LUND UNIVERSITY

Oil and Development - A Formula for Sustained Economic Growth?

The impact of oil exports as a ratio of GDP on Economic Growth in Sub-Saharan Africa

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Authors:

Adam Holmgren

Erik Wallström

Instructor:

Emre Aylar

ABSTRACT

The purpose of our study is to determine the importance of oil exports in relation to GDP in countries located in Sub-Saharan Africa when it comes to promoting economic growth. Due to the fact that oil accounts for approximately 40 percent of the world's total energy production, and is predicted to do so for at least 45 more years to come, we found this a highly relevant topic to look into.

At the moment, Sub-Saharan Africa is in the middle of an oil-boom. Eastern and Western Africa have become promising exploration areas and thus attracted a lot of interest all around the globe. Therefore, we chose to include 14 Sub-Saharan African countries in our econometric study. We look at how the value of oil exports as a ratio of GDP affects economic growth in these countries during a time period of 27 years, stretching from 1983-2010. Our hypothesis deals with the presence of a "Resource Curse", stipulating that an economy which is overly dependent on oil tends to lead to none, or negative, economic growth.

With this report, we conclude that an increase in the ratio of oil exports to GDP will generate higher economic growth in our chosen Sub-Saharan African countries. However, we find evidence against a "Resource Curse" taking place in the region. On the other hand, as it is a relatively under-developed region there is still a possibility that the oil sector has yet to gain enough influence in many economies to actually suffer the consequences of the phenomena. Perhaps this could be something for these countries to take into account as they become more reliant on oil as a means of production.

Table of Contents

1. Introduction

During the last decade, many empirical studies focusing on oil price fluctuations and its implications on economic growth in resource abundant economies have emerged. Only a few of these lay their attention on the impact of oil exports in regards to economic growth in Sub-Saharan Africa (Akanni, 2007, p. 2).

So why do we think that this region in particular is important to study? Africa is the continent in the world with the most varied growth rates, and in recent years they have experienced some exceptionally high numbers, as can be seen in the figure 1.1. This figure shows the development of GDP growth between the years 1980-2010. Almost 20 countries in Sub-Saharan Africa are right now experiencing growth rates above 5 percent. On top of this, the region is right in the middle of an oil boom. This has been argued by many to be one of the main reasons why growth rates are peaking, together with some institutional advancements and democracy slowly spreading. Especially Western and Eastern Africa have become promising exploration areas and thus attracted a lot of interest all around the globe (Afeikhena, Dipo and Senyo, 2009, p. 2).

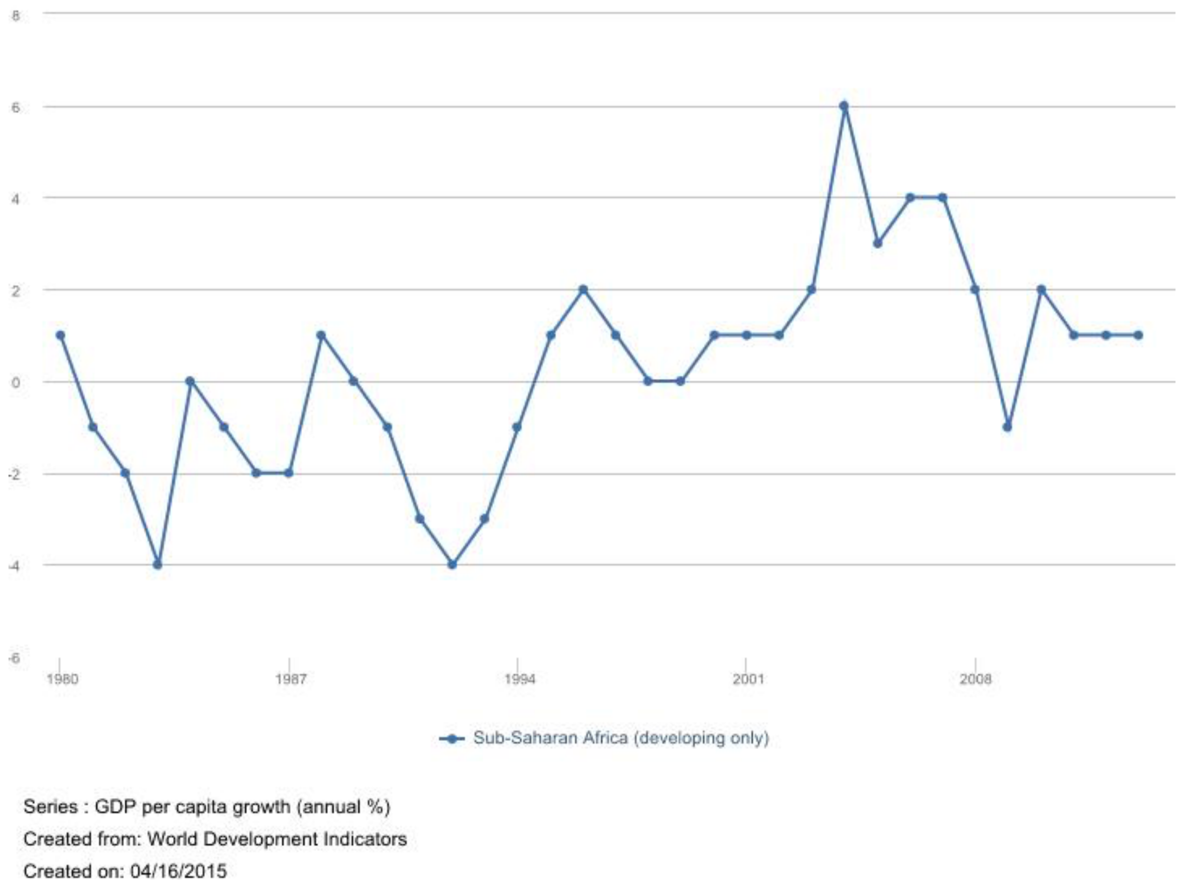


Figure 1.1 - Economic growth Sub-Saharan Africa 1980-2013

With this paper we want to establish how important oil exports are for countries in Sub-Saharan Africa when dealing with economic growth. It is already established that oil is important for economic growth due to the fact that it accounts for about 40 percent of the total energy in the world. Furthermore, the current reserves have been proven to meet the demand for at least 45 more years to come. Thus, it will continue to be very influential for a long time. Developments in infrastructure together with technological advances have made oil a safer and cleaner fuel. This, in combination with a relatively low price has made it even more attractive to use as a means of production (OPEC, 2004).

One important finding in the last century is that economies with an abundance of natural resources tend to grow slower than economies with deficiencies (Karl, 2005, p.23). Therefore, we will in this paper focus on the value of oil exports as a ratio of a country's GDP in Sub-Saharan Africa and how this ratio then can be related to increases in income (GDP). Additionally, higher economic growth will help countries invest in more human capital and infrastructure and promote economic growth even further. We will analyze this question with an emphasis on our overall hypothesis, the "Resource Curse", which states that economies with an abundance of natural resources tend to have none, or even negative, economic growth. This happens because countries shift their focus into one sector, thereby weakening other sectors (Karl, 2005, p.23-24)

There are many existing theories regarding economic growth. One of them is the endogenous growth theory, where economic growth is generated mainly from enhancing human capital, which will in turn make it possible to acquire technology from other countries. Compared to the neoclassical models, technological progress is now the main factor for economic growth, and the technology does not have to be produced within the country. Therefore we find it well-suited for our analysis of Sub-Saharan Africa as a region since their research- and development sector is relatively small (Hansson, 2015b, p. 21).

We have in our analysis chosen to include 14 countries in the region. As a result of our emphasis on the importance of oil exports we have included countries where oil refineries are highly present, as well as countries surrounding these in order to capture the effects of accumulating technology. As we can see in figure 1.2, these are located mainly on the West coast. In recent decades though, some have started to emerge along the East coast, such as Kenya and Tanzania. As can be seen in appendix 8.2.2 we have chosen a sample of countries that all vary in export of oil over time. Gabon, Nigeria and Congo-Brazzaville are all countries who have had oil exports from 1983, and have since increased their oil exports to make up a relatively large part of their GDP. Cameroon, Chad, Ivory Coast, Sudan and Senegal are other countries who began with none, or close to zero, oil exports in 1983 and have since experienced a significant increase. The rest of our chosen countries have had very limited oil exports during the entire timespan. As a result of this, with our diversified countries, we do not experience any selection issue which can be a risk in these studies. Furthermore, we expected that data collection would be a problem in a region such as Sub-Saharan Africa, and have therefore excluded Angola, where a big part of the data we needed was simply not available.

