth rates. They distinguish between natural resource dependence (RD) and natural resource endowment (RE), estimating two models using World Bank data on national capital stocks. In a one-equation model they showed that RD has a negative effect on growth rates, apparently confirming the main results of the resource "curse" literature. RE, however, has a positive impact on growth. Then a three-equation recursive model was estimated by introducing endogenous human capital and allowing for endogeneity also in resource dependence. Here, the effects of natural resources on growth are not significant.

More importantly, in examining the channels through which natural resources transmit to the rest of the economy, a number of empirical studies have given support to the existence of Dutch disease. These include studies on Bolivia (Auty and Evia, 2001), Venezuela (Rodriquez and Sachs, 1999), Mexico, Brazil and Venezuela (Auty, 1994), and Algeria, Ecuador, Indonesia, Nigeria and Venezuela (Fardmanesh, 1991). A major problem with all of these papers is that they tend to predict a monotonic effect of resources on development that is not always consistent with the cross-country evidence (Acemoglu, Johnson and Robinson, 2002). Although the Dutch disease literature has a lengthy theoretical degree, it appears to be the empirically least important mechanism. For example, Spatafora and Warner (2001) examined 18 oil exporting developing countries covering a period running from the mid 1960s until the 1980s. They found that Dutch disease effects are strikingly absent.

Another strand of the literature on economic growth, starting with early contributions by Knack and Keefer (1997) and Mauro (1995), has turned to the effects of good institutions on economic growth. It is fair to say that recent work, including Hall and Jones (1999), Acemoglu et al. (2002), Easterly and Levine (1997), Dollar and Kraay (2003), and Rodrik et al. (2002), has reached close to an intellectual consensus that the political institutions of limited government cause economic growth. Vijayaraghavan and Ward (2004) examined the relationship between institutional infrastructure and economic growth rates across 43 nations during the years 1975–1990. Within the framework of the neoclassical growth model, their study integrates a broad set of institutional variables that together proxy for the overall institutional infrastructure of an economy. Security of property rights, governance, political freedom and size of government are the indicators used in the study, facilitating identification of the most important institutions that account for the observed variations in economic growth rates among nations. Results indicate that security of property rights and size of government are the most significant institutions that explain the variations in economic growth rates.

There is also an extensive literature on the interrelationship between economic growth and democracy (Przeworski et al., 2000). Democracy is said to undermine investment (because of populist pressure for increased consumption) and to block good economic policies and reform because the governments in democratic societies are exposed to pressure from particular interests. Autocratic regimes are believed to be better suited than democracies to oppose pressures for the redistribution of income and resources coming from the poor majority of the population (Alesina and Rodrik, 1994).

In a recent paper, Robinson et al. (2006) modelled a situation in which politicians in developing countries seem to have quite a large amount of autonomy from interest groups. This follows from the group formation effect postulated by Ross (2001), where increased oil wealth permits government to thwart the formation of social and pressure groups to demand political rights, or even influence the outcomes of elections, and increase resource misallocation in the rest of the economy (Mehlum et al., 2005). For example, in a study of effects of the oil boom in Nigeria, Gavin (1993) found that between 1973 and 1987 employment in all sectors contracted with the only exception being the service sector, which included government employment. This led to a highly bloated public sector. Government paid huge wage bills. More importantly, this effort was seen as a deliberate policy by the then government to stay in power despite an earlier promise to withdraw

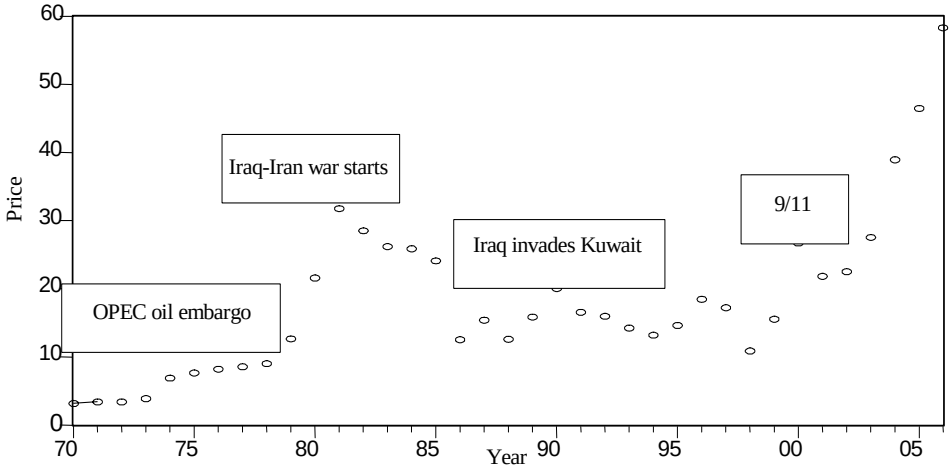
in 1975 (Gavin, 1993). Ross (2001) found that oil rents do inhibit democratic governance not only in the Middle East, as formally claimed in previous empirical studies, but also in other oil exporting countries like Indonesia, Malaysia, Mexico and Nigeria. Moreover, oil does greater damage to democracy in oil-poor states than in oil-rich ones. Thus oil inhibits democracy even when exports are relatively small, particularly in poor states.

The majority of studies investigating the economic growth-resource curse nexus use a version of the neoclassical growth model (Solow, 1956), augmented to include measures of human capital (from Mankiw et al., 1992) and such transmission mechanisms such as institutions, democracy or Dutch disease. Studies are yet to incorporate all these different transmission mechanisms in a single model for empirical analysis to assess their various implications for oil exporting African countries. This study intends to bridge this gap.

