The curse that plagues the content of Africa.

In-depth analysis of the resource curse and policy recommendations to avoid it.

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Masters Dissertation

Abstract

The resource curse is a phenomenon that is both paradoxical and controversial. It is argued that the curse both exists and is a construct of western discrimination. The resource curse as coined first by Auty (1993) claims that an increase in natural resource growth will cause a decrease in domestic growth should certain factors exist. This paper examines the nature of the curse and empirically demonstrates the true nature of this occurrence. Furthermore, this paper engages with some of the factors that cause this curse to rear its head. It proposes policy recommendations that will help nations create GDP growth when faced with increasing resources and avoid some of the pitfalls other economies have suffered.

The first section of this paper tests the existence of the resource curse empirically using Sachs and Warner(Warner, 1997), Gylfason (2001) and Manzano and Rigabon (2001). We prove the existence of the curse in African developing countries and show the severity of the curse. Moreover, the section assesses the severity of the curse in each economy and provides indications as to how drastic the presence of the curse is.

Moreover, section two of the paper examines some of the root causes of the resource curse. We examine the resource pull effect, degrading of human capital as well as lack of savings. We test these results empirically using Mehlum Moene Torvik (2006), Oskenbayev et al (2013) and Gylfason and Zoega (2004). Furthermore, we construct an optimum model that both diagnoses the resource curse as well as indicates some of the potential causes in the given economy. We provide some Policy recommendations that can be taken in order to avoid some of these causes.

Contents

Introduction

1.1 Background of the study

The examination around natural resource endowment and its trade is one of the oldest debates in economics. Although, most economists have agreed that trade is no longer viewed as a "Zero Sum Game,"(Scott, 1993) there is nevertheless no consensus that natural resources exports lead to growth.

Old wisdom understood natural resources would lead to growth as it would stimulate the economy, create employment and be a means of exports. However, following Auty (1993) it is no longer clear that an increase in natural resources will necessarily lead to an increase in growth.

This paper will aim to assess the *Resource Curse* as coined by Auty (1994). He explains that an increase in natural resources can cause a decrease in the growth rate of GDP. This paper will assess these claims from an empirical standpoint in order to determine the extent of this relationship.

1.2 Motivation of the study

This study is motivated by the relative lack of empirical studies done on the resource curse in developing African countries on an individual level. Although many studies have included developing African countries in their cross-sectional panel data (Gylfason, Tryggvi and Gylfi, 1999; Sachs and Warner, 1999; Manzano and Rigobon, 2001; Humphreys, Sachs and Stiglitz, 2007), very few studies have looked at multiple countries individually. Furthermore, there is an ongoing debate in the literature both from an empirical perspective as well as theoretical as to whether there truly exists a resource curse. The study is further motivated by the unique situation that has evolved in African developing countries over the last thirty years. New discoveries of natural resources, primarily in western Africa, have changed the terrain in which previous natural resource curse studies have been conducted.

Moreover, there is a lack of consensus in the literature as to what causes the resource curse (Badeeb, Lean and Clark, 2017). Various studies have identified what they believe is the

primary cause of the resource curse and have tested and attempted to prove this using data. However, resource curse literature falls short when it comes to comparing causes of the resource curse models. There exist very few papers that compare competing models that explain the emergence of the curse in an attempt to isolate the root cause of the curse. Indeed, we have not found studies that isolate various causes that may be country or situation-specific.

1.3 Objective of the study

This study is an attempt to understand the impact of an increase in natural resources on the growth rate of economic growth. By investigating various resource curse empirical models, this paper will attempt to determine the success and accuracy of varying methodologies. Moreover, this paper will attempt to assess the underlying causes of the resource curse in order to be able to give policy recommendations.

By comparing Sachs and Warner (1995), Gylfason (2001) and Manzano and Rigobon (2001) the first section will investigate the existence of the curse. Four African countries have been chosen in order to compare these models. The paper looks to determine the best model for predicting the existence of the resource curse as well as identifying the intensity of the curse. This will allow for policy recommendations to both avoid the curse and extract an economy out of the curse.

The second section of the study further aims to determine some of the key factors that cause the resource curse. We compare models from Mehlum Moene and Torvik (2006) with Oskenbayev et al (2013) as well as Gylfason and Zoega (2004). This allows us to give individual policy recommendations for each country depending on the best model that explains the curse in the given situation. Moreover, we aim to build a model that encompasses all the best of each model in order to create a single model that can be used for any country looking to identify the resource curse and determine the best method to avoid the curse.

1.4 Countries of the study

South Africa is investigated due to its changing economic inputs since 1994. The end of apartheid in South Africa resulted in drastic changes in exports, GDP per capita and the general standard of living. (Lam and Wantchekon, 2002)

Ghana's unique resource curse is interesting in its own right. Ghana historically relied purely on agricultural exports. In the 1970s the discovery of gold changed the complexion of the Ghanaian economy and created a reliance on gold. In the early part of the twenty-first century, Ghana discovered oil. Ghana has constantly swayed from resource reliance and abundance to the resource curse. Then as the natural mineral seems to be depleted they discover a new natural resource. (Ofosu-Mensah, 2016)

Nigeria is one of the fasted growing economies in Africa. This is attributed primarily to the size of its population as well as its natural endowment of oil reserves. Interestingly, Nigeria was not open to trade in the original 1995 Sachs and Warner study and therefore was not exporting oil. Furthermore, the changing oil prices have had significant impacts on the country's economy and make the nation one worth looking at. (Sachs and Warner, 1995)

Botswana is the final country and economy that is assessed in this study. Botswana is blessed with an abundance of resources. However, according to Sachs and Warner and many studies that follow, Botswana does not exhibit the resource curse (Stevens, 2005). Our study aims to reassess this and validate whether there is a resource curse in this African exception and determine some reasons why their curse may not exist here.

1.5 Research problem

The research problem is a direct result of the studies conducted by Auty (Auty, 1993) which determined that there is not a positive relationship between resource endowment and economic growth. Following Sachs and warner (Sachs and Warner, 1995, 2001, 2009; Jian, Sachs and Warner, 1996; Warner, 1997) this paper investigates whether there is a resource curse in developing African countries. We look to establish the severity of the curse should it exist as well as determine some of the pathways that the curse takes in order to slow growth. Moreover, this study aims to determine whether changing circumstances in Africa have changed the results of previous models that determine the resource curse.

1.6 Research question

The following research problem arises with four main questions

i) Does the resource curse exist for African developing economies and if so what is the severity of the resource curse in developing African economies?
ii) What are some of the causes of the research curse?

1.7 Contribution of the study

This study contributes to the literature by comparing competing models to determine the existence of the curse. Moreover, this study determines measures for assessing the impact and severity of the curse. This study further contributes by comparing competing models in the literature in order to determine some of the causes of the research curse. This results in the study creating a hybrid model that encompasses all of the previous models and assistances in determining an individual diagnosis for each country.

1.8 Structure of the Study

The first section will assess the basic resource curse. This section will evaluate the curse and the ways to measure if the curse is present in a given economy. This paper will primarily focus on Africa and the effect of the curse on the continent. The paper looks at three countries in Africa each with unique problems and situations that each show signs of the curse. The paper considers South Africa, Ghana, and Nigeria. These countries have been chosen due to their unique situations as well as the relative accurate data available. Moreover, the paper will also assess the impact of the resource curse on Botswana, which is cited in multiple sources as an exception to the curse. (Deacon and Rode, 2015)

The second section will take a closer look at some of the causes of the curse. By assessing, some of the determinants of the curse this paper will aim to give policy recommendations to countries that are vulnerable to the curse. Moreover, by using our case studies of African countries this chapter will attempt to show concrete differences in Botswana that can be adopted in other African countries in order to avoid the resource curse.