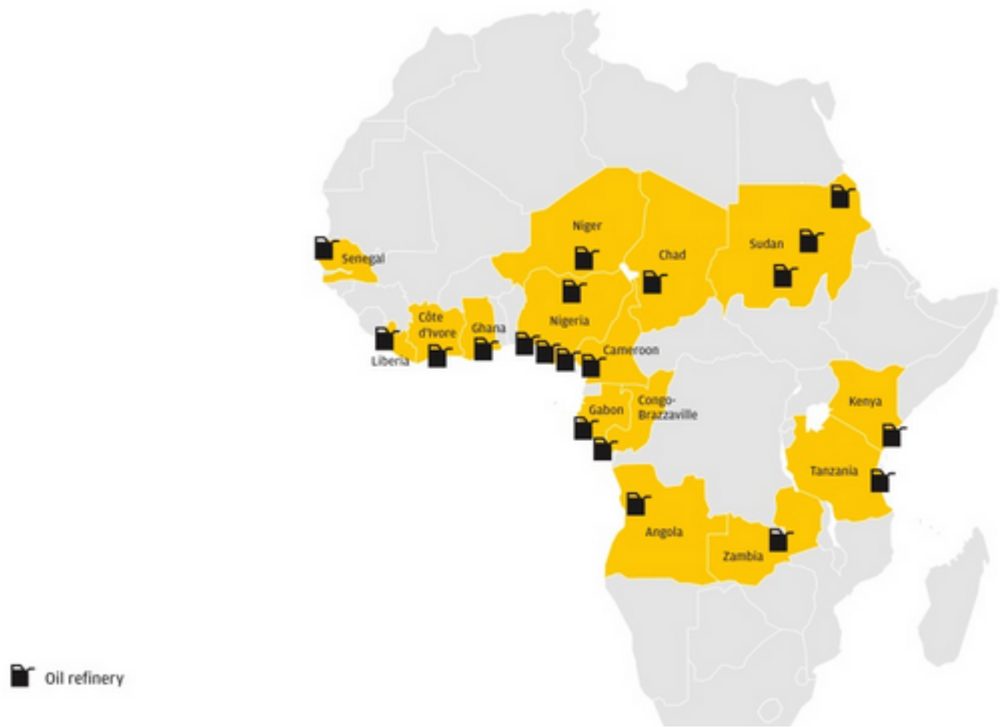


Figure 2.2 - Oil refineries in Sub-Saharan Africa

Taken from: (CEED Institute, 2014)

Taken on: 04/28/2015

We will analyze these countries with the help of cross-sectional time series data with a time period of 27 years, stretching from 1983-2010. In practice, this will be executed through a panel data approach. Data on oil exports before this period is almost non-existent, and therefore we find this boundary to be suitable.

In the second chapter, we present our theoretical framework regarding oil and economic growth as well as our hypothesis, consisting of the resource curse. In chapter 3 we will provide some background facts and an empirical literature review to show what has already been done on the subject and what results they presented. We will implement this to further deepen our analysis. Further on in chapter 4, we will present our data, including our variables which we have chosen and why they are of importance to our model. In chapter 5 we present our panel data approach and how we have constructed it to fit our theoretical model. We continue in chapter 6 to present the results from our regressions and how they stand against economic theory and our hypothesis. Finally, we will end our analysis with a conclusion where we summarize the paper and conclude our results.

2. Theoretical framework

In this part we want to clarify some of the important concepts included in our analysis. These are economic growth, the endogenous growth model, oil and the resource curse. Thus, we will in this chapter present our theoretical model of choice and broaden the knowledge on the previously stated concepts.

2.1 Economic Growth

Economic growth is measured as an increase in the value of all produced goods and services in a country. In other words, the change in a country's Gross Domestic Product (GDP). The growth rate measures increases in the production within a country, which can be viewed as an increase in income in the particular country. Economic growth is often measured during longer time periods and therefore excludes depressions and booms that can occur in the short run. In this paper we measure economic growth in the long run where inflation is adjusted for, simply because prices generally increase on their own, raising income but reducing its actual value. As a result, we have chosen measurements of real GDP, which is GDP in constant prices.

So why is economic growth of importance? It is an accountable way of comparing the development in different countries to one another. Even though growth rates may only differ by small amounts, they become more important in the long run. This is why it is crucial to understand that increases or decreases in growth rates can have major impacts on future income flows in a country. However, the GDP measure is not perfect in regards to production and income. It only captures the real production which gets reported to the government. Thus, the black market and for example working at home both end up being excluded from the measure. On the other hand, given that the measurement errors are consistent, if the undervaluing of GDP within a country is the same year after year, the growth rates will not be affected as much (Hansson, 2015a, p. 2-6, 9-11).

2.1.1 Endogenous Growth Theory

In order to analyze the impact of oil in regards to economic growth in Sub-Saharan Africa, we will view it as an income source that can be used for different productive purposes within the country. The model of our choice is an endogenous growth model where the ability to produce technology within the country is relatively limited, hence this model puts emphasis on the possibility to absorb technology from nearby countries for economic growth. This is something we mentioned earlier, but which is highly relevant in the analysis of developing countries as the ones in our region of choice. Thus, economic growth is affected by real capital, human capital and technological progress, which will be explained in equation 21-2.3 (Hansson, 2015b, p. 21).

Change in real capital, such as equipment or machinery, depend on government savings (investments) which are now increased by the revenues accruing from oil exports. Depreciation of the real capital has a negative effect on this ratio (Hansson, 2015b, p. 22). This is shown in equation 2.1 below.

$$\dot{K} = s \cdot (Y + oil\ export\ income) - \delta K \qquad \text{(Equation 2.1)}$$

$\dot{K}$ is change in capital, s is savings (investments), Y is income and δK is depreciation of capital.

The additional income generated by oil exports can be used for investments in real capital and human capital which will increase economic growth. However, these oil revenues can also affect economic growth in another way. As seen in equation 2.2, change in human capital will get positively affected if the country starts to invest in e.g. infrastructure and education due to this increase in income. Thus, both human capital productivity (μ) and quality of education (Ψ) will increase. Furthermore, more human capital enables more advanced technology to be used within the country. This will increase technology (A) and thereby increase economic growth (Hansson, 2015b, p. 22-23).

$$\dot{h} = \mu e^{\Psi u} A^{\gamma} h^{1-\gamma}$$ (Equation 2.2)

$\dot{h}$ is change in human capital, μ is productivity in human capital, Ψ is quality of education, u is years of schooling and A is the technology available in nearby countries.

Finally, we are interested in examining the variables that affect economic growth (GDP growth) per capita. GDP per capita in equilibrium is influenced by real capital variables, human capital variables and technology available in nearby countries. This relationship is derived in appendix 8.1 and shown in equation 2.3.

$$y^*(t) = \left(\frac{s_K}{n+g_A+\delta}\right)^{\frac{\alpha}{1-\alpha}} \left(\frac{\mu}{g} e^{\psi u}\right)^{\frac{1}{\gamma}} A^*(t)$$ (Equation 2.3)

Real capital Human capital Technology

$y^*(t)$ is the GDP per capita in equilibrium(steady state) and depends on real capital variables:S_k is the rate of savings(investments), n (population growth), g_A (technology growth rate) and δ (depreciation). It also depends on human capital variables: μ (productivity in human capital), g (growth rate of technology in nearby countries), Ψ (quality of education) and u (years of schooling). Finally it depends on A(t), which is the technology level in nearby countries.*

We will in our regression control for three of these variables as they might explain some parts of economic growth according to the endogenous growth theory: rate of investments (S_k), openness as a measure of human capital productivity (μ) and years of schooling (u) (Hansson, 2015b, p. 24). Furthermore, we will interpret our results with an emphasis on the endogenous theory regarding technological progress and human capital as the long-term solution for higher economic growth, and real capital working as a booster for short-term economic growth.