3. Some stylized facts

Since 1973, high and rising oil prices have seriously aggravated the management of macroeconomic policy. This section assesses the trends in oil prices and the consequences of oil price rises for the general price level, the trade balance, domestic and international credit markets, and the exchange rate in the oil exporting African countries. As evidenced from Figure 3, the price of crude oil rose considerably from US$3.89 in 1973 to US$6.87 in 1974 and US$12.64 in 1979 because of the Iranian revolution and the start of the Iraq-Iran war in 1979. The annual average price of crude oil peaked at US$31.77 in 1981, before declining to US$28.52 in 1982 and then to US$24.09 in 1984. Rising prices resulted in increased exploration and production outside of OPEC. From 1980 to 1986 non-OPEC production increased 10 million barrels per day. OPEC was faced with lower demand and higher supply from outside the organization. Thus, prices continued to decline reaching a low of US$12.51 in 1986 and US$15.86 in 1989 (British Petroleum, 2007).

Figure 3: Correlation of annual average crude oil price (US$)10



Oil prices spiked in 1990 because of the uncertainty associated with the Iraqi invasion of Kuwait and the Gulf War that emerged thereafter. They remained steady again at US$16.54 in 1991 and US$15.56 in 1999, after a major low of US$10.87 in 1998. Price

recovery began in early 1999 as OPEC reduced production; by the middle of 1999 OPEC's output dropped by about 3 million barrels per day, which was sufficient to move prices to an average of US$26.72 per barrel in 2000. The 11 September 2001 terrorist attack on the United States caused the price of crude oil to plummet, but production cuts by OPEC and non-OPEC members, particularly Russia, had the effect of pushing the price up again so that by 2002, the average price of crude oil was US$22.51. It has continued to rise thereafter.

An analysis of the macroeconomic indicators for some major oil exporting countries in Africa, including Nigeria, Gabon, Egypt, and Algeria is summarized in Figure 4. Oil became a major player in these economies during the 1970s. In Gabon, for example, oil was discovered in the 1970s and has contributed significantly to the determination of income in the country, accounting for about 50% of GDP and 80% of exports. The same pattern exists for Nigeria and Algeria. Oil exports accounts for 90% of total exports in Nigeria and contributes to about 70% of GDP. Although these countries experienced significant inflow of revenues as oil prices increased, as argued by the resource curse literature, and observed from Figure 4, there is no evidence of significant growth and development in these economies.

Figure 4: Per capita GDP growth rates

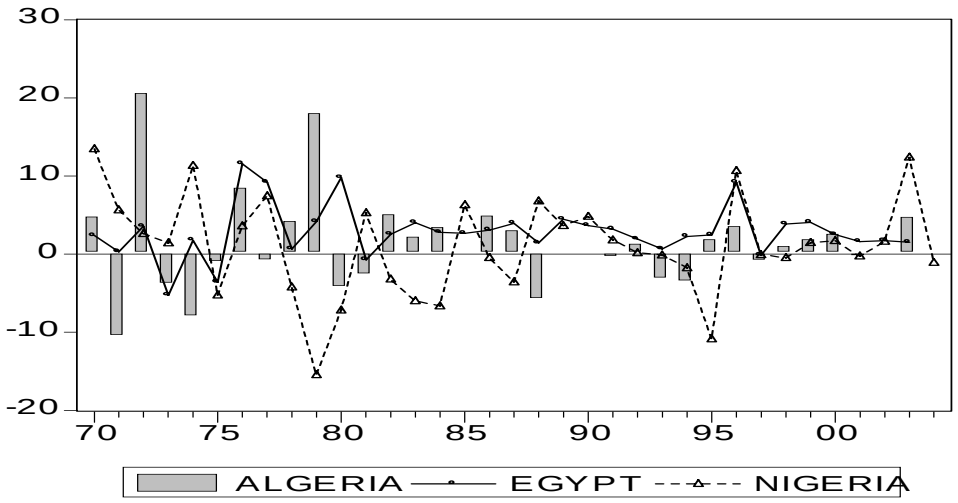


Figure 4 illustrates the per capita GDP growth rates for these countries during the period 1970 to 2003. In Algeria, the growth rate of output declined from 17.99% in 1979 to -2.82% in 1981, -0.04% in 1985 and -0.22% in 1990, before rising marginally through 1.84% in 1995 to 2.54% in 2002 and 4.71% in 2004. During notable booms, Nigeria and Egypt recorded different patterns of economic growth. For example, in 1980, GDP growth rate in Nigeria was -7.2%, whereas in Egypt it was 9.79%. However, by 1981, output growth in Nigeria stood at 5.27% while that of Egypt declined to -0.71%. But by the end of the boom period in 1990, Nigeria's economy grew by 4.8% while Egypt grew by 3.65% due to earnings from oil exports. In 2001, when there was a

slight increase in the price of oil, Nigeria's economic growth declined to -0.27% while Egypt grew by 1.62%.

Table 1 illustrates the distribution of countries according to real GDP growth for each of the countries. It is observed here that the countries under study failed to sustain rapid GDP growth rates for extended periods as reflected in considerable fluctuations in growth rates. As oil exporters, these economies experienced a boom in economic activities during the 1970–1979 period, when the world experienced the first oil shock (in 1974). Between 1980 and 1989, only Congo Republic could sustain the 5% real GDP growth. Cameroon slipped to between 3 and 5%, while Nigeria and Gabon slid further to between 0 and 3%.

Table 1: Distribution of countries according to real GDP growth (averages)

Real GDP growth rates	1960–1969	1970–1979	1980–1989	1990–1997
>5%	Gabon	Cameroon, Congo Rep., Gabon, Nigeria, Egypt, Algeria	Congo Rep., Egypt,	
>3–5%	Congo, Rep.		Cameroon,	Nigeria, Egypt, Gabon
0–3%	Cameroon Nigeria		Gabon, Algeria, Nigeria	Congo, Rep. Algeria, Angola
Negative				Cameroon, Congo DR

Source: Adapted from African Development Report, 2000 (p. 11).