Existence of the Resource Curse

2.1 Introduction

This chapter will examine competing theories in the literature as to the nature of the resource curse. The resource curse will be investigated using competing theories that measure both the presence of the curse but also its severity. By examining developing countries in Africa, this chapter will debate the extent to which the curse presents itself and underline some of the critiques associated with the curse. By comparing Sachs and Warner (2001) empirical assessment of the research curse to both Gylfason (2001) and Manzano and Rigobon (2001) this chapter determines the best method of measuring the presence and severity of the resource curse.

The resource curse is vital to diagnosis in developing African economies. We can observe historically that countries that have not identified and addressed the resource curse have suffered (Hammond, 2011). As nations continue to rely on their abundance of resources, they begin to neglect other areas of the economy (Kronenberg, 2004). We have seen that the longer the curse remains undiagnosed the more drastic policy intervention is required in order to create economic growth. (Stevens, 2005)

The gap that exists in the literature existence is the assessment of the presence and severity of the curse from both an empirical and theatrical standpoint. We have not found in the literature an investigation that attempts to determine the best measure for the resource curse and the severity of the curse. Sachs and Warner (Sachs and Warner, 1999) show the existence of the resource curse from an empirical point of view but they do not look at the severity. Furthermore, this chapter investigates African countries that have not been studied using all models for the last twenty years using competing models. Each country chosen in this paper is specified for an individual characteristic that has changed since the Sachs and Warner (1995) study. South Africa, Ghana, Nigeria, and Botswana each have been specified and their unique qualities identified introductory section.

Research problem

Various developing countries with mineral resources are often suspected to have resource dependency problems (Parcero and Papyrakis, 2016). It is often important to determine the presence and absence of this for policymaking purposes such that the possible costs could be mitigated against (Stevens, 2005). There have often been various ways in the literature to test for the presence of the resource curse problem.

Research questions

i) Is there a true negative relationship between resource abundance and economic growth in developing African economies?

ii) Further, if the curse is prevalent to what extent does it have an effect on growth in resource-rich countries?

This chapter contributes to the literature by imperially testing three models to test for the presence of the resource curse in resource-rich developing African economies. Sachs and Warner (1995), Manzano and Rigobon (2001) and Gylfason (2001) are each used to test for the presence of the resource curse in South Africa, Ghana, Nigeria, and Botswana. This chapter further contributes to the literature by measuring the severity of each country's curse thereby laying to bear unique country-specific characteristics of each economy that we consider in this study.

The paper also analysis the presence or absence of the curse and its severity including time horizons that the literature has not considered, that is the late 1990s and the 2000s (Sachs and Warner, 1995, 1999; Jian, Sachs and Warner, 1996; Gylfason, Tryggvi and Gylfi, 1999; Manzano and Rigobon, 2001; Neumayer, 2004). This chapter has identified the best measure of African developing countries is the most robust method of measuring the presence of the research curse. Moreover, the severity of the curse is highlighted in the model and is in line with empirical findings.

The structure of the chapter is as follows: Section 2.2 presents a literature review, section 2.3 presents the methodology section that outlines the competing methods of testing for the presence of a resource curse, section 2.4 deals with data and analysis and section 2.5 concludes.

2.2 Literature review resource curse

Defining the resource curse

The Dutch disease phenomenon was one of the first signs of the resource curse. Prior to this, economics predominantly held the view that natural resources in an economy would lead to growth. Adam Smith, David Ricardo, and more recently Walter Rostow argued that an abundance of natural resources would allow an economy that is underdeveloped to pivot to an industrial economy. They argued that natural resources would be used to facilitate industrial

development similar to the cases of Australia, the United States, and Britain. (Badeeb, Lean and Clark, 2017) `

In the 1970s many economists began to observe that there was not, as previously believed, a strong positive relationship between resource abundance and economic growth. Prior to these observations, resource-led growth was believed to be an appropriate strategy for a resource-rich country to adopt. (Beckerman, 1962)

The term "Resource curse" was first coined by Auty (1993) in 1993. The phrase was coined on the back of research by Corden and Neary (1982) and Gelb (1988) on the "Dutch disease curse."(Badeeb, Lean and Clark, 2017) The Dutch disease was one of the first examples of resource abundance creating negative economic growth. In 1980, the discovery of natural gas in Groningen led to a rapid decrease in the manufacturing sector in the country. This led researches to begin to hypotheses that natural resources may in fact not be a blessing.

Gelb (1988) noted that during the Oil Crisis countries that were producers of oil such as Venezuela and Nigeria all attempted to increase growth through oil and failed. The book references some institutional political and structural faults that may be the cause of this lack of growth. Average growth rates were below what was predicted by neoclassical models given the size of the investment booms in these countries. This case is one of the first observations that chipped away at the armour of resource-led growth theories. (Gelb, 1988)

Auty (1994) observed that not only was resource abundance not a blessing but he argues that it is, in fact, a curse. He further goes on to explain that countries that were rich in resource endowment grew, in many cases, far slower than similar countries without natural resource endowment. Auty (1993) analysis specifically mineral-rich economies which he defines as; countries that generate at least 8 percent of their GDP and 40 percent of their export earnings from mineral sector. His findings are similar to Gelb (1988) who focused on oil-producing countries. He founds that the observed countries with mineral-rich economies grew at a far slower rate than other countries that were not mineral-rich. Auty(1993) does not prove that a negative relationship exists between growth and resource abundance but rather he shows that countries with resource abundance on average grow slower than those without.

Sachs and Warner (1995) are the first paper to empirically prove that the curse does in fact exist. That is to say that there exists a negative relationship between resource abundance and economic growth. The existence of the curse is often contested and is claimed by Brunnschweiler (2008) to be a mere dependence on resources and not an effect of large

resource endowments. Indeed, there is room to argue that economies that do not focus on resources growth even with the large resource endowment may avoid the curse.

Identifying the resource curse and its importance

The Dutch Disease as explained by Sachs and Warner (2001) is a result of the "spending effect." They explain the case of the Dutch disease as a special form of the resource curse. They observe this phenomenon when there is a new discovery of natural resources. The increase in natural resources increases domestic income and demand for goods. This in terms drives up the price of locally manufactured goods as income increases and the manufactured goods become less competitive for exports. Moreover, this creates inflation in the local economy causing local goods prices to increase from the increase in income. (Sachs and Warner, 2001)

In his book *Escaping the Resource Curse,* Humphrey (Humphreys, Sachs and Stiglitz, 2007) explains that the resource curse doesn't only create the "spending effect" but also creates the "resource pull effect." This he explains is when a country diverts all its resources to extracting natural resources and therefore abandons manufacturing and production. This, in turn, leads to the cost of labour rises, the cost of inputs rising as well as the exporting of manufacturing decreasing. Moreover, aside from the rising costs and increasing inflation, there can be a decrease in human capital. He explains that because fewer people work in manufacturing there is a decrease in "learning by doing." Furthermore, there is less motivation for education as the rewards from extracting natural resources are greater or equal to the rewards from professionalism. (Humphreys, Sachs and Stiglitz, 2007)

The Dutch Disease

Van Wijnbergen (1984) assesses the case of the United Kingdom and the Netherlands as cases of countries with declining traded goods as a result of an increase in oil and gas production. He argues that oil revenue in part is spent on non-traded goods and that leads to real appreciation of traded and non-traded goods (Wijnbergen, 1984). He argues from Solow (1957) (Romer, 1986) that capital accumulation explains only a small part of economic growth and rather a larger determinate of growth is an increase in human technology "Learning by doing." By using the Salter-Swan open economy two-period model, Wijnbergen (Wijnbergen, 1984) highlights that oil production creates a period of retrenchment, which hinders learning by doing. He recommends using high oil revenue to accumulate foreign assets as this will stop inflation and keep local goods competitive.