However, it is possible that due to countries having different income levels in their equilibrium, they experience different growth rates. Therefore, excluding the previously explained variables, different income levels could also affect economic growth. Thus, our regression might not explain all aspects of economic growth. This is explained further in the next two paragraphs (Hansson, 2015b, p. 14).

2.1.1.1 Steady state

Steady state or equilibrium identifies the break-even point that a country is heading towards. If a country is experiencing relatively small shocks to the economy, they are often quite close to their point of steady state. Consequently, it is a relatively good estimator of the actual development within the country (Hansson, 2015b, p. 10-11).

2.1.1.2 Conditional convergence

Conditional convergence is a hypothesis that has actually been shown to have empirical support to a large degree. It states that since countries have different income levels in their steady state, those who lie far beneath their own steady state should experience faster growth rates. This has been proven especially for countries in a transitional phase from a lower to a higher steady state (Hansson, 2015b, p. 14). This can therefore be argued to explain parts of the high growth rates in Sub-Saharan Africa, even though it is hard to measure.

2.2. Oil and production

Oil is one of the most important and valuable possessions in the world. It is mainly used as fuel, but it also holds the largest share of production in the world. So without doubt, oil is of great importance in our world today. However, the future of oil production is uncertain. It is used especially in the transportation sector, which is unlikely to come to a stop in the near future (Roberts, 2005, p. 31).

Why should we study the impact of oil exports on economic growth? Empirical research concludes that there is a clear relationship between economic growth and the price of oil (also named oil rents). This implies that the amount of oil exported should have a great impact on the countries growth rates. Additionally, research has shown that an increase in oil prices should be of positive value for an oil exporting country and bad for an importing country. Oil can therefore be viewed as a kind of estimator for economic stability, due to the fact that we are highly dependent on oil-produced products (Ghalayini, 2011, p. 127-128, 130).

2.3 Resource Curse

Since oil is one of the main factors stimulating economic activity, we can expect that having an abundance of oil would be very beneficial for a country. Not least for a poor country with relatively few sources of income. But is this really the case in the world we live in? Research has shown that developing countries who suddenly start to rely heavily on oil exports tend to experience increased poverty, corruption and violence compared to countries with other sources of income. This is argued to be true due to a number of factors such as volatility of oil prices, fewer jobs available for the unskilled labor force, to some degree corruption as well as ‘the Dutch disease’ (Karl, 2005, p. 22). The Dutch disease implies that when the importance of the oil sector rises, it increases the value of the local currency, making other exporting sectors lose their economic influence. The oil sector therefore dominates and takes over other important sectors. Manufacturing and agriculture often suffer the most (Karl, 2005, p. 23-24). One sector becoming abundant to others will create two effects; resource transfers and increased spending. In the former, demand for labor in the abundant resource sector will increase, which will shift production to that sector. The latter effect will, through the extra income from the abundant resource sector, shift labor away from the declining sectors, and therefore increase the prices of produced goods within these. As a result of this, exchange rates increase (Akanni, 2007, p. 3).

3. Empirical literature

The well-known relationship between oil and economic growth is a common area to study. There are a lot of research papers who have explored this area thoroughly together with its implications in specific regions. Previous empirical work focusing on the Sub-Saharan region differ from each other in terms of theory and approach, even though many of them work with the same kind of datasets and include similar analyses. The same goes for the resource curse and Dutch disease as a phenomena. Other studies have mentioned and dealt with this theory before, but not while isolating the importance of oil exports on economic growth in Sub-Saharan Africa. Or more specifically, while looking at the value of oil exports as a ratio of GDP.

The majority of the papers we have read have focused specifically on oil prices (crude oil) and its relationship to economic growth. Although this part in particular does not answer any of our questions, it can give a good insight into the subject and it’s determining factors. It also provided us with some ideas for appropriate models and a proper regression analysis. Another common denominator amongst the studies is that they have chosen panel data as a method to deal with their data in order to look at the effects both over time and in between countries.

3.1 Oil dependence in Sub-Saharan Africa

In his report regarding oil use and economic development in Sub-Saharan Africa, Jakobsson, K. discusses the concept of oil dependence. He defines oil dependence as the value of heating the oil in a country as a ratio of total heating of all energy sources. Jakobsson comes to the conclusion that this value can be a good estimator of how important oil is in different regions. According to the EIA, shown in figure 3.1, Sub-Saharan Africa has the highest level of oil dependence in the world. Thus, oil seems to play an important role in the energy sector in this region in particular compared to the rest of the world (Jakobsson, 2007, p. 16-17).

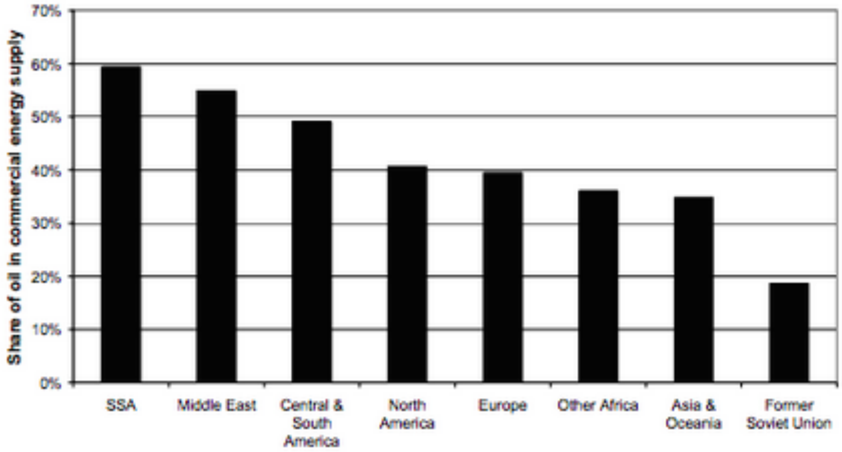


Figure 3.1 - The share of oil in commercial primary energy supply by region in 2004

Taken from: (Jakobsson, K., 2007) derived from (EIA, 2006)
Taken on: 04/28/2015

Despite this being one of the few reports we have found on this subject and the fact that Jakobsson has created a relatively subjective measure, we still find this to be a legitimate estimation of the importance of oil in Sub-Saharan Africa. Primarily due to the fact that it is presented in commercial energy form, which indicates that the population in Sub-Saharan Africa is more reliant on oil than in any other region.

3.2 Oil prices and economic growth

A research study from 2007 by Akanni for the African Economic Research Consortium looked at oil wealth and economic growth in oil exporting African countries while focusing on the price as a main factor of influence. He found that oil rents (prices) have failed to promote economic growth in these countries. Akanni also included the resource curse in his analysis of natural resources on growth in the same region, and came to the conclusion that this was not an observable phenomena. He did, on the other hand, mention the absence of other factors such as democracy and proper institutions and that this could be influencing growth negatively instead (Akanni, 2007, p. 19-20, 22). Adjibolosoo S., Busari D., and Jerome A. continues on the same track by introducing investments and terms of trade and their implications on economic growth. They found that these factors have a positive impact on the growth process, while crude oil prices show the opposite. Results were not robust but significant (Afeikhena, Dipo and Senyo, 2009, p. 1).

The European Central Bank (ECB) assesses the effects of oil price shocks on the output of some developed countries. They find that oil prices have different effects towards output when it falls or rises, thus a nonlinear relationship is presented once again. This relationship is, in general and according to theory, believed to be linear, therefore they find this surprising. The results, however, differ for different countries. An increase in the price of oil in the UK is found to be significantly negative towards economic growth, while it in Norway is found to be promoting economic growth. Japan also seems to have a positive relationship between an increase in oil prices and economic growth (European Central Bank, 2004, p. 3, 5-6, 26-27). Elmi, Z. and Jahadi, M. analyzed how oil price shocks affect economic growth in the developed world from 1970-2008, specifically in countries located within the OPEC and OECD areas. They concluded that oil is important as a source of income for exporting countries as well as an input towards production in importing countries. Their results show that economic growth is affected by oil price shocks in all countries, but once again the size of these effects differ substantially (Elmi and Jahadi, 2011, p. 627, 634).