Table 2 shows some economic and political indicators of development in Africa, and some selected oil exporting developing countries, for comparative analysis.

Table 2: Economic and political indicators

Country	Daily oil production '000 barrels	Corruption rankings**	Political rights***	Development ranking*	Average annual per capita income	Annual per capita health expenses	Infant mortality rate****
Saudi Arabia	9,817	71	7/7	73	$8,530	$375	23
Russia	8,543	90	5/5	63	$2,610	$115	18
Iran	3,852	87	6/6	106	$2,000	$363	35
Venezuela	2,987	114	3/4	69	$3,490	$307	19
Nigeria	2,185	144	4/4	152	$320	$15	110
Algeria	1,857	97	6/5	107	$1,890	$73	39
Libya	1,488	108	7/7	61	N/A	$143	16
Angola	885	133	6/5	164	$740	$31	154
Azerbaijan	313	140	6/5	89	$810	$8	74
Eq. Guinea	249	N/A	7/6	116	$930	$76	101
U.S.A	7,454	17	1/1	7	$37,610	$4,887	7

* out of 175 countries, 1=highest
** out of 146 countries, 1= least corrupt
*** 1=most free, 7=least free
**** deaths per 1,000 live births
Source: British Petroleum 2004 Statistical Review of World Energy (oil production); Transparency International (corruption ranking); United Nations Development Report (development ranking, health expenditures, infant mortality).

As evidenced in the table, in spite of enormous oil rents to be generated given high daily production and increasing prices of crude oil, available evidence shows that the benefits failed to trickle down to the key sectors of the economy to generate growth and development. For example, in Nigeria, Algeria and Libya (OPEC members), the corruption level is very high. These African countries rank lowest on the development scale, with per capita income very low, with the exception of Algeria. Angola and Equatorial Guinea, non-OPEC oil exporting African countries, recorded per capita income greater than that of Nigeria. Annual per capita health expenditures are the smallest for Nigeria at about US$15 and US$31 for Angola. Infant mortality rate (infant deaths per thousand live births) is highest for Angola, Nigeria and Equatorial Guinea. With the exception of Nigeria, with its recent move towards democracy, all other oil producing African countries lack reasonable experience of civil liberties.

A problem faced by most governments was lack of clarity as to whether the oil boom would be permanent or transitory. But the major challenge facing these African countries has been whether to accumulate more foreign reserves, or instead spend the higher income. If the decision is to spend, then is it for consumption or investment? Driven by influences of rising powerful political groups, the oil money has always been dissipated, as governments have to adjust their expenditures to higher levels. For example, the share of investment to GDP rose in all the countries between 1973 and 1979, while consumption expenditures fell, except in Nigeria. In Algeria, private consumption as a ratio of GDP declined from 46% to 33%, while imports fell from 58% to 36%. Similar development was noted in Tunisia, where the investment ratio rose to 22% from 18% in 1973, and private consumption fell from 73% in 1973 to 71% in 1979. In Nigeria, however, private investment fell from 27% in 1973 to 22% in 1979, while public investment rose to 60% from 56% in 1973. Public consumption rose from 8% to 11% in 1979. The positive growth recorded during this period could be due to the considerable increase in exports, from 20% of GDP to about 25%, more than the growth in imports.

Developments within these economies changed thereafter. In the 1980s only Algeria experienced a marginal fall in private consumption from 66% in 1983 to 63% in 1986, while the investment rate was constant at 25%. By the 1990s, however, private investment in Algeria had risen to 67%, while capital formation declined to about 16% by 1997. The general trend in these developments was that the oil windfalls that should have ushered in sustained economic growth have exacerbated slow growth and engendered poverty. This is what tends to echo the development in literature of resource curse, whereby a negative correlation exists between natural resource abundance and economic growth.

4. Methodology

Here we analyse the impact of oil rents on economic growth. The analysis is based on the conditional convergence hypothesis and a Barro-style (1991) cross-country regression controlling for initial income and average investment rates. Thus, following Sachs and Warner (1999) and Lederman and Maloney (2002), our growth equation has the following form:

$$y_{i,t} = \sigma y_{t-2} + X'_{i,t}\kappa_1 + W'_{i,t}\kappa_2 + \phi OIL_{i,t-2} + \eta_i + \rho z_i + \nu_{i,t} \quad (1)$$

Variables

In Equation 1, t denotes points in time $t=2...T$. However, each variable is computed over an average period of five years. Therefore the dependent variable, $y_{i,t}$, denotes the mean of the annual growth rates in country i in the years 1970–2000. In this study, we use per capita GDP (y) as the measure of aggregate economic activity while the difference in the logarithm of current and previous period defines economic growth.

Explanatory variables

The first explanatory variable, y_{t-1}, is the level of income per worker at the beginning of each of these periods. According to the conditional convergence hypothesis, we expect σ to have a negative sign, implying that high income countries have lower growths than low income countries. W is a vector of endogenous covariates that are measured as an average over each of the five-year periods. The endogenous variables are investment rates, population growth and technology. Average population growth rates were computed as the difference between the natural logarithm of total population at the end and beginning of each period and dividing this difference by the number of years. As in previous studies, technological progress and depreciation rates were assumed to be constant across countries and they sum to 0.05. Thus, the natural logarithms of the sum of population growth and 0.05 were calculated. Following Hoeffler (2002), the investment–GDP ratio is used to proxy savings rate. We expect a positive impact of capital accumulation on growth. Our variable of interest is the measure of oil rents, *OIL*, measured as the ratio of the value of oil exports to the gross domestic product (GDP). Oil rent is defined as the price of crude oil in the international market multiplied by the quantities of oil. The resource curse implies a negative sign for the oil variable.