Parvin and Dezhabkhsh (Parvin and Dezhbakhsh, 1988) examine the Dutch disease in relation to OPEC countries in the 1970s. They look at the ratio of traded goods and non-traded goods. They build a simple model that takes into account-imported technology into the economy that invested in non-exported goods such as construction. They show that the increase in domestic prices of non-traded goods creates a Hyper Dutch disease in all but three of the OPEC members. (Parvin and Dezhbakhsh, 1988)

The severity and implications of the resource curse: a case of Hyper Dutch Disease

Parvin and Dezhabkhsh (Parvin and Dezhbakhsh, 1988) explore the "Hyper Dutch Disease" in oil-producing countries by using a model that assumes a basic economy with two primary sectors; traded and non-traded goods. Traded commodities are either locally produced for export or they are imported. The price of these commodities is fixed to the international commodity market. Goods produced in the manufacturing area are tradable goods whereas construction and services are non-tradable goods.

Before they build the model, they explain that oil is excluded from both non-traded and traded goods. The reason for these assumptions is because oil is capital intensive and its own revenue finances its growth. They build a model to maximise profit subject to traded and non-traded goods. The ratio of non-traded goods price over the traded goods price is the implicit constraint of the transformation curve between the traded and non-traded goods. The assumption is that all non-traded goods are consumed domestically.

We can now add the effect of an increase in oil production on the model. Because Oil is a primary driver of wealth, the increase in production in the economy creates a wealth effect. This results in the Ricardian version of rent (Gelb, 1988) in the nontraded goods sector as the prices of nontraded goods increases. This increases the demand for nontraded goods on the production possibility curve as investment from both foreign and local is injected into the nontraded industry. Since we assume a fixed proportion of traded and non-traded goods prediction the production possibility curve will shift rightward and increase the quantity of non-traded goods while keeping the traded goods at the same level as previously. This results in non-traded goods increasing as oil production increases and the price of non-traded goods increasing.

They then empirically test the model using OPEC member countries. They use Oil as a lagged variable as the increase in production will result in the wealth effect. They further lag the investment variable, as this too will be affected by the lagged response to the wealth effect. They use agriculture and construction as the representatives of the traded and non-traded sectors respectively. By observing ten instances of ten countries from 1969 to 1978, they model the effects of an increase in oil production. The results support the hypothesis and the coefficients were significant with the correct signs. There was an upward trend in production in the nontraded sectors and a downward trend in production in the nontraded sector.

Moreover, the wealth effect was proven by showing the significance and positive relationship between oil revenue and the price ratio. The lagged variable of oil revenue and the supply of non-traded goods was negative and showed the effect of the Dutch disease. Indeed, the model and empirical evidence prove evidence of the Hyper Dutch Disease in OPEC countries.

The development of the resource curse in the literature

Richard Auty (Auty, 1993) used the term "resource curse" to explain how some countries that were rich in natural minerals couldn't use the wealth they generated to boost the economy. He focused on mineral producing countries and examined the industrial policies implemented in these countries and the effects that they had. Aunty argued that the volatility of the natural resources created instability in countries as revenue was difficult to predict. Moreover, he argued that because many of the mining houses were foreign-owned and so the government did not generate enough revenue from these companies. (Auty, 2007)

Sachs and Warner viewed the theory of Aunty as inspirational and began to embark on the underlying foundations of many resource curse studies. They proved the curse empirically using cross-sectional data in multiple papers. The tested empirical the existence of a negative relationship between natural resources dependence and economic growth. This was investigated in papers in 1995, 1997, 1999 and 2001. The further argued that the strength of the institutional quality of a country would determine how likely the resource curse may be. (Sachs and Warner, 1995, 1999, 2001; Jian, Sachs and Warner, 1996; Warner, 1997)

Post these studies, Gylfason (2001) and others began to explainer the effect of the resource curse on elements other than growth. They looked at how resources affected savings, investment and human capital formation. (Shao and Yang, 2014)

Auty original study focuses on countries that rely heavily on copper, tin and bauxite. His analysis Bolivia, Peru, Chile, Jamaica, Papa New Guinea and Zambia. An in-depth look at the Latin American counties indicated that post the mineral boom all three countries increased the cost of manufacturing locally using development strategies and focused on protection from imports. This was on the basis that the mineral prices and revenue would increase economies and therefore cover the extra cost associated with local manufacturing. However, the price instability caused by decreasing commodity prices meant that these countries experienced low revenue from exports and high local prices. (Auty, 1994)

Sachs and Warner (1999) use empirical evidence from Latin American countries as well as East Asian nations to assess the impact of the resource curse. They seem to conclude that resource booms have little impact on long-term growth. In further studies, they examine nations that successfully created long term growth with resource abundance as well as more nations that failed(Warner, 1997). The 1997 paper proves robustly that for the 20 year period using an open economy model there is a clear relationship between resource abundance and negative growth rates. (Sachs and Warner, 1995, 1999; Warner, 1997)

Critiques of the resource curse and its existence

Badeeb (2017) argues that is not sufficient to simply prove a correlation between resource abundance and negative growth but rather a rational needs to be provided and proven for the theory to hold. He proposes two main approaches to this question; political explanations and economic explanations. (Badeeb, Lean and Clark, 2017)

Moreover, we can observe many overlaps between these two approaches. The economic theories such as Dutch disease, commodity price volatility and resource pull theories are all interconnected to the political theories. (Kronenberg, 2004)

Jones (2008) makes a compelling argument for the non-existence of the resource curse. He argues that although there is some presence of the curse in some countries, others display little or no evidence of the curse. Moreover, Jones argues that weak institutions can cause a "curse" regardless if the resource wealth and therefore shows that the resource abundance may in fact not be a factor in negative economic growth. (Jones, 2008)

Lederman and Maloney (2017) argue that each of the explanations brought forward by Sachs and Warner(1999) and others can be explained by any nation that focusses on a specific industry. They use the case of Costa Rica that specialises in computer chips and explain that

the Dutch Disease is prevalent there even when the main exported good is not a natural resource.

Kwaramba, Mahonye and Mandishara (2016) examine the case of Zimbabwe and the capital flight therein. By examining specific minerals and coal from the aspect of misinvoicing they are able to show that the capital flight, often through misinvoicing, is most pronounced during the periods of crisis. This further contributes to the understanding that weak institutions create grabber mentality and increase the likelihood of the resource curse. (Kwaramba, Mahonye and Mandishara, 2016)

Although some political theorist suggests the resource curse does not exist and is merely a construct of western discrimination (Ross, 1999), others argue that the large western corporations create or contribute to the resource curse (Obi, 2010). Since western corporations swoop into African countries where oil and diamonds are found and immediately begin to extract the resources with no intention of creating long term growth or employment this creates inequality as the political elite benefit from the resource rents while the rest of the nation remains desolate. (Obi, 2010)

How the literature measures the resource curse

In order to successfully prove that the resource curse exists it is necessary to measure both resource abundance and growth. Deniers of the resource curse often will criticise the proxies used to measure natural resources as well as growth. This section will attempt to summarise some of the primary measures of resource curse as well as the proxies that are used.