To a certain degree, these empirical studies are unanimous. Most of them agree on oil rents having an effect on economic growth, although how and to what extent this happens differs. In African countries, one study concludes that oil prices do not promote economic growth, and in another that it actually has a negative effect instead. If we, on the other hand, turn our focus towards the more developed world we find that crude oil prices affect economic growth, but as mentioned before to different magnitudes. With the support of these studies, we would then expect to find none or a negative effect towards economic growth in African countries if we believe that oil rents can be a good estimator for the importance of oil exports. Although, since most of these studies are based from countries where the oil sector is relatively large, such as OPEC members or OECD, we can also expect to find a positive relationship towards economic growth in some Sub-Saharan Africa countries, where we observe a large oil dependence.

3.3 Resource Curse

Regarding the concept of a 'resource curse' in developing countries, Karl, L. tries to explain the causes and why it is often significant in empirical studies. He explains the resource curse as countries that become overly dependent on oil revenues, instead of possessing minerals or other fuels. This dependence can be measured as the ratio of oil exports to GDP, which we are using as our dependent variable later in our regression analysis. He also presents results from a study of OPEC members from 1965-1998 showing a decrease in GDP each year, in contrast to developing countries without oil who grew on average. This shows that the higher the dependence on oil and other resources, the worse the growth performance (Karl, 2005, p. 22-23).

Magud, N. and Sosa, S. explain the Dutch disease as one of the causes for the resource curse and present how this phenomena was born. The Netherlands discovered oil and gas in the 1960s, which led to drastic increases in wealth. Furthermore, oil prices rose, and the demand for it grew. This, in turn, raised the prices of other non-tradable goods, which made the Netherlands less competitive in regards to their other exporting sectors. This effect was later named 'the Dutch disease'. In more recent studies, Sosa and Magud have analyzed over 60 papers treating the Dutch disease and concluded that this concept does in fact exist. It can lead to a decline in exchange rates, reducing exports and outputs of other sectors. Although there is no clear evidence that it actually reduces economic growth. Instead, they found the possibility of misalignment or overvaluation being the main causes of less economic growth (Magud and Sosa, 2011).

These previous studies regarding this phenomenon is relatively united. In developing countries it is hard to find evidence for such a phenomenon since their oil dependence is less than for example an OPEC member where evidence show that more oil exports result in declining economic growth. It is also concluded that 'the Dutch disease' as one of the causes for the resource curse exists but that there is no evidence of a reduction in economic growth, only a decline of other exporting sectors.

4. Data

The set of data used ranges from the years 1983-2010 and consists of 14 countries located in Sub-Saharan Africa. These countries all vary in size, location and the respective size of the oil sector. As our data stretches both over several different countries and a chosen time period, we use panel data as our measurement method. This is a multi-dimensional approach which consists of a combination of cross-sectional data and time series. Our dependent variable is economic growth (GDP growth) per capita and it depends on the value of total oil exports in relation to total GDP. Economic growth was gathered through the World Bank and their database World Developments Indicators and is calculated as annual percentage growth rate of GDP per capita. We transformed this data by finding its natural logarithm. This is important as the original economic growth trend is exponential and thus harder to use and interpret in our final regression. Taking the natural logarithm of economic growth per capita facilitates the analysis as we end up with a linear trend instead (Krauth, 2004, p. 1-2).

Apart from these two important variables, a few others had to be controlled for in order for the regression to be appropriately fit for the data. When choosing what variables to control for, we took into account certain regional issues and factors which could potentially harm or affect economic growth in other ways. These are variables such as democracy, institutions, investments, openness, life expectancy, exchange rate, infrastructure, years of schooling and government consumption. Based on the endogenous growth model and the current political and socio-economic situation in Sub-Saharan Africa, we chose to control for all of these variables in our regression. In addition, previous empirical research and the endogenous growth model both have confirmed the use of many of these variables as they have been shown to affect economic growth.

4.1 Independent Variable

The independent variable in our model is the value of oil exports as a ratio of GDP. A reason why we chose to look at the ratio instead of simply the value of total oil exports is that we have then made sure to control for the size of the economy. Otherwise we could have ended up with unbalanced data and the results would have been harder to interpret in general due to large economic differences within the countries. According to the resource curse theory, an increased ratio weakens the strength of the other exporting sectors due to an overvalued currency and thus reduces competitiveness and economic growth (Karl, 2005, p. 23-24).

The variable was calculated by dividing the value of total oil exports with each country's GDP annually. Data on the value of total oil exports could be collected through IMF and their database World Economic Outlook (WEO) from 2012. These values are equal to the price per unit of quantity of oil exports multiplied by the number of quantity units and are measured in billions of U.S. dollars. In order to look at the importance of these exports in relation to GDP, we then divided the values once again with each country's total GDP to retrieve the ratio.

4.2 Control Variables

It is important to include control variables in the regression as it is crucial to remove some of the underlying differences which are not already being controlled for in the independent variable. These additional variables function as stabilizers and make sure that as much as possible of the change in the dependent variable can be explained by the change in the independent variable. In other words, the control variables are a part of the regression as they are believed to have explanatory power in the change of the dependent variable. We have based our choices of control variables on relevant economic theory and previous empirical literature connected to our region of choice.

4.2.1 Democracy

The reason why democracy is an important factor which cannot be overlooked is because many of the countries in Sub-Saharan Africa struggle to try and maintain or develop well-functioning and modern political systems. They are often plagued by corruption or too few democratic elections (The Economist, 2011). Values on democracy could be found in the Polity IV Project dataset provided by the Center for Systemic Peace. These numbers are valued on a scale from -10 (hereditary monarchy) to +10 (consolidated democracy) annually. The dataset and numbers are based on executive recruitment, constraints on executive authority and political competition (Center for Systemic Peace, 2015).

4.2.2 Institutions

A measure of institutional quality is provided by Penn World Tables 7.1 and looks at the constraints on decision-making powers of chief executives. This goes for both individuals and collectives. It functions as a ranking system where higher numbers correspond to better/higher institutional quality. The variable is particularly important to look at as research has shown a clear positive relationship between GDP per capita and average protection against risk of expropriation (better economic institutions) (Acemoglu, Johnson and Robinson, 2005, p. 402-403).

4.2.3 Investments

Investments are included in the endogenous growth model as a measure of real capital and therefore needs to be a part of our regression**.** Investments are measured as percentage shares of GDP and the variable is one of the fundaments in the endogenous growth model. The theory behind this is that technological progress is the main driving force of economic growth, which in turn is promoted by an increase in investments in the form of real capital. In other words, more investments tend to facilitate technology absorption in a country (Borensztein, Gregorio and Lee, 1997, p. 116-117). This variable is gathered from Penn World Tables 7.1.

4.2.4 Openness

Openness is also included in the endogenous growth model as a measure of productivity of human capital. As a result of this, it is also incorporated in our regression. It shows the length to which a country is involved in international trade. By looking at total imports and exports in relation to GDP these values can be generated. This factor is important due to its implications on economic growth. Greater participation in international trade has been proven to lead to increased GDP growth as a result of technological change and increased market size for producers which in turn raises innovation and growth (Harrison, 1995, p. 419-420). Values on openness were calculated through adding the import and export ratios of GDP. It is found in the World Development Indicators dataset.

4.2.5 Life Expectancy

The relationship between life expectancy and growth can be explained by short-sighted behavior. A low expectancy would therefore reduce investments and savings and in turn growth as people do not invest for future purposes. Furthermore, higher life expectancy creates incentives for people to invest in human capital such as education which is fruitful for economic growth in the long run (Lorentzen, McMillan and Wacziarg, 2005, p. 5-9). This variable is measured in years and counts from birth. It is gathered from the World Development Indicators.