Control variables

X_{it} is a vector of strictly exogenous covariates. This includes democracy, *DEMOC* and the real exchange rate, *REER*, and institution, *INST*. To capture the Dutch disease effect, we allow the real exchange rate (*REER*) to interact with oil rents (*REEROIL*). A positive *REEROIL* indicates an appreciation of the product of real exchange rate and oil rents, and hence distortions in resource allocation in the domestic economy. For the political economy effect, following Ross' (2001) finding that the oil-impedes-democracy claim is both valid and statistically robust, we proceed to approach this indirectly. We use an interaction term (*DEMOCOIL*), which allows oil rents and the democracy variable (*DEMO*) to interact. A negative coefficient implies that oil hurts democracy, and hence growth. Z_i is the time invariant country characteristics such as geographical location and η_i is the unobserved country specific effects.

Estimation technique

We exploit the time series data for each country and consider repeated observations for shorter periods. Substantial complications arise in the estimation of Equation 1 using the OLS. In both the fixed and random effects setting, the difficulty is that the lagged dependent variable is correlated with the error term, even if we assume that the disturbances are not themselves autocorrelated. Thus, the system generalized method of moments (SYS-GMM) is used. The SYS-GMM method addresses the problems of omitted variable bias, endogeneity and unit root effects in the choice of the instruments. Following Arrelano and Bond (1991), we first difference Equation 1 to remove z_i as follows:

$$\Delta y_{i,t} = \sigma * \Delta y_{i,t-1} + \kappa \Delta x_{i,t} + \Delta v_{i,t} \tag{2}$$

In Equation 2, $\sigma^*=(\sigma+1)$. While differencing eliminates the country-specific effect, it introduces a new bias; by construction, the new error term $\Delta v_{i,t}$ is correlated with the lagged dependent variable, $\Delta y_{i,t}$. Thus, Arrelano and Bond (1991) proposed the following moment conditions:

$$\begin{aligned} &E\left[y_{i,t-s}\left(\Delta v_{i,t}\right)\right] = 0 \text{ for } s \geq 2;\ t=3...T \\ &E\left[X_{i,t-s}\left(\Delta v_{i,t}\right)\right] = 0 \text{ for } s \geq 2;\ t=3,...T \end{aligned} \tag{3}$$

The assumptions here are that the error terms, *v*, are not serially correlated and the explanatory variables (*X*) are weakly exogenous (that is, they are assumed to be uncorrelated with future values of the error term). Under these moment conditions, Arrelano and Bond (1991) proposed a two-step GMM estimator. In the first step, the error terms are assumed to be independent and homoscedastic across countries over time. In the second step, the residuals obtained in the first step are used to construct a consistent estimate of the variance-covariance matrix, thus relaxing the assumption of independence and homoscedasticity. The two-step estimator is thus asymptotically more

efficient relative to the first-step estimator. The GMM estimator based on these conditions is referred to as the difference estimator (DIFF-GMM).

There are conceptual and statistical shortcomings with the DIFF-GMM, however. Conceptually the study is a cross-country data analysis of the relationship between oil rents and economic growth, which is eliminated in the difference estimator. Statistically, if there are persistent explanatory variables, lagged levels of these variables are weak instruments for the regression equation in differences (Alonso-Borrego and Arrelano, 1995; Blundell and Bond, 1998; Hoeffler, 2002). If the regressors are strictly exogenous, however, then all the past and present and future values of *X* are valid instruments in each of the differenced equations. But for this study, the Arrelano–Bond dynamic panel-data estimator uses the following instruments: the levels of dependent variable lagged two or more periods; levels of the endogenous variables lagged two or more periods; and the first differences of the strictly exogenous covariates, which are used as their own instruments.

Blundell and Bond (1998) show that lagged levels of the variables in the system may not be good instruments of current differences if the series is close to a random walk. Instead, they propose a GMM estimator derived from the estimation of a simultaneous system of two equations, the first being the difference equation and the second being the levels equation. Suitably lagged levels of $y_{i,t}$ and $x_{i,t}$ are used as instruments in the differenced equations while $\Delta y_{i,t-1}$ and $\Delta x_{i,t}$, provided $\Delta x_{i,t}$ is strictly exogenous, are used as instruments in the levels equation.

Following Arellano and Bover (1995), Blundell and Bond (1998), and Hoeffler (2002), the present study adapts the estimator that combines in a system the regression in difference (Equation 2) with the regression in levels (Equation 1), to reduce the problems noted above. In this case, since investment is assumed endogenous, it is lagged two periods or more and used as instruments in the first-differenced equation, while in level equation, $\Delta y_{i,t-1}$ and $\Delta x_{i,t}$ are used as instruments. Thus, additional moment conditions for the regression in levels could be specified as:

$$E\left[\left(y_{i,t-s} - y_{i,t-s-1}\right)\left(\eta_i + \varepsilon_{i,t}\right)\right] = 0 \quad \textit{for } s=1$$
$$E\left[\left(X_{i,t-s} - X_{i,t-s-1}\right)\left(\eta_i + \varepsilon_{i,t}\right)\right] = 0 \textit{ for } s=1 \tag{4}$$

The consistency of the GMM estimator depends on the validity of the assumption that the error terms do not exhibit serial correlation and on the validity of the instruments. To address these issues, the two specification tests proposed by Arellano and Bond (1991) and Blundell and Bond (1998) are used. The first is the Sargan test of over-identifying restrictions, which tests the overall validity of the instruments. The second test examines the hypothesis that the error term is not serially correlated. An attempt is made to test whether the first differenced error term is second-order serially correlated. Failure to reject the null hypothesis gives support to our model.