Badeeb (2017) highlights some of the confusion in the literature. He explains that many papers will use the term resource depended and resource abundance interchangeably. As argued by Brunnschweiler (2008) a country can be resource-dependent without an abundance of resources and a country can be resource-abundant and not be dependent on its resources for growth. The distinction begins to become clearer when we look at various proxies for measuring resources. Proxies such as resource exports as a percentage of GDP clearly focus on resource dependence whereas natural resource capital per capita measures resource abundance.

Natural resource dependence

Sachs and Warner (1995) measured natural resources as the primary exports over GDP. They defined this as agricultural exports, mineral exports and energy exports divided by total GDP.

This effect gives the percentage of natural resource exports as a percentage of GDP. This method was adopted by Neumayer (2004); Arezki and Van der Ploeg (2011); Beck (2011); and Boschini et al. (2013). This measure has been criticised in the literature for its endogenous variables and biased results. Ross (2015) followed by Auty (2007) measured natural resources as rents from natural resources over GDP. We can observe that this method too is a resource dependency as it is a percentage of the GDP of the country. Gylfason (2001) uses the share of natural capital in national wealth as the proxy for natural resources. This is defined as natural capital over the sum of natural capital and the perpetual inventory value of produced assets and ‘‘human resources.’’

Natural resource abundance

Brunnschweiler (2008) not only criticised the resource curse for being a “red herring” but also provided an alternative way to measure resource abundance. He claimed that resource abundance does not prove a curse exists but rather it proves that bad policy choices lead to negative growth. Therefore he suggested that we measure resource abundance by taking total natural capital and mineral resource assets in US $ per capita as the proxy. This proxy aggregates the estimate for subsoil assets, cropland, and, timber and non-timber forest resources, and protected areas in US $ per capita. He further suggests we use subsoil wealth as an alternative proxy. This values the principal fuel and non-fuel mineral stocks present in a country.

Country-Specific Resources

Ghana

The main exported products in Ghana was conventionally resources. (Florentini & Hassan, 1994). The stagflation of the economy that occurred in the 1980s created the platform for economic change. (Florentini and Hassan, 1994).Indeed, in 1987 Ghana was the first African country to adopt financial structural reform. (Ziorklui and Barbee, 2003). This reform was aimed at increasing exports and focusing the Ghanaian economy around Agriculture. (Florentini and Hassan, 1994)

Ghana’s economy traditionally revolved around the Cocoa industry (Danquah, 2003). The crop was responsible in part for political turmoil and upheaval. Because many chiefs were either cocoa farmers or landowners, they suffered when the crop was affected by the disease. Haessel and Vickey (1975) highlight the fact that a third of all Ghana exports was Cocoa from the years 1951-71. (Haessel and Vickery, 1975)

The mining industry in Ghana experienced its first jungle boom in 1892 (Owusu-Koranteng, 2008). The boom allowed for mineral FDI (Foreign Direct Investment) into Ghana (Davison, 1957). Ghana's mining companies' board of directors had great influence in government and funded government in order to protect their interests (Hawkins, 1958) The third Jungle Boom in the 1980s as a result of lower taxes and high gold prices. This encouraged FDI again in Ghana's gold mining and increased exports(Owusu-Koranteng, 2008).

We can see in Figure 1 that the oil rents increased from 2010 to 2016. This corresponds with the functioning prices of oil and shows a clear relationship between price fluctuations of commodity prices and rents as seen in Figure 3.

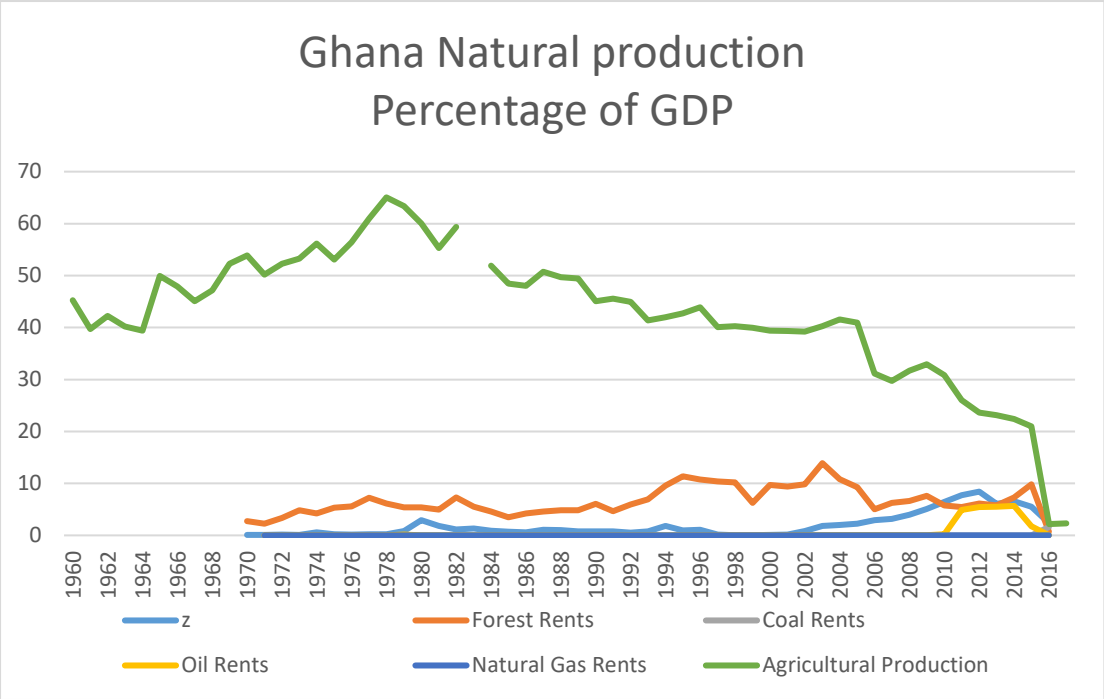

Figure 1

South Africa

Miriam Altman (2001) addresses the lack of growth in South Africa experiences following the GEAR (Growth Employment and Redistribution Plan) program. She looks at the drivers of the South African economies growth and determines the country to be a *minerals economy* and looks at some of the ways the country can shift away from this dependency. The aim of the study was to address the growing unemployment rates that are characterised by a resource-dependent country. (Altman, 2001)

South Africa gold exports made up between 44% and 21% of total exports from 1988 to 1997. (Altman, 2001) Manufactured products did not exceed 20% in 1997 and were a mere 5% of total exports in 1988. Altman argues that the shift from mineral extraction to manufacturing production was inefficient and therefore did not create the growth and subsequent jobs that should be associated with the shift. Therefore, it is clear that the resource curse continued to take its toll on the country.

Moreover, we can see that coal rents spiked in 2008 corresponding with the coal price boom in the same year as seen in Figure 2 while agriculture rents continued to decline at a steady rate. This indicates a reliance on less agriculture and more on minerals as time progressed. Mineral rents increased over time and indicate a strong reliance on mining product reliance.