4.2.6 Exchange Rate

Another factor which influences economic growth is the exchange rate. This is particularly important to include in our case as a control variable simply because developing countries rely on this to a greater extent than more developed countries. This is due to market failures and lower institutional quality, which many developing countries experience. An undervaluation of the local currency has been proven to increase relative profitability of investments in tradable, and in turn have positive implications on economic growth (Rodrik, 2008, p. 22). Moreover, this variable is important in the analysis of the Dutch disease as it explains currency overvaluation. The exchange rate is measured as the value of the local currency towards US Dollars. It is gathered from Penn World Tables 7.1.

4.2.7 Infrastructure

Measuring the general level of infrastructure in a country can be difficult, especially deciding what specific variable to look at. We use a proxy in the form of the number of telephone lines in our countries in order to try to determine this level of development. This was chosen over other proxies such as internet users and mobile cellular subscriptions due to the current level of development in the Sub-Saharan African region. The reason why we need to look at infrastructure is because it represents the success of activities and investments in manufacturing and infrastructure in a country. Investments in infrastructure also promote economic growth through social support advances in the form of health, education and other services (The World Bank, 2015). The data on this variable consists of the sum of active numbers of analogue fixed telephone lines and similar voice-over connections. It is gathered from the World Development indicators.

4.2.8 Years of Schooling

Years of schooling is included in the endogenous growth model as a measure of human capital and therefore needs to be in our regression. Furthermore, according to Barro, J. (2003), there is a proven relationship between an increase in years of schooling and higher economic growth. Notable in this case though, is that the data does not include any measures of quality, but simply counts as the number of years males and females above 15 years of age choose to stay in school. The measure is also an average over 5 years at a time. It is gathered from Penn World Tables 7.1.

4.2.9 Oil Rents (price)

As previously mentioned, the price of oil is of importance in the analysis of economic growth and oil exports. It has been included in the majority of the previous research papers due to the simple fact that it is one of the main driving forces behind fluctuations in terms of trade. Further on, we will discuss the relevancy of oil rents in our paper, and why it might not be of interest for us to include (section 6.3). This was gathered from the World Development indicators.

4.2.10 Government Consumption

Our final control variable, government consumption, is included as a control variable due to its implications on economic growth. Two famous empirical studies have been made to explain this relationship by J. Barro (2003) and B. Grier, Tullock (1989) as government consumption being negatively correlated to economic growth. It is measured as a share of purchasing power parity (PPP) converted GDP per capita at 2005 constant prices. It is gathered from Penn World Tables 7.1.

4.3 Data-related issues

Dealing with Sub-Saharan Africa as a region can be problematic at times, mainly due to issues related to validity and availability of data. Fortunately, we did not suffer much from these problems, apart from a few missing values in the dataset World Development Indicators provided by the World Bank. The absence of these values is shown in the descriptive statistics figure (Figure 8.1) and had to do with some GDP per capita growth numbers not being available in certain countries. As a result of many countries in Sub-Saharan Africa sometimes being very corrupt and lacking proper institutional stability, issues like these were also something we expected to encounter when collecting data. It is central to understand though, that World Development Indicators is the most current and accurate dataset available today, which naturally makes it our primary source of development data (The World Bank, 2015). We chose to let Stata handle this issue automatically meaning that these values are dropped and not included in our regression.

5. Method

Analyzing the methodological approach is a crucial part of our study as it determines the end-result and how we are should interpret the effect of our variables on economic growth. We will explain and discuss the endogenous growth model and present our regression in this section. The included variables will also be further considered in this part. Moreover, some econometric issues are mentioned and dealt with.

5.1 Regression

As mentioned before, we are dealing with panel data, which is preferable in our case due to it including both cross-sectional (differences between countries) and time series (changes over time) data. All of the control variables in the previous section will be incorporated in our regression model together with the independent variable to be able to control for several other factors which might affect the change in GDP growth per capita. The regression will therefore have the following appearance:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \cdots + \beta_k X_{k,it} + u_{it}$$

Where:

Y_{it} is the dependent variable, where i = country and t = time.

B_0 is the intercept of the dependent variable

X_{it} is our independent variable.

B_1 is the coefficient for our independent variable.

U_{it} is our error term.

5.1.1 Fixed Effects

We are interested in how our independent variable, the ratio of the value of oil exports on GDP, affects our chosen countries overall economic growth. Thus, we are interested in examining variables that vary over time. Fixed effects helps us identify and control for effects which are not seen nor controlled for with our control variables. These can, for example, be region-specific conditions which are only apparent in Sub-Saharan Africa and within all of our countries of choice (Borenstein, Hedges and Rothstein, 2007, p. 29-30). These effects are captured as an intercept in the variable α_i in our regression.

$$Y_{it} = \beta_1 X_{it} + \cdots + \beta_k X_{k,it} + \alpha_i + u_i$$

Where:

α_i (i=1...n) is the unknown intercept for each country (fixed effect of being in state i)

Y_{it} is the dependent variable, where i = country and t = time.

X_{it} is our independent variable.

B_1 is the coefficient for our independent variable.

U_{it} is our error term.

5.1.2 Control Variables

We will include control variables in the regression with the purpose of removing some underlying differences that are not controlled for with the independent variable. Thus, we want to see if the independent variable can actually explain the change in the dependent variable or if this is a coincidence. As mentioned before, these consist of other factors surrounding the dependent variable which could in fact alter the end-result if not controlled for.

5.1.3 Multicollinearity

In a multiple regression, when several variables are included, there is a risk that the variables are correlated and give results which are misleading. We need to investigate if there is a correlation or not. In practice, multicollinearity increases the standard errors for the independent- and control variables and therefore may make these variables statistically insignificant. It is therefore of importance to rule out such correlation to get statistically significant variables (Institute for Digital Research and Education, 2015). We can control for this with the help of a correlation matrix in Stata which shows to what degree all of the variables are correlated with each other. Correlation values can assume values ranging from -1 to 1, depending on if a variable affects another positively or negatively. In the correlation matrix shown in appendix 8.2.4 we observe relatively low correlations between all variables, with the exception of oil rents in relation to the oil exports ratio, which was expected.

5.1.4 Heteroscedasticity

Heteroscedasticity occurs when the variation in the error term is unequally distributed. In other words, the variability of a variable is unequal across all data of another variable that predicts it. So, the variability of some dependent variable increases or decreases if the value of the independent variable (Long and H. Ervin, 1998, p. 2-3). When we use data from countries of different sizes, it is a chance that the error term might be different depending on a country's size. We test for this through a Wald-test where we observe the presence of heteroscedasticity since the "prob>chi2" value is 0,0000. Thus, we reject the null hypothesis about homoscedasticity (constant variance). Since this is the case we use the option "robust" in our regression to obtain heteroscedasticity-robust standard errors. In other words, a Huber/white estimation (Torres-Reyna, 2007, p. 27).

6. Results

In this part we will interpret and present the outcome of our regression and later on discuss the importance and meaning of these results. We begin our first regression by isolating the oil exports to GDP-ratio (our independent variable) in order to show its relevance to economic growth. We then include our control variables as it is crucial to remove some of the underlying differences which are not already being controlled for with the independent variable. Hopefully we will be able to relate the presented results to previous empirical evidence and relevant theory. This will be further discussed in the final section. Our regression results in terms of significance are shown in table 6.1.

Table 6.1 – Regression results

	Only independent variable	All variables	All variables apart from oil rents
Oil export ratio	0,428	0,050**	0,094*
	0,003	0,0077	0,0066
Years of Schooling		0,071*	0,11
		0,13	0,14
Investment of GDP		0,019**	0,032**
		0,87	0,973
Exchange rate		0,032**	0,031**
		0,00009	0,00009
Life Expectancy		0,955	0,901
		0,02604	0,0279
Government consumption		0,73	0,99
		0,02339	0,02082
Institutions		0,036**	0,033**
		0,0389	0,0396
Democracy		0,033**	0,031**
		0,03938	0,0402
Oil rents		0,516	
		0,01504	
Openness		0,88	0,665
		0,00258	0,003132
Infrastructure		0,75	0,775
		0,156511	0,1569
Observations	302	302	302
R2	0	0,0171	0,025

Regressions in detail in appendix 8.3

Level of significance:

**p<0,1, Coefficient is significant at 10 % - level*

***p<0,05, Coefficient is significant at 5 % - level*

****p<0,01, Coefficient is significant at 1 % - level*

6.1 Economic Growth and Oil Exports as a ratio of GDP

When only including the ratio of oil exports on GDP in our regression to show to what degree it can explain changes in economic growth, we end up with a positive and significant p-value at a 10%-level. This means that an increase in oil exports by one unit will increase economic growth by 0,0067 percent. Looking at previous research, we expect a positive relationship between these two factors to be apparent. In other words, an economy which is dependent on oil exports to a greater extent is believed to experience higher economic growth (section 3.3).