The next problem to be addressed in the estimation is the treatment of the time invariant characteristics, which in this study is geographical location to capture the African effect in the regression analysis. This is crucial in that the study is interested in

the effect of oil prices on economic growth in Africa. As argued by Hoeffler (2002), a number of empirical studies (such as Barro and Lee, 1993; Easterly and Levine, 1997) have found that the Solow model failed to explain African economic growth. To this effect Hoeffler (2002) introduced an Africa dummy into the study and found that growth in Africa is explained by the same fundamental production function used in the Solow model. Since the present study deals with oil rents and some African countries are major oil exporting nations, it would be useful to examine the level of significance of an African dummy in Solow' s model in a production function augmented for oil wealth.

In Equation 1, it is possible that the measured country characteristics, z_i, may be correlated with the unobserved country specific effects and/or the error term. Thus, following Hoeffler's (2002) two-step procedure, we estimate Equation 1 with z_i^* (where $z_i^* = \Phi z_i + v_{i,t}$), using the Blundell and Bond (1998) SYS-GMM. The SYS-GMM estimator allows us to obtain consistent estimates of σ^* and Φ. These consistent estimates are then used to estimate the residuals of the model. In the second step, the obtained residual is then regressed on the measured country characteristics, z_i.

Data

In order to measure the impact of oil rents on democracy, institutions and growth, and at the same time explore its possible diverse effects, data for 47 oil exporting countries and 13 non-oil exporting countries were used. But data were not available for all the countries for all of the five periods, thus making the panel unbalanced. GDP per capita and GDP growth rates as well as the investment rates, population growth and exchange rates were obtained from Penn World Table (PWT) 6.1 adjusted for PPP and based on a chain index. Democracy, the *DEMOC* data set, is taken from the Polity IV data set (Jaggers and Marshall, 2000) and calculated by subtracting the autocracy score from the democracy score in each country year, for a range of between -10 and +10. A positive sign indicates that democracy constitutes a good environment for economic growth to take place. In this study, however, the democracy variable is normalized so that the scores lie between 0 and 1, with 0 being least democratic and 1 being the most democratic.

To capture the role of institutions, we adopt the method employed by Tabellini (2005), who used variable constraints on the Executive, as defined in the set Polity IV. This variable is designed to capture "institutionalized constraints on the decision making process of the Chief Executive" (Jaggers and Marshall, 2000). According to this criterion, better political institutions have one or both features: the holder of executive powers is accountable to bodies of political representatives, and/or government authority is constrained by checks and balances and by the rule of law. The value varies from 1 (= unlimited authority) to 7 (= accountable executives constrained by checks and balances). Higher values thus correspond to better institutions (Tabellini, 2005). We also allow *OIL* to interact with institution to examine the joint effect of oil and institutions (*INSTOIL*) on economic growth. A negative relationship implies that increased oil rents do not filter to growth through a weak institution. The data on oil rents were derived from the World Bank Tables (2001).

5. Empirical results

The econometric package used for the study was PC-GIVE 10. All reported standard errors are corrected for heteroscedasticity. We report the ordinary least squares regression (OLS), the fixed effect, the Arrelano–Bond DIFF-GMM and the Blundell–Bond (SYS-GMM) results in Appendix Tables A1, A2, A3 and A4. All regressions included time dummies, which were found to be jointly significant in every regression. But the coefficients are not reported here to conserve space. In the Blundell–Bond SYS-GMM estimation, the approach of Hoeffler (2002) and Nkurunziza and Bates (2003) was followed by assuming the initial GDP to be predetermined and investment endogenous. Oil rent was also treated as endogenous. Even if the price of crude oil is determined outside the economy, the quantity to be produced and sold in the international market is a function of the level of domestic political stability and general economic activities in the oil exporting country. Thus, investment and oil rents variables each level lagged two periods and more were used as instruments in the first-difference equations and their once lagged differences were used as instruments in the levels equation. The various diagnostic tests of the appropriateness of the instruments used in the regression were presented in the tables. The first two are tests of first and second-order serial correlation in the first differenced residuals. The statistics reported are p-values giving the probability of correctly rejecting the null hypothesis of no autocorrelation. The third test was a Sargan test of identifying restrictions under the null hypothesis of the validity of the instruments. AR(1) rejects the null while AR(2) fails to reject the null of no autocorrelation. First differencing introduces AR(1) serial correlation when the time varying component of the error term in levels is serially uncorrelated (Arrelano and Bond, 1991). Therefore, GMM estimates are consistent only when second order correlation is not significant, although AR(1) needs not be zero (Nkurunziza and Bates, 2003). Thus, from tables A3 and A4, the high p-values suggest that we cannot reject the null hypothesis that the set of instruments is appropriate.

Descriptive statistics

In Table 3, we present some descriptive statistics for our panel data set for oil and non-oil exporting countries, oil exporting developing countries and oil exporting African countries. The columns report the mean for both oil and non-oil exporting countries, oil exporting countries and oil exporting African countries. These statistics are summary statistics for the 47 net oil exporters and 13 non-oil exporting countries between 1970 and 2002. The values for the GDP per capita and oil wealth per capita are reported in constant 2000 US dollars.

Table 3: Summary of descriptive statistics

	Mean for both oil and non-oil exporting countries	Mean for oil exporting countries	Mean for oil exporting African countries
Real per capita GDP growth	2.23	1.93	1.07
Investment–GDP ratio	2.82	2.82	2.35
Oil wealth	9.22	9.24	9.47
Institutional quality	4.12	4.40	2.3
Real GDP per capita (US$)	7,674.1	8,125.2	5,921.3
Population growth	-4.00	-4.55	-3.45
Democracy	4.28	5.02	0.9
Exchange rate	1.52	1.50	2.16

As evidenced from the table, the average growth rate of GDP for both oil and non-oil exporting countries was 2.23%, while that of oil exporting developing countries alone was 1.93%. Oil exporting African countries experienced a much lower growth rate of 1.07% per annum. Interestingly, oil wealth measured as *OIL/GDP* per annum was 9.47% in oil exporting African countries, compared with the total average of 9.22% for oil and non-oil exporting countries and 9.24% for all the oil exporting developing countries selected for the study. On average, among oil exporting developing countries, African countries in the group enjoyed more inflow of oil rents.