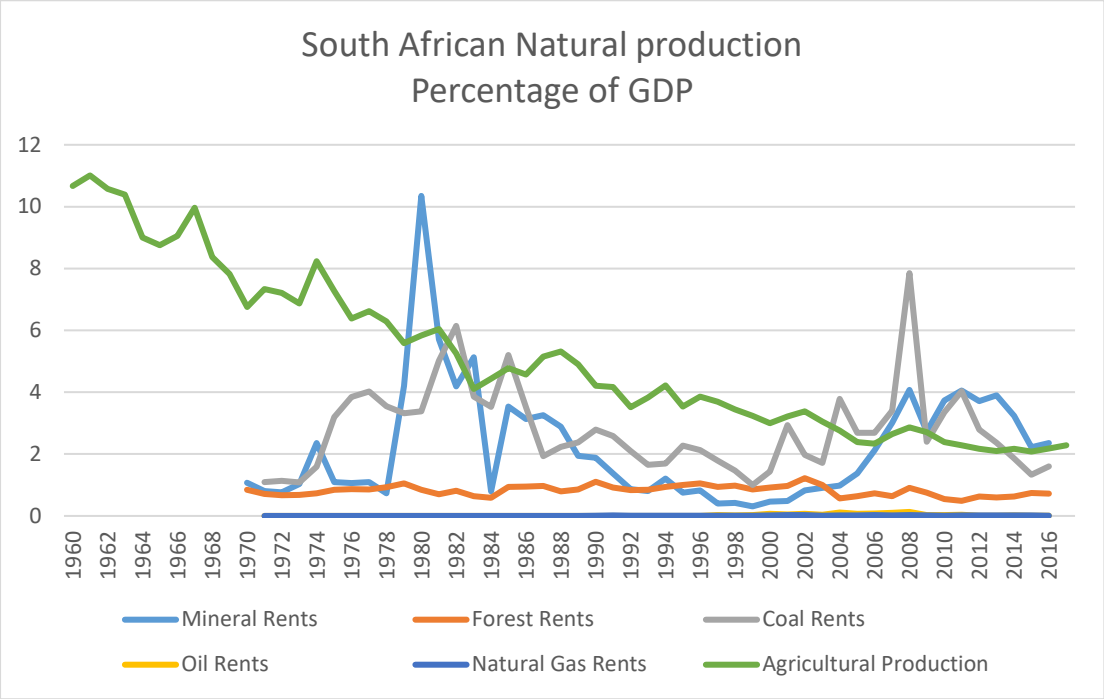

Figure 2

Nigeria

Nigeria has received large oil rents since the 1970s. The production and exports of oil range between 19% of GDP in 1982 to highs of 54% in 1993 as seen in Figure 4. Obi (2010) addresses the oil curse specifically. For the case of Nigeria, he references instability in government and rent-seeking behaviour that creates poverty. Moreover, the production of oil creates pollution and destroys lands in rural Niger Delta that could otherwise be used for agricultural purposes. (Obi, 2010)

Indeed, Olarinmoye (2018) shows that the allocation of oil wealth is the main contributor to the oil curse (Olarinmoye, 2018). He explains that the distribution of the profits of wealth leaves the wealth in the hands of the government elite class as well as large corporations. He argues that the institutional weakness is as a result of the oil curse and not a contributing factor. Moreover, we can see that the rents received from oil in Figure 3correspond with the increasing oil rents in Figure 4.

Oil price per barrel adjusted for inflation

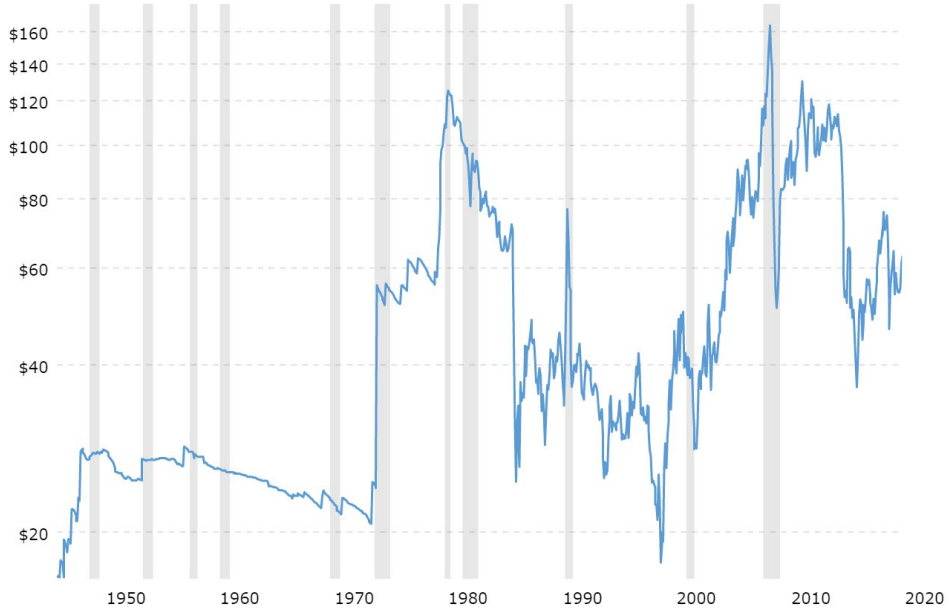

Figure 3

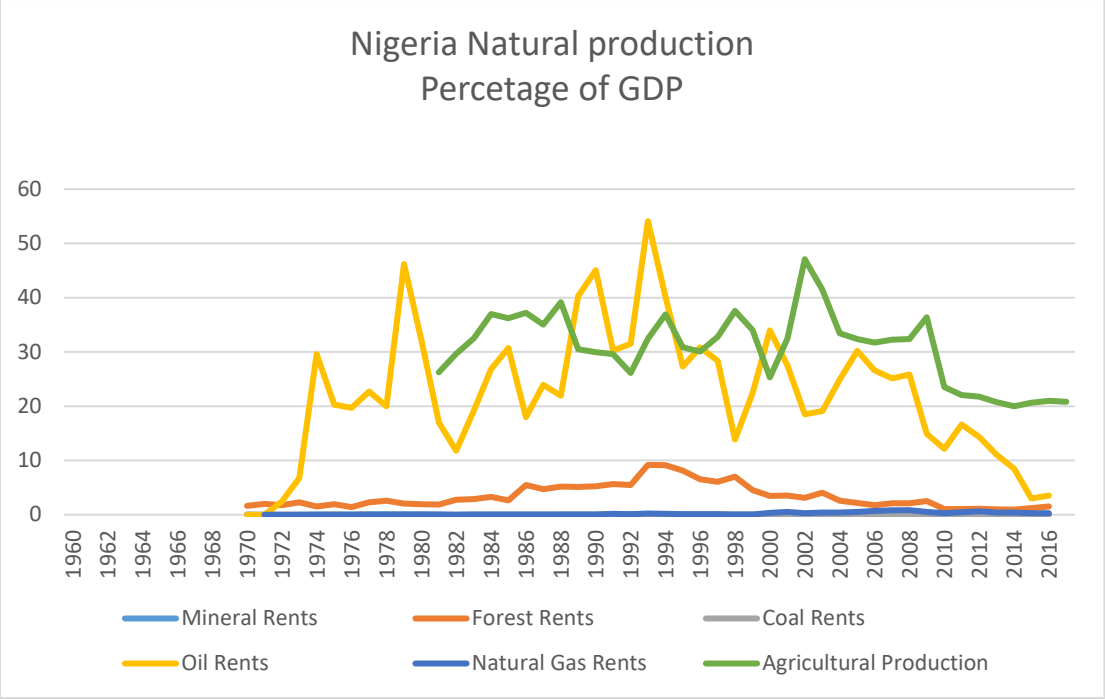

Figure 4

Botswana

Botswana exported over 2 Billion Dollars in 2002. Eighty percent of these exports were composed of diamonds, nickel-copper and gold (Iimi, 2016). Figure 5 shows the increasing reliance on mineral exports between 2004 and 2010. These minerals were largely dominated by diamond exports.