The reason why we chose to look at the relationship between only these two variables is that we want to see how big part of the economic growth which can already be explained simply by including the ratio. According to our results, the connection is significant but to a lesser extent. Hereafter we will include other factors influencing GDP growth per capita, which will hopefully render a more accurate and significant result. The positive sign in front of the coefficient is still of importance though and proves the relationship mentioned before.

6.2 Including all control variables

Running a new regression where we include all of the control variables, gathered from the endogenous theory and earlier research, gives us an independent variable with a p-value of 0.050, implying that it is significant at a 5%-level, and therefore can explain changes in our dependent variable, economic growth. We can also note that our β-value is positive, which means that there is a positive relationship between the two variables. Thus, an increase in oil exports by one unit will make economic growth increase by 0,0167474 percent since this variable takes the form of its own natural logarithm.

According to the endogenous theory, these increasing oil revenues can be used to invest in real capital and human capital which will increase economic growth, as can be seen in equation 2.1 and 2.2. If they invest in human capital, such as infrastructure and education, they will also reach a point where they can acquire more technology from nearby countries, increasing their economic growth even more. However, this is something we cannot conclude from only a regression.

Regarding our initial hypothesis and empirical research, the resource curse should show a declining GDP each year. Thus, higher dependence on oil exports should lead to less growth. Our findings, however, do not support this research. For the countries included in our regression, oil exports have a positive effect on economic growth when we control for a country's size through looking at oil exports as a ratio of GDP. Hence, we find evidence against our initial hypothesis.

Our paper focuses on how oil exports affect economic growth in Sub-Saharan Africa. However, it can also be of interest to look at our significant control variables, which were chosen as they act to explain the remaining part of the economic growth outlook in Sub-Saharan Africa. As we chose the endogenous growth model as our framework, we have included the three fundamental variables which affect GDP per capita accordingly. These are years of schooling, investments and openness. Two of these turned out to be significant. Investments is significant with a p-value of 0,019 and also showed a positive β-value. An increase in investments by 1 unit will make economic growth increase by 2,342675 percent. Years of schooling showed less, but significant results at a 10%-level with a p-value of 0,071. An increase in years of schooling by 1 unit will make economic growth decrease by -0,2622 percent.

As mentioned before, we also observe significant results in other control variables. Exchange rate is significant at a 5%-level and has a p-value of 0,032, it also shows a positive β-value. So when the exchange rate increases by 1 unit, economic growth in turn increases by 0,0002286 percent. Institutions is significant at a 5%-level and has a p-value of 0,036. It also has a negative β-value. Thus, an increase in institutions by 1 will decrease economic growth by 0,0910707 percent. Democracy is significant at a 5%-level and has a p-value of 0,033. Democracy shows a positive β-value, meaning that an increase by 1 unit increases economic growth by 0,0936921 percent.

It is important not only to look at the variables in the regression and their corresponding p- and β-values, but also at other signs of decency of our model. We can derive proof of this directly from the results of the regression. As can be in appendix 8. by “corr(u_i, Xb)”, the error term u_i is correlated with the regressors to a negative degree of 0,5357. “Prob > f” can be viewed as a measure of how suitable our model is. If the number is less than 0,05, the model can be seen as well-suited for our dataset. In our regression we can see that our model has a number below that (0,0000) which proves it fit for our study (Torres-Reyna, 2007, p. 19-20). Furthermore, the value of ‘R-squared’ shows how much of the real change in economic growth that we are explaining with our model. Although we are aware that this value is very small (0,0171), we believe that this might be a result of the generally low values of oil exports to GDP ratios.

6.3 All variables apart from oil rents

The reason why we chose to include a regression when excluding oil rents (oil price) is because this variable is highly correlated with our independent variable, the ratio of oil exports on GDP which is shown in appendix 8.2.4. This is not surprising at all, as one could argue that the ratio already contains information about oil rents. We realize that this might be the case, but still chose to regress once more while incorporating oil rents due to its importance in previous studies and according to empirical literature.

The variables in our new regression (excluding oil rents) are not affected to any great extent. We identify the same significant control variables with little changes in their respective p-values. What does change though, is the significance of our independent variable, which is now showing significance at a 10%-level with a p-value of 0,094. Thus, an increase in oil exports by one unit will make economic growth increase by 0,01203 percent. When we exclude oil rents, our independent variable will increase economic growth by less than in our regression with all control variables. However, our model is still suitable and the R-squared value has almost doubled (0,025), meaning that we are now explaining more of the change in economic growth.

7. Conclusion

The lack of empirical studies regarding oil exports and economic growth in Sub-Saharan Africa and the fact that the oil-boom has attracted interest all around the globe made us interested in looking into this topic. Since it has been proven that a resource curse is often apparent in countries with an abundance of oil, we chose this as our overall hypothesis. Thus, we believe that when an oil sector emerges in a Sub-Saharan African country, their economic growth will shrink. Furthermore, since this hypothesis has not yet been as apparent in developing countries as others due to lack of research on the subject, we found it legitimate and interesting to cover in our study.

As can be seen in our theoretical framework, economic growth is an important instrument in several comparisons across countries in regards to economic development. Therefore, we used an endogenous growth model in our analysis with oil included as the main independent variable. How it moreover affects economic growth depends on how the government chooses to use these revenues for different productive purposes. In this regard, the region is struggling to develop and maintain institutional quality and establish democracy.

Not only is the Sub-Saharan region enduring political and social instabilities, it is also suffering from a slow technology-advancement process due to few investments, which is crucial for promoting economic growth. As a result of this, our endogenous growth model is a good fit as it focuses on the absorption of technology from nearby countries instead of an isolated accumulation within the country. Important variables for economic growth are presented in equation 2.6, and these are real capital variables such as investments, human capital variables in the form of openness (ability to absorb technology) and years of schooling. These variables are highly important for economic growth and therefore included as control variables in our regression. Investments and years of schooling turned out to be significant, which proves the relationship with economic growth as theory suggests. However, openness as a measurement of human capital productivity instead turned out to be insignificant and leaves us unable to prove any relationship between these and our dependent variable. As openness is measured through exports plus imports divided by GDP, we believe that there is a possibility that these numbers are too small in the chosen countries, or the technology available to absorb from nearby countries is non-existent, and therefore this do not affect economic growth.

The resource curse has been proven in previous research to be of importance for a country's economic performance. Karl, L. showed this in a study on the member countries of OPEC, where a higher oil dependence took over other sectors and thus led to a decline in economic growth. Our results, however, show a significantly positive relationship between oil exports as a ratio of GDP and economic growth. This implies that increased oil exports will raise economic growth, which is the opposite of what our hypothesis says. The reason behind this we expect has to do with the fact that oil is a relatively new source of income and production in Sub-Saharan Africa, and that it still accounts for a too small part of each of the smaller country's GDP. In other words, the oil sector is still too small to affect GDP growth in a manner replicating the Dutch disease.

One can therefore, with the support of our results, argue that oil exports are beneficial for countries located in Sub-Saharan Africa to a certain degree. Since we have looked at years ranging from 1983-2010, it is possible that a similar analysis in the future will show traces of a resource curse, provided that the oil sector gains more influence.

Even if our findings prove a relationship between oil exports as a ratio of GDP and economic growth there are other important factors to take into account. As our data shows, democratic and institutional values in all Sub-Saharan African countries are relatively small. It is important to note that these measures are the only ones available and that it is hard to accurately measure the quality of these factors. As a result this, corruption is expected to dilute real investments coming from economic growth. This makes GDP growth a somewhat problematic measure since it only looks at, as stated in the introduction, the level of production directly reported to the government.