Moreover, the average initial income per capita for oil exporting African countries was very high relative to the average for pooled data and oil exporting countries. It was about 77% of average initial income per capita for oil and non-oil and about 73% of oil exporting developing countries. Therefore, one would have expected a higher rate of convergence. However, the low growth rate of GDP per capita per annum could be explained by many factors observable from Table 3. First, the extent of democratic transition in Africa was very low (0.9%) compared with an average of 5.02%. Second, the institutional quality index for oil exporting African countries was rather low (2.3%) compared with an average of 4.4% for oil exporting developing countries.

The implication of these is that weak and poor institutional quality that encourages corruption and entrenched autocratic regimes prevailed in oil exporting African countries, thereby exacerbating the problem of the resource curse. Moreover, from the table it can be observed that the investment share of GDP was lowest in oil exporting African countries (2.35%) compared with an average of 2.82%. This implies that African countries that export oil do not invest much when compared with other oil exporting countries. This is also not surprising, given that the region had the highest population growth rate. Increasing population pressure can limit savings rate and hence investment spending for productive activities. Finally, exchange rate appreciated in oil exporting African countries by 21.6%. This tends to suggest that huge profits from oil exports shifted resources away from the non-tradeable sector thus giving rise to the Dutch disease problem. Therefore, these observed differences should be expected to account for some of the oil exporting African countries' low growth performance.

Impact of resource endowment on economic growth

The left-hand side variable is the change in the logarithm of real per capita GDP. First, an OLS regression was run. The lagged income was included on the right-hand side to capture persistence in economic growth and also potentially mean reverting dynamics in economic growth (i.e., the tendency of growth to converge to some equilibrium value for the countries or convergence. Thus, the negative coefficient on the initial GDP is interpreted as conditional convergence. In all the regression analyses, the findings show that investment is positively and significantly related to economic growth, while population growth is negatively and significantly related to economic growth, as suggested by the Solow model. This finding is consistent with previous studies on economic growth in the literature (for example, Barro, 1996; Sachs and Warner, 1997). The introduction of other variables into the model did not change the predicted sign and significance of investment and population growth. This is evidenced from Tables A1–A4 in Appendix A.

Oil wealth and economic growth

Tables A1, A2 and A3 provide the results for both oil and non-oil exporting countries. In Table A1, column 1 shows the pooled OLS relationship between economic growth and oil rents as well as the variables representing the channels of transmission, while column 2 shows the results of the fixed-effect OLS. The main variable of interest is *OIL/GDP*. The parameter therefore measures whether oil rents has an effect on economic growth. Column 1 of Table A2 indicates the results of OLS when interactions are introduced into the model. Both columns indicate oil rents to be positively related to economic growth but the coefficients are not significant. This tends to run counter to expectations from the resource curse literature. However, when the interactions are introduced into the model, oil rents contribute negatively but insignificantly to economic growth, supporting the resource curse literature. The Arrelano–Bond GMM and the Blundell–Bond SYS-GMM produce more interesting results. In the both cases, the coefficients on oil rents were negative and significant at 5%.

Oil wealth, democracy and growth

In the regression results (tables A1–A4), the democracy variable, *DEMOCRACY*, was negative and significant, except in Table A3 using the Arrelano–Bond while controlling for regional effect. When all the non-oil exporting countries were used, the OLS fixed-effect model in Table A1 and column 1 of Table A2 shows that democracy had a negative and significant effect on economic growth. The Arrelano–Bond GMM reported a coefficient of -0.124 and a t-statistic of -2.10 in columns 1 of Table A3 when the interaction variables were introduced.

Oil rents and Dutch disease

The results indicated that the Dutch disease syndrome may not account for the negative impact of oil rents on economic growth. Although the coefficients on exchange rates, for both oil and non-oil countries, were negative and significant for the OLS and fixed-

effect model (columns 1 and 2 of Table A1), this relationship disappeared when interaction variables were introduced and also when the GMM methods were adopted (tables A2 and A3). An interesting observation, though, was that when only oil exporting countries were considered, the SYS-GMM results indicated that exchange rate was positive and significant at 10% level (column 1, Table A4). But when the other interaction terms were introduced, it was no longer significant, though still positive. In all the analyses, however, the interaction of oil rents and exchange rates produced negative and insignificant results.

Oil rents, institutions and growth

The role of institutions in shaping economic growth in oil exporting countries can be observed in the pattern of results obtained in the analysis. Following the work of Mehlum et al. (2005), the prediction followed in this study is that the resource abundance is harmful to growth only when the institutions are grabber friendly. Thus, it is expected that the interaction term has a positive coefficient. However, contrary to the findings of Mehlum et al., the interaction of oil rents and institutions produced negative coefficients, and in fact affect economic growth significantly more than institutions itself as a unique determining variable. In Table A2, only when the fixed effect model was estimated was the institution variable positive and significant for the pooled countries. In Tables A1, A2 and A3, the coefficients of the interaction of oil rent and institution were negative and significant at the 5% level. For oil exporting countries, the results were not different. In this case, both institution and interaction of oil rents and the institution variable, *INSTOIL*, produced negative and significant results. This result implies that oil exporting countries encourage a "grabber-friendly" environment because of their poor and weak institutions. This invariably undermines growth and economic progress.

Oil rents and growth: Is Africa different?