Iimi (2016) shows that the increase in mineral exports can be as a result of the price increases in diamonds. Moreover, the good government policies allowed for this revenue to be used to establish other sectors of the economy and not have a reliance on exports as a means of

economic growth. (Iimi, 2016)

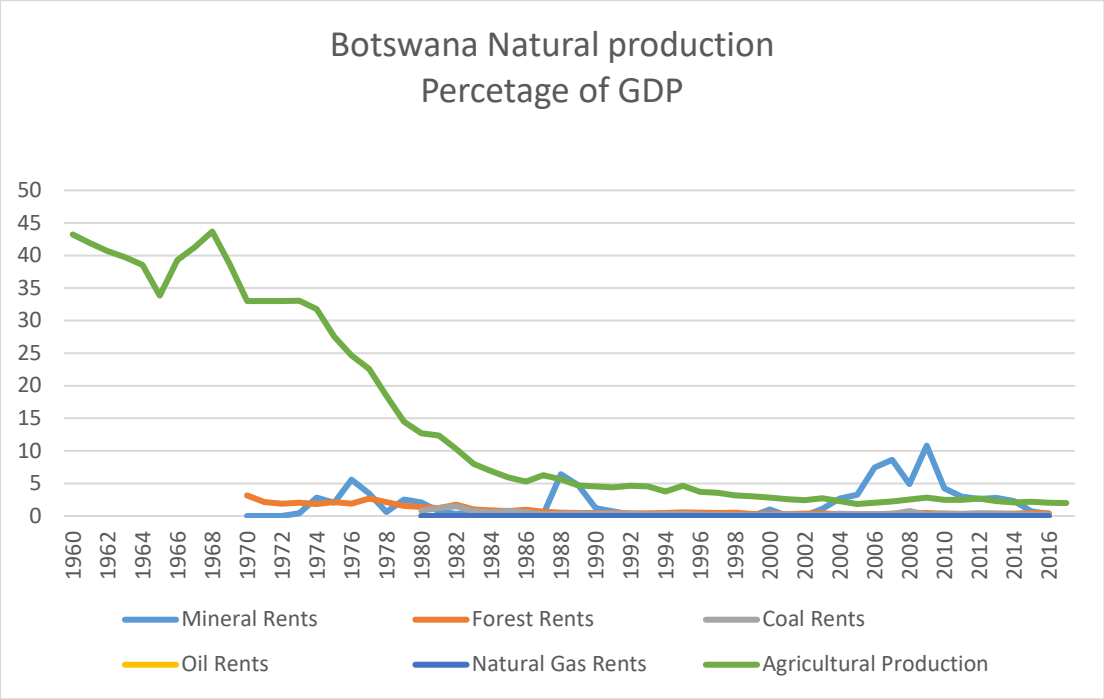

Figure 5

The success of other nations

The case of China

There is an argument that China has achieved a spectacular increase in its exports over the last two decades. However, the nature of this achievement, as well as the factors that led to this feat, have caused great debate in the literature available (Geethanjali Nataraj and Tandon, 2011). Brouthers and Xu (2002) argue for branding leadership instead of pricing strategies. Furthermore, they argue that the key to Chinese exporting successes is when firms target less developed countries (Brouthers and Xu, 2002). In contrast, Zhao and Zou (2002) argue that the coastal nature of the manufacturing firms is the secret underlying the exporting success. (Zhao and Zou, 2002)

In addition, Gao et al (2010) argue that the planned economy of China was the key driver of the exporting success(Gao *et al.*, 2010). They maintain that the exporting accomplishment was not the goal of the Chinese economy but rather a means of creating high levels of growth.(Gao *et al.*, 2010). The exporting prowess, as well as low cost of labour, encouraged FDI which in turn created local economic growth. Therefore, they argue that exporting alone is not enough to stimulate the economy but rather manufacturing exports and hi-tech exports will increase FDI and growth.(Gao *et al.*, 2010)

Nataraj and Tandon (2011) look at the comparative advantage China holds over other exporting nations (GEETHANJALI Nataraj and Tandon, 2011). They argue that the significant factor underlying the growth of the Chinese economy has been the progression from exporting of raw material to manufacturing goods and now a hi-tech industry. Further, they maintain that the constant need to improve education and upskill labour has improved the economy more than just the FDI and positive balance of trade (GEETHANJALI Nataraj and Tandon, 2011). Indeed, China is a good example of an economy that has transformed from resource-based exports to manufacturing-based exports.

The case of non-resource dependent African economies

According to the World, Bank Benin has a growth rate averaging 6% annum. They have achieved this with no coal rents, no gas rents and since 1998 close to no oil rents. Since 2004 Ethiopia has maintained growth rates between 13.5% and 6.8% with no coal, oil or gas rents. Finally, we can investigate Senegal who too has no resource rents. They have achieved a positive growth rate of over 5% since 2014. It is clear that African countries that have little resource endowment can achieve strong growth rates. (World Bank, 2020)

2.3 Methodology- Is there a Curse?

Methodology introduction

Many studies have used cross-sectional data to prove the existence of the curse. We will review some of the methods used and attempt to construct a model that integrates the best of each model. In this section, we start by outlining the resource curse methodology as explained by Sachs and Warner (1995). This is followed by the methodology of Gylfason (2001) and finally, we look at Manzano and Rigobon (2001) in order to determine an optimal methodology for measuring the presence and severity of the resource curse.

Sachs and Warner (1995)

Sachs and warner use the cross-country growth equation explained by Barrow and Sala-I-Martin (1996) that is used to link trade policies and growth. The model uses multiple countries that each trade with one another. The model theory states that for country i=1 there should be a negative function of initial income Y_0^i and a vector of other structural characteristics of the economy Z^i .

$$\frac{1}{T}\log\left(\frac{Y_T^i}{Y_0^i}\right) = \delta_0 + \delta_1 \log(R^i) + \delta' Z^i + \varepsilon^i \qquad (0.1)$$

Sachs and Warner (1995) attempt to test whether resource dependence is one of the variables captured in Z. In order to measure resource dependency, they calculate the primary produce exports to GDP as R.

The empirical starting point was just to include the Growth rate of R the share of primary exports in GDP denote initial income has a negative relationship to the growth rate of Y. Z is calculated as a catchall variable that incorporates some explanatory variables that can be used to determine the pathways connecting resource intensity and growth.

The resulting regressions were estimated assuming that Z is measured whether a country is open to trade. This was calculated as either 1 or a 0 for each year depending on whether the country was open to trade. The following transformation was then taken

$$Z = \frac{\sum_{t=1}^{t} open_t}{t} \times open_t \qquad (0.2)$$

Where open is either 1 or 0 and t is the year. Y is the real per capita growth rate of GDP per annum and R is the total exports of the primary exports over GDP.