To make this analysis trustworthy it is also of interest to include some data-related issues. Since we are dealing with Sub-Saharan Africa as a region, availability and reliability of data can be an issue. As previously mentioned, the most up-to-date and accurate dataset available is the World Development Indicators which we chose to utilize. Although we did bump into some obstacles, the missing values appeared just after 1983 for some countries - and were expected since many Sub-Saharan African countries are suffer from corruption and institutional instability.

In conclusion, our results are in line with many of the empirical studies we have previously introduced. We have shown that an increase in oil exports as a ratio of GDP will generally lead to higher economic growth. However, we found evidence against a resource curse. This has been debated in previous studies and their findings have proved the existence of such a phenomena in countries which are heavily reliant on oil production as a source of income. Since Sub-Saharan Africa is a relatively under-developed region where oil exports are expected to yet reach their peak, it is possible that we will observe a resource curse in the future.

8. Appendix

8.1 Derivation of Equilibrium GDP per capita

$$\tilde{y} = \frac{Y}{hL} = \frac{K^{\alpha}(hL)^{1-\alpha}}{hL^{\alpha}hL^{1-\alpha}} = \tilde{k}^{\alpha}$$

$$\dot{\tilde{k}} = \frac{\dot{K}}{hL} = \frac{K}{hL}\left[\frac{\dot{K}}{K} - \frac{\dot{h}}{h} - \frac{\dot{L}}{L}\right] \rightarrow \frac{K}{hL}[\frac{sY - \delta K}{K} - g_h - n]$$

$$\rightarrow \frac{sY - \delta K}{hL} = (g_h + n)\tilde{k} \rightarrow s\tilde{y} - (\delta + g_h + n)\tilde{k}, \dot{\tilde{k}} = 0 \; in \; equillibrium$$

$$\rightarrow s\tilde{k}^{\alpha} = (\delta + g_h + n)\tilde{k}$$

$$\rightarrow \tilde{k} = (\frac{s}{(\delta + g_h + n)})^{\frac{1}{1-\alpha}}$$

$$y = (\frac{s}{(\delta + g_h + n)})^{\frac{\alpha}{1-\alpha}}, because \; y = \tilde{y} \cdot h$$

$$\frac{\dot{h}}{h} = \mu e^{\psi u}(\frac{A}{h})^{\gamma} = g \; in \; equillibrium \; \leftrightarrow h^{\gamma} = \left(\frac{\mu e^{\psi u}}{g}\right)A^{\gamma}$$

$$\leftrightarrow h = (\frac{\mu e^{\psi u}}{g})^{\frac{1}{\gamma}} \cdot A \rightarrow$$

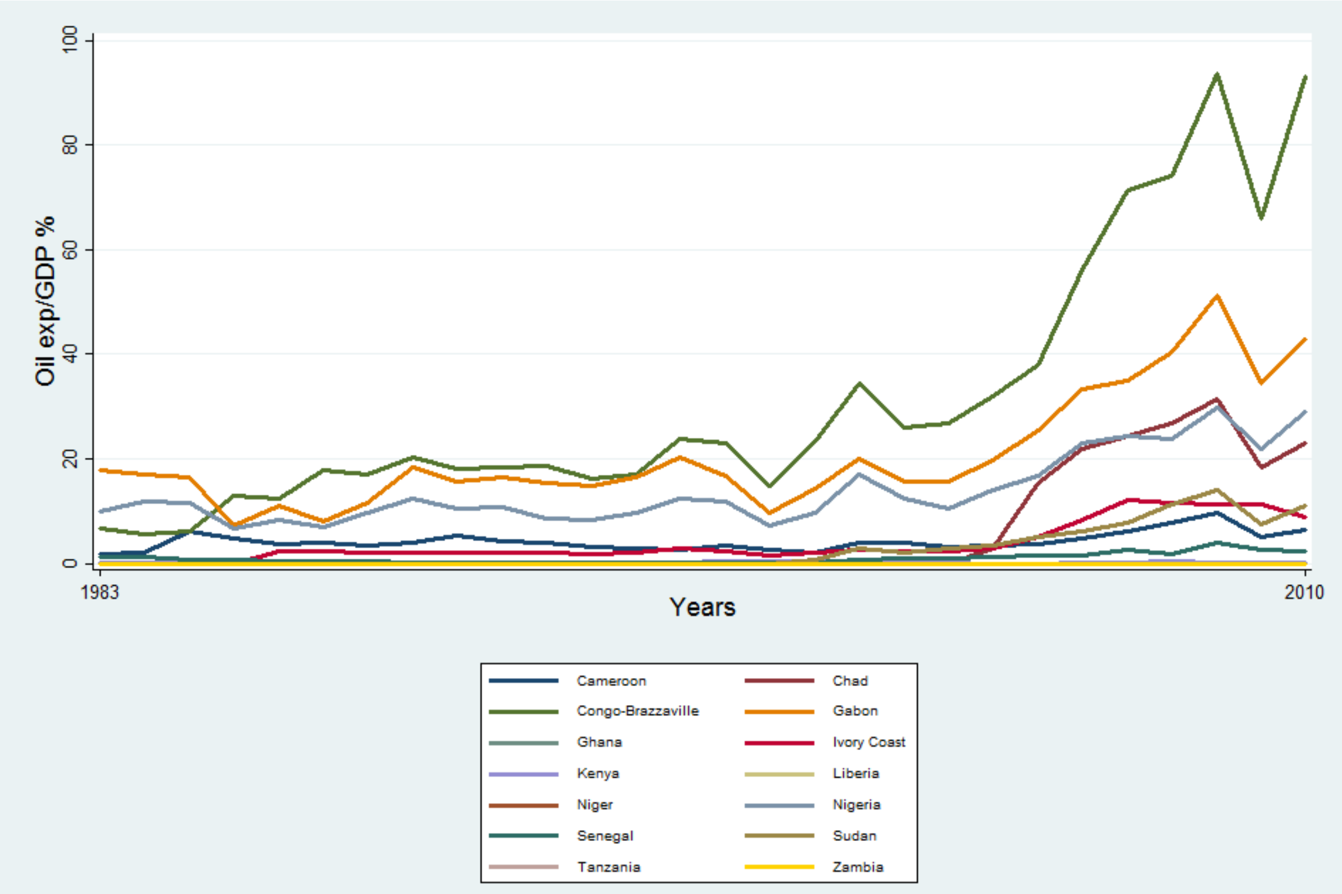
$$y^{*}(t) = \left(\frac{s_K}{n + g_A + \delta}\right)^{\frac{\alpha}{1-\alpha}}\left(\frac{\mu}{g}e^{\psi u}\right)^{\frac{1}{\gamma}}A^{*}(t)$$