Since the major focus of this study is on oil exporting African countries, it is crucial to ask whether the experiences of oil producing African countries are uniquely different from the results of the pooled data analysed above. Tables A3 and A4 present the results of the Arrelano–Bond GMM and the Blundell–Bond SYS-GMM for oil and non-oil exporting countries controlling for regional effects. The result obtained was not different for oil exporting African countries. As evidenced from Table A4, when the interaction terms were not introduced, oil rent was significant at 10% level, but it was negative. But when the interactions were introduced, the coefficient of -0.03 was not found to be statistically significant. The implication of this finding is that the resource curse literature that oil rents do not promote economic growth was validated in this study for oil exporting African countries.

On the linkages among oil wealth, democracy and economic growth, however, when we control for oil exporting African countries, the coefficient becomes positive but insignificant as evidenced in column 4 of Table A2. Although the methodology adopted in this study was different from that of Ross (2001), yet the interaction of oil and democracy and their effects on economic growth can tell us about the effect of democracy

on growth in oil exporting African countries. The result obtained for oil exporting African countries alone did not significantly differ from the earlier ones obtained for a pooled data of oil and non-oil exporting countries. As evidenced in Table A4, democratic regimes had a negative and significant relationship with growth. This result tends to support the findings that the more autocratic a government, the lower the prospect for economic growth. More interesting is that the interaction between oil rents and democracy do negatively shape the economy of the oil exporting African countries. The more oil rents are accrued, the less is the amount that is filtered through a democratic government to economic growth. The cumulative effect is decline in economic growth prospects. Another interesting result for oil exporting African counties is that the interaction of oil rents and exchange rates produced negative and insignificant results, indicating the prevalence of Dutch disease in the economies.

The results also show that institutions in oil exporting African countries failed to promote economic growth. Institution and interaction of oil rents and institution variable, *INSTOIL*, produced negative and significant results as evidenced in Table A4. Here, too, the implication is that the poor and weak institutions in oil exporting countries cannot prevent the development of a "grabber-friendly" environment.

This study confirmed previous findings that increasing inflow of oil wealth does not necessarily produce growth, the main argument of the resource curse literature (Ding and Field, 2005; Auty, 2001b; Sachs and Warner, 1997).

The following findings are derived from the analysis:

- There was evidence of resource curse in oil exporting countries, including oil exporting African countries.
- Exchange rate and the Dutch disease syndrome do not explain the resource curse in these countries, including Africa.
- The absence of democracy in oil exporting countries hinders economic growth.
- The deplorable state of institutions in oil exporting countries encourages grabbing of public resources and oil rents through rent-seeking, hence retarding economic growth.

6. Policy lessons and conclusion

The basic conclusion from this study is that in oil exporting African countries, as in other oil exporting countries, oil rents have failed to promote growth. Oil rents do not filter to growth through democratic governments and institutions, primarily because these do not exist in most oil producing African countries. The most obvious explanation is the fact that most oil rich developing (African) countries are characterized by weak rule of law, malfunctioning bureaucracy and corruption. They often rely on a system of patronage and do not develop a democratic system based on electoral competition, scrutiny and civil rights. The cumulative effect is a retarded economy in the face of increasing revenue generated from crude oil sales in the international market. Thus, oil exporting African countries should ensure enforcement of rule of law and reduce corruption and rent-seeking activities so that oil rents can filter to economic growth. Moreover, developing countries need to diversify the production base so that manufacturing activities can be developed.

Notes

1. It can also be the mining of gold, copper, diamonds or bauxite, or the production of crops, such as coffee or cocoa.

2. Tornell and Lane (1999) explain the disappointing economic performance following significant oil windfalls in Nigeria, Venezuela and Mexico by dysfunctional institutions that invite grabbing. Even more stark examples of grabber-friendly conditions can be found in countries where the government is unable to provide basic security. In these countries resource abundance stimulates violence, theft and looting by financing rebel groups and warlord competition (Skapar-das, 2002).

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Appendix A – Regression results

Table A1: Oil rents, democracy and growth (oil and non-oil exporting countries)

Base sample, 1970–2000
5-year data in averages

	Pooled OLS (1)	Fixed effect OLS (2)	Anderson–Bond IV (3)	Arellano–Bond GMM (4)
Dependent variable is growth rate of GDP				
y_{t-1}	-6.066	-1.24	-1.068	-0.09
	(-2.52)	(-2.46)	(-2.21)	(-1.979)
Investment	3..51	1.22	1.32	0.72
	(6.21)	(4.55)	(3.10)	(2.84)
Population	-0.76	-0.59	-0.92	-0.66
	(-3.09)	(-0.982)	(-2.62)	(-1.97)
$[Oil/GDP]_t$	0.019	0.019	-0.04	-1.24
	(0.748)	(0.649)	(-1.95)	(-1.679)
Exchange rate	-0.00001	-0.00001	-1.0002	-1.04
	(-2.32)	(-3.86)	(-1.42)	(-0.817)
Democracy	-0.363	-0.653	-.024	-0.79
	(-2.30)	(-2.90)	(-0.932)	(-1.49)
Institution	0.352	0.706	-1.02	-1.22
	(1.32)	(2.29)	(-1.62)	(-1.98)
Time effects F-test	[0.000]	71.2 [0.000]	[0.000]	[0.000]
R^2	0.70			
AR(1)		-2.556 [0.011]	-3.76 [0.005]	-3.36 [0.000]
AR(2) test		-2.21 [0.101]	-2.83 [0.071]	-3.01 [0.021]
Observations	268	268	268	268
Countries	60	60	60	60

Table A2: Oil rents and the various transmission channels (oil and non-oil exporters)