Sachs and Warner do however test for other factors that can be included in Z however this study will not address these here as we will add other such factors in other models which are better proven to be better fits of the data. We would expect, if the hypothesis is correct, to see a negative sign for log (R) and a positive sign associated with Z. furthermore, we can assume that the greater the value of δ_1 the greater the presence of the resource curse.

Gylfason (2001)

Gylfason (2001) uses Seemingly Unrelated regressions to model the enrolment rate on GDP. He states, however, that OLS regression shows no significant difference in the estimation of the model.

He defines the model as:

$$g_Y = \delta_0 + \delta_1(Nr) + \delta_2(E) + \delta_3(I) + \delta_4(Iinc) + \delta_5(Z) \qquad (0.3)$$

Where gy is defined as economic growth per capita, Nr natural capital E secondary school enrolment rate, I investment and inc as initial income. Equation 2.3 can be used to explain that as Nr increases over time we can expect to see a decrease in economic growth. However, this factor will be mitigated by increases in Education and investment. We can expect to see a negative relationship with Initial income that increases by a growth factor as this will show us what the income would be assuming no resources found. Z is a catch-all variable and consists of external debt as well as a dummy variable.

Equation 2.3 shows us the relationship between education and natural resources. Gylfason (2001) explains that as money or income because easier to obtain we will see less need for education as the relative payout from an increase in education is lower. Therefore, we will see a drop in education. We can, therefore, expect a negative sign to be accompanied by alpha1 as well as alpha 2 as the increase in income decreases the need for education. (Gylfason, 2001)

Like Gylfason, in order to isolate the existence of the resource curse in our first model, we omit enrolment as an explanatory variable. The model is unique as far as it measures each external debt as well as country-specific dummy variables to cater for external shocks.

We can expect to find that delta one has a negative sign where the other variables have a positive sign. Delta 5 can be either positive or negative depending on the external shocks and their outcome on the country.

Manzano and Rigobon (2001)

Manzano and Rigobon (Manzano and Rigobon, 2001) assess Sachs and Warner (Warner, 1997) estimation of resource curse prevalence. They modify some of the assumptions found in Sachs and Warner and attempt to cater for some of the indigeneity.

This explains Sachs and Warner's model in a similar fashion to how it was explained above. Because of the slight variation and the catchall variables, we will show the Sachs and Warner model as explained in the Manzano and Rigobon (2001) paper.

$$(\ln y_{i,t} - \ln y_{i,t-\tau}) - (\ln N_{i,t} - \ln N_{i,t-\tau}) = \alpha \ln N_{i,t-\tau} + \beta X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad (0.4)$$

Where $y_{i,t}$ represents output for country i at period t. X represents a catchall variable to explain GDP growth. N is the natural resources and η_i is a country-specific explanatory variable. The significance of this model is shown on the left-hand side of the question that

removes the growth of natural resources from the growth rate of total GDP. This is done in order to not over-specify the model.

This model allows for more variation in the modelling and allows for country-specific variables. They highlight two main issues that find in the Sachs warner paper. Firstly, the cross-section of data may be problematic and the second issue, which for our case will focus on, is the use of total GDP as a measurement.

Total GDP includes the resource sector of the economy. That means that the effected sector would be measured in GDP and in the resource curse. If the share of primary exports is high, the resource sector would be a significant factor in contribution to GDP. Measuring using non-resource GDP, we find that the curse is still prevalent but the magnitude is not as great. Non-resource GDP is measured as GDP net of resource exports.

Total Gross Domestic Product is measured as the Growth rates and logarithms of past values are per economically active population. It is calculated using the gross domestic product per capita constructed by the methodology developed in Summers and Heston (Summers and Heston, 1991) and updated in Summers and Heston. This number is divided by the share of the economically active population.

We would expect to see a negative sign for alpha and a positive sign for beta. Obviously, the sign associated with η_i would-be country-specific as this may be a specific negative or positive effect.

2.4 Data and findings

Data transformation

For Sachs and Warner, we calculated GDP Growth using World Bank GDP Current USD Data. We calculated the growth rate of GDP by taking the log difference between each year. In order to obtain the open variable, we began by obtaining the Sachs and Warner data set of 1995. Each country had already begun opening up to trade in the data set aside from Nigeria. Following Sachs and Warner (1997) data, we observed that Nigeria opened for trade-in 1996. Each country was then given either a 1 or 0 for each year depending on whether they were open for trade-in that year or not. In order to create a standardized weighting Sachs and Warner then take the average of the entire data set. This returns a value between zero and one. We multiply this average by the data set in order to obtain the openness variable. We

calculated Primary exports as the total non-manufactured exports as a percentage of GDP using World Bank Data.

In our model using the Gylfason(2001) model, we maintain the same GDP Growth rate calculations as in the Sachs and Warner model. Investment is gross domestic capital as a percentage of GDP and the initial income in 1960 is the GDP in Current USD in 1960. Primary exports have calculated the percentage of total exports. The external Debt to GDP ratio is the External Debt in Current USD as a percentage of GDP in Current USD. All these variables are from the World Bank Data. We add a country-specific dummy variable for each country the model to accommodate for external factors. In South Africa and Botswana, the dummy variable used to adjust for the decrease in GDP Growth in 2009 due to the Financial Crisis of 2008. In Ghana, we make use of the Dummy variable in 1975, which accommodates for a major drought experienced in that year. (Bhatt, 1993). In Nigeria, we use a dummy variable in 2004 to accommodate for the increasing GDP Growth associated with changes in the GDP calculations, an increase in oil prices and an increase in public sentiment. (Obeng-Odoom, 2012)

Like Manzano and Rigabon (2001), we calculate the growth rate of GDP as the Log difference of GDP less the log difference of Resource rents. Resource rents are calculated from the World Bank Data value of Natural rents as a percentage of GDP. This value is first transformed into a value that is independent of GDP and the log difference is taken in order to obtain the growth rates. The natural resource proxy is the log value of total natural rents and the openness value is the same as that of Sachs and Warner (1995)

Sachs and Warner (1995)

Sachs and warner 1995 used data from 1970 to 1989. Extending this analysis from 1960 to 2016, we find that the model proposed by them is still a good fit and the relationship still holds. Data is from the World Bank data. GDP is measured in dollars with the base year of 2010. EXPER is the exports as a percentage of GDP. Open is measured as the fraction of years during the period 1960-2016 in which the country is rated as an open economy according to the criteria in Sachs and Warner (1995). This data is from Wits World Integrated trade solutions (wits.worldbank.org).

In our model, we can observe that the model is not a good fit for our data. We have an R^2 and adjusted R^2 that does not exceed 0.5. Our F test probability is greater than our test of significance in the south Africa model and is therefore indicative of our gradients are equal to

zero. For South Africa and Nigeria, we find that the signs of the coefficient are what we would expect given the presence of the resource curse. For Botswana, we can also find that the signs are as expected as Botswana has been found by other studies to not exhibit the resource curse. Ghana's coefficients do not behave as expected and are not significant in the model. The fact that this model is not a good measure of fit for GDP Growth can be expected as there are very few variables in the model commonly used to explain GDP growth. However, the presence of the correct signs does give some indication there is a resource curse. The Durbin Watson variable shows that at a 5% level of significance we can reject the null hypothesis of collinearity. We find that the mean square error terms are low indicating a good fit for our model.