8.2 Figures

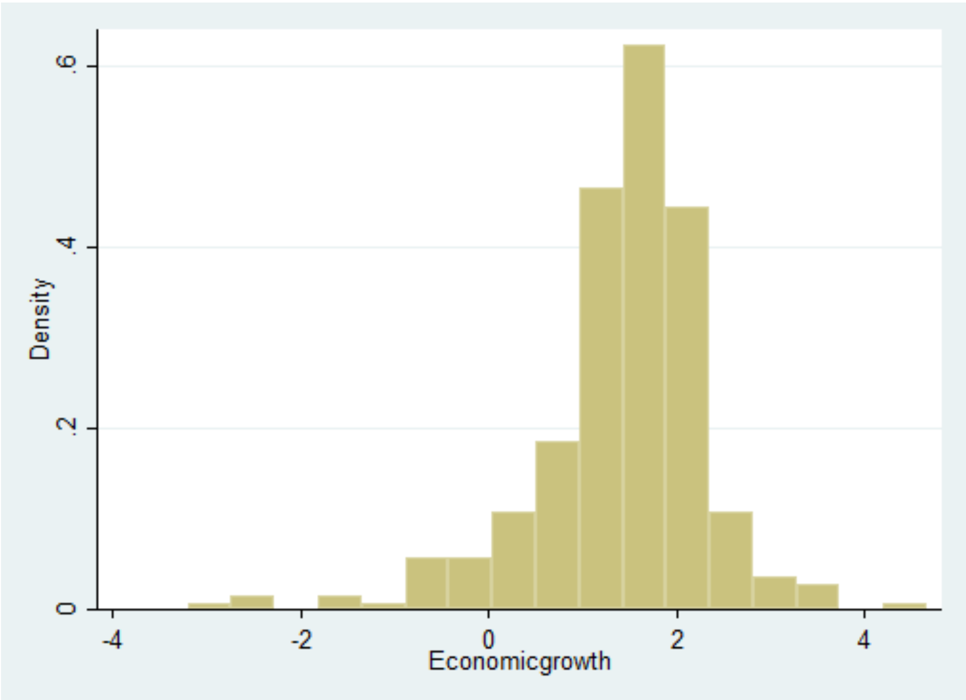
8.2.1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Years	392	1996.5	8.08807	1983	2010
Oilexpratio	392	6.003577	12.31401	0	93.63988
Yearschool	392	4.361385	1.69566	.7740021	8.17
InvestGDP	392	.1557544	.084341	.007238	.5381295
Exchangerate	392	399.5813	728.624	.0008825	5046.109
Lifeexp	392	52.68406	5.317468	40.77578	62.84188
Govcons	392	12.65263	11.45564	.9	58.64
Institutions	392	-3.431122	22.64889	-88	7
Democracy	392	-4.25	22.51226	-88	8
Oilrents	392	10.84846	17.92593	0	75.70786
Openness	392	61.66982	30.96951	0	179.1209
Economicgr~h	302	1.430809	.9190816	-3.19601	4.666075
Infrastruc~e	392	10.9547	1.455699	7.056175	14.33904
Country1	392	7.5	4.03628	1	14

8.2.2 Variation in Oil exports as a ratio of GDP across countries



8.2.3 Variation in GDP growth per capita across countries



8.2.4 Correlation Matrix

	Years	Oilexp~o	Yearsc~l	Invest~P	Exchan~e	Lifeexp	Govcons	Instit~s	Democr~y	Oilrents	Openness	Econom~h	Infras~e	Country1
Years	1.0000													
Oilexpratio	0.2717	1.0000												
Yearschool	0.3539	0.3138	1.0000											
InvestGDP	0.2386	0.2726	0.3231	1.0000										
xchangerate	0.2399	-0.1256	0.1517	0.2299	1.0000									
Lifeexp	0.1704	0.1069	0.3287	0.3822	-0.2768	1.0000								
Govcons	-0.1290	-0.0997	-0.5291	-0.0390	0.0504	-0.3642	1.0000							
nstitutions	0.0328	-0.0128	0.1297	0.1650	0.0589	0.1798	-0.0946	1.0000						
Democracy	0.0602	-0.0265	0.1324	0.1705	0.0689	0.1861	-0.1009	0.9979	1.0000					
Oilrents	0.1145	0.8343	0.2884	0.2651	-0.1706	0.0730	-0.1620	0.0303	0.0144	1.0000				
Openness	0.2477	0.5132	0.3972	0.3510	-0.0305	0.1361	-0.1999	-0.0201	-0.0178	0.5324	1.0000			
conomicgr~h	0.1195	-0.0017	-0.0276	0.1082	0.0932	0.0272	0.1002	0.0622	0.0745	-0.0024	0.0168	1.0000		
nfrastruc~e	0.3608	-0.0995	0.3846	-0.1250	0.0161	0.1577	-0.4714	0.1015	0.1058	-0.0996	-0.2318	-0.1570	1.0000	
Country1	0.0584	-0.3282	-0.1343	-0.1502	0.3170	-0.1030	-0.1146	0.1379	0.1476	-0.3526	-0.3312	0.0181	0.3659	1.0000

8.3 Regressions

8.3.1 Solely independent variable

```
Fixed-effects (within) regression               Number of obs      =       302
Group variable: Country1                        Number of groups   =        14

R-sq:  within  = 0.0050                         Obs per group: min =        13
       between = 0.0272                                        avg =      21.6
       overall = 0.0000                                        max =        27

                                                F(1,13)            =      0.67
corr(u_i, Xb)  = -0.1980                        Prob > F           =    0.4278

                              (Std. Err. adjusted for 14 clusters in Country1)
```

Economicgr~h	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Oilexpratio	.0067745	.0082771	0.82	0.428	-.0111071	.024656
_cons	1.38738	.0530613	26.15	0.000	1.272748	1.502012
sigma_u	.53842839					
sigma_e	.82600169					
rho	.29819988	(fraction of variance due to u_i)				

8.3.2 including all variables

```
Fixed-effects (within) regression               Number of obs      =       302
Group variable: Country1                        Number of groups   =        14

R-sq:  within  = 0.0937                         Obs per group: min =        13
       between = 0.0085                                        avg =      21.6
       overall = 0.0171                                        max =        27

                                                F(11,13)           =     36.48
corr(u_i, Xb)  = -0.5357                        Prob > F           =    0.0000

                              (Std. Err. adjusted for 14 clusters in Country1)
```

Economicgro~h	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Oilexpratio	.0167474	.0077441	2.16	0.050	.0000172	.0334776
Yearschool	-.262242	.1331205	-1.97	0.071	-.5498315	.0253474
InvestGDP	2.342675	.8788178	2.67	0.019	.4441047	4.241246
Exchangerate	.0002286	.0000952	2.40	0.032	.000023	.0004343
Lifeexp	.0014851	.0260451	0.06	0.955	-.054782	.0577522
Govcons	-.0082393	.0233933	-0.35	0.730	-.0587775	.0422989
Institutions	-.0910707	.038943	-2.34	0.036	-.175202	-.0069395
Democracy	.0936921	.0393819	2.38	0.033	.0086127	.1787715
Oilrents	-.0100573	.0150446	-0.67	0.516	-.0425592	.0224447
Openness	-.000398	.0025875	-0.15	0.880	-.0059879	.005192
Infrastruct~e	.0509805	.1565117	0.33	0.750	-.2871426	.3891035
_cons	1.702273	1.532516	1.11	0.287	-1.608527	5.013072
sigma_u	.65987518					
sigma_e	.80241494					

8.3.3 All variables apart from Oil Rents

```
Fixed-effects (within) regression               Number of obs      =       302
Group variable: Country1                        Number of groups   =        14

R-sq:  within  = 0.0901                         Obs per group: min =        13
       between = 0.0027                                        avg =      21.6
       overall = 0.0250                                        max =        27

                                                F(10,13)           =      6.86
corr(u_i, Xb)  = -0.4989                        Prob > F           =    0.0010

                              (Std. Err. adjusted for 14 clusters in Country1)
```

Economicgrowth	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Oilexpratio	.0120316	.0066525	1.81	0.094	-.0023403	.0264035
Yearschool	-.2464584	.1436121	-1.72	0.110	-.5567136	.0637967
InvestGDP	2.333828	.9738357	2.40	0.032	.2299843	4.437672
Exchangerate	.0002315	.0000956	2.42	0.031	.000025	.000438
Lifeexp	.0035522	.0279342	0.13	0.901	-.0567959	.0639004
Govcons	.0002585	.0208206	0.01	0.990	-.0447216	.0452387
Institutions	-.0947664	.0396988	-2.39	0.033	-.1805305	-.0090022
Democracy	.0974182	.0402007	2.42	0.031	.0105698	.1842666
Openness	-.0013864	.0031326	-0.44	0.665	-.0081539	.0053811
Infrastructure	.0458927	.1569048	0.29	0.775	-.2930794	.3848649
_cons	1.456118	1.777785	0.82	0.428	-2.384553	5.296788
sigma_u	.64204728					
sigma_e	.80257098					
rho	.39023686	(fraction of variance due to u_i)				

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9.1 Databases

Center for Systemic Peace, Polity IV Project

IMF, World Economic Outlook (WEO) from 2012

Penn World Tables 7.1

The World Bank, World Development Indicators