Base sample, 1970–2000
5-year data in averages

	Pooled OLS (1)	Pooled OLS – With interactions (2)	Fixed effect – OLS (3)	Arellano–Bond GMM (4)
Dependent variable is growth rate of GDP				
y_{t-1}	-0.29	-0.12	-0.298	-0.37
	(-3.60)	(-4.76)	(-3.43)	(-4.36)
Investment	0.376	0.350	0.339	0.57
	(8.77)	(8.19)	(4.99)	(3.91)
Population	-0.75	-0.60	-0.31	-0.41
	(-3.55)	(-2.82)	(-1.86)	(-2.20)
$[Oil/GDP]_t$	-0.049	-0.046	-0.059	-0.069
	(-1.19)	(-1.41)	(-0.893)	(1.99)
Exchange rate	-0.00006			
	(-0.247)			
Democracy	-0.35			0.13
	(-2.66)	(2.38)		
Institution	0.278			
	(1.29)			
OilxDemoc	-0.0055	-0.014	-0.0036	-0.002
	(-0.580)	(-1.81)	(-0.273)	(-1.92)
Oilxinstitution	0.0165	0.027	0.008	-0.01
	(0.895)	(1.67)	(1.97)	(-2.39)
Oilxexchr	-0.00001	-0.00001	-0.00006	0.002
	(-0.421)	(-0.0529)	(-0.338)	(0.278)
Time effects F-test	[0.018]	[0.0042]		
R^2	0.33	0.31		
AR(1)			-2.337[0.019]	3.587[0.000]
AR(2)			-3.647[0.000]	3.132[0.002]
Observations	268	268	268	268
Countries	60	60	60	60

Table A3: Oil rents and growth: Regional effects (oil and non-oil exporters)

Base sample, 1970–2000
5-year data in averages

	Arellano–Bond GMM (1)	Arellano–Bond GMM (2)	Blundell–Bond SYS-GMM (3)	Blundell–Bond SYS-GMM (4)
Dependent variable is growth rate of GDP				
y_{t-1}	-0.312	-0.287	-0.22	-0.25
	(-2.99)	(-3.27)	(-3.13)	(-3.19)
Investment	0.646	0.434	0.24	0.28
	(4.62)	(2.25)	(2.57)	(2.41)
Population	-0.47	-0.48	-0.31	-0.33
	(-2.17)	(-3.25)	(-3.06)	(-2.98)
$[Oil/GDP]_t$	-0.05	0.056	-0.10	-0.007
	(-1.71)	(1.87)	(-1.99)	(-1.96)
Exchange rate	0.00002	0.00001	-0.00005	-0.00005
	(0.121)	(0.876)	(-1.08)	(-1.11)
Democracy	-0.124	0.07	-0.21	-0.189
	(-2.10)	(1.59)	(-1.44)	(-1.56)
Institution	0.021	-0.001	-0.022	-0.05
	(0.897)	(-1.61)	(-1.95)	(-2.11)
OilxDemoc	-0.024	-0.004	-0.0001	-0.0002
	(-1.61)	(-1.81)	(-1.90)	(-1.87)
Oilxinstitution	-0.009	-0.009	-0.07	-0.21
	(-1.90)	(-2.05)	(-2.01)	(-1.99)
Oilxexchr	0.002	0.0025	-0.005	0.004
	(0.788)	(0.922)	(-0.197)	(1.00)
Developed	-0.318			
	-0.387)			
Africa		-0.41		-0.33
		(-1.33)		(-1.82)
Time effects				
F-test	13.66[0.018]	21.45[0.007]	19.44[0.000]	17.78[0.010]
Sargan test			-2.678[0.002]	-2.97[0.031]
AR(1)	3.63[0.000]	3.366[0.001]	-2.337[0.019]	-3.22[0.000]
AR(2)	3.192[0.001]	2.989[0.003]	-3.647[0.000]	-3.765[0.00]
Observations	268	268	268	268
Countries	60	60	60	60

Table A4: Oil rents and growth (oil exporting countries)

Base sample, 1970–2000
5-year data in averages

	Blundell–Bond SYS-GMM (1)	Blundell–Bond SYS-GMM (2)
Dependent variable is growth rate of GDP		
y_{t-1}	-0.396	-0.368
	(-3.75)	(-3.55)
Investment	0.125	0.228
	(2.31)	(2.40)
Population	-0.30	-0.32
	(-1.98)	(-1.88)
$[Oil/GDP]_t$	-0.02	-0.03
	(-1.89)	(-1.68)
Exchange rate	0.0056	0.002
	(1.78)	(1.01)
Democracy	-0.05	-0.001
	(-2.02)	(-1.94)
Institution	-0.136	-0.005
	(-1.79)	(-2.10)
OilxDemoc		-0.28
		(-2.27)
Oilxinstitution		-0.22
		(-2.92)
Oilxexchr		-0.002
		(-0.984)
Africa		-0.21
		(-2.33)
Sargan test	-2.311[0.000]	-2.47[0.044]
AR(1)	-3.471[0.002]	-3.586[0.000]
AR(2)	-3.697[0.000]	-3.214[0.039]
Observations	182	180
Countries	47	47

Appendix B – List of countries

Algeria, Angola, Argentina, Australia, Austria, Burkina Faso, Bangladesh, Botswana, Benin, Bolivia, Brazil, Cameroon, Canada, Chile, China Columbia, Congo, D.R., Congo, R., Denmark, Dominican Republic, Ecuador, Egypt, France, Gabon, Ghana, Greece, Grenada, Hungary, Hong Kong, India, Indonesia, Israel, Iran, Italy, Japan, Kenya, Malaysia, Mexico, New Zealand, Netherlands, Nigeria, Norway, Panama, Paraguay, Pakistan, Peru, Romania, Singapore, Spain, Syria, Turkey, Trinidad and Tobago, Taiwan, Thailand, Uruguay, United Kingdom, United States of America, and Venezuela.

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