Sachs and Warner (1995) find that there is a negative relationship between resources in the primary sectors as exports. They find that a single increase in the exports of primary goods as a percentage of GDP will cause a 4% decrease in the growth rate of GDP. We find that for South Africa there is a decrease of 9% and Nigeria 12%. However, we did not find this relationship in Ghana and Botswana. This difference in results may be due to the fact that this study uses time series of specific countries in the study and does not use cross panel data like Sachs and Warner which did include South Africa, Nigeria, Botswana, and Ghana. Moreover, our study has used more recent data than Sachs and Warner and therefore encompasses new information. Moreover, we can see that the average results find in Sachs and warner may be heavily influenced by some of the drastic cases we have found here. Indeed, it is possible the average results of Sachs and Warner were weighted due to the presence of these countries in the study. We find that there is a severe presence of the research curse in South Africa and Nigeria using the Sachs and Warner methodology. This paper addresses this limitation through the use of time-series data that provides an individual country appreciation for the severity of the presence of the resource curse using the Sacha and Warner methodology. This type of finding is important for policymaking purposes as opposed to a panel approach that does not empower individual countries to understand the extent of the presence of the resource curse in their respective economies.

Table 1 Estimated Parameters of Sachs and Warner (1995)

Variable	South Africa	Ghana	Nigeria	Botswana
δ(1)	0.040010*	0.003400	0.029001	-0.082209**
	(0.006269)	(0.012285)	(0.08522)	(0.043125)

Primary Exports δ(2)	-0.095206** (0.071988)	0.067398 (0.06166)	-0.128748 (0.344592)	0.279118* (0.055421)
Openness δ(3)	0.005490 (0.022399)	0.0604070* (0.012285)	0.1780224* (0.063709)	-0.061115* (0.029228)
R^2	0.055839	0.236557	0.201095	0.443548
Adjusted R^2	0.020210	0.208281	0.151164	0.415012
S.E of Regression	0.024134	0.039079	0.070681	0.037323
Durbin-Watson stat	1.122001	1.625943	1.873895	1.481784
Prob (F-Stat)	0.218121	0.0000684	0.027537	0.000011
Mean Square Error	0.000551	0.001447	0.004568	0.001293

*Significant at 5% **Significant at 10%

Gylfason (2001)

Using the growth rate of GDP and the log of capital rents, gross investment and initial income growing at the real interest rate we find the following model. The model shows that all variables are significant save for the log of the exchange rate. We can see that a 1% increase in primary exports on GDP will cause a 2.1% decrease in the growth rate of GDP for South Africa. Similarly, for Ghana and Nigeria, this will cause 1.9% and 1.4% respectively. Moreover, the Gylfason models show that for Botswana the curse is not present as a single percentage increase in primary exports will cause an 11% increase in GDP growth. Like our previous model, this model does not fit well for South Africa but is a better fit for the remaining three countries. Our Standard error of the regression is relatively low and our error terms are mean-reverting. The Durbin Watson stat allows us to reject the null hypothesis that there is autocorrelation between our error terms. We find the Mean Square Error term to be low; indicating this model is a good fit for our data.

Table 2 Estimated Parameters of Gylfason

Variable	South Africa	Ghana	Nigeria	Botswana

INVEST	0.001410** (0.000810)	0.000835 (0.001090)	-0.005003* (0.001449)	0.002385** (0.001449)
INIT_GDP	-8.59E-20 (3.84E-19)	1.46E-11* (3.45E-12)	1.42E-14* (3.25E-15)	-6.10E-09 (4.10E-09)
PRIMARY_EXPORT	-0.021982 (0.113338)	-0.019103* (0.004506)	-0.014159 (0.017395)	0.118876 (0.096004)
EXTERNALDEBT_OFGDP	0.097420*** (0.073190)	-0.035050** (0.018638)	-0.026910 (0.017395)	0.192542* (0.069205)
DUMMY	-0.047092** (0.022438)	-0.173911* (0.030497)	0.281769* (0.050215)	-0.182854* (0.050261)
R^2	0.157406	0.612658	0.644101	0.480965
Adjusted R^2	0.077159	0.576626	0.598179	0.431533
S.E of Regression	0.021448	0.029845	0.048255	0.048640
Durbin-Watson stat	1.237262	1.926285	1.873895	1.355397
Mean Square Error	0.000411	0.000798	0.002005	0.002114

*Significant at 5% **Significant at 10%

Gylfason finds that an increase in resource exports will create a 9% decrease in the growth rate of GDP per Capita. He includes the African countries that have been included in this study to achieve this panel result. We find here that for South Africa there will only be a 2% decrease, Ghana a 1.9% decrease and for Nigeria a 1.4% decrease. Botswana is in line with our Gylfason (2001) that indicates this economy does not suffer from the resource curse. We find new data, as well as time-series analyses, has allowed us to view a more measured approach to measuring the resource curse. We find that by measuring each country individually we are able to isolate the respective intensity of the course and therefore embark on policy recommendations that can be used.

Manzano and Rigobon (2001)

Following the methodology of Manzano and Rigobon (2001), we used the basic Sachs and Warner (1995) model with a few variations (Manzano and Rigobon, 2001). The dependant variable no longer contained the growth rate of natural resources as this is removed. Moreover, we use the income from rents of natural resources to measure natural resources instead of using exports that will contain variables other than natural resources. The model is shown to be a good fit and is alpha is a good estimation of the resource curse. An increase in LOGK, the log of natural resources, causes a decrease in LOGGDPNONRESOURCE, which is the growth rate of GDP excluding the growth rate of land.

We can see that a single increase in resource rents growth will cause a 7.3%, 5%, 9% and 6.1% for South Africa Ghana Nigeria and Botswana respectably. The model is a good fit as we have a high R^2 and adjusted R^2. The error terms are mean reverting and our Stander error terms are low. The F test shows a high probability of rejecting the null hypothesis that the gradients are equal to zero. The Durbin Watson test leaves ambiguity as to whether there may be autocorrelation between our error terms. As a result, we tested the Breusch-Godfrey Serial Correlation LM Test (not shown) and found there is close to zero percent probability of autocorrelation with 2 lagged variables. We find the Mean Square error term to be low indicating our model is a good fit for the data. However, we find this is not the case for Botswana indicating our model may not be a good fit here further indicating a lack of resource curse.

Table 3 Estimated Parameters Manzano and Rigobon

Variable	**South Africa**	**Ghana**	**Nigeria**	**Botswana**
Intercept H	19.82254* (0.650177)	13.05257* (0.649905)	23.66204* (1.363660)	14.02636* (1.207098)
LogK A	-0.734905* (0.028152)	-0.505288* (0.032364)	-0.922494* (0.056763)	-0.617412* (0.069261)
Open B	0.945834* (0.077582)	0.145680*** (0.131973)	1.875685* (0.255222)	2.113036* (0.307942)
R^2	0.941673	0.905222	0.857644	0.664128
Adjusted R^2	0.939022	0.900914	0.851174	0.648861
S.E of Regression	0.114595	0.158009	0.302887	0.482533
Durbin-Watson stat	0.701909	0.539013	0.166423	0.445823
Prob (F-Stat)	0.000000	0.000000	0.000000	0.000000
Mean Square Error	0.012294	0.023373	0.085885	0.217976

Manzano and Rigobon (2001) find that there is a negative relationship between resources in the primary sectors as exports. They find that a single increase in the exports of primary goods as a percentage of GDP will cause a 9% decrease in the growth rate of GDP. We find that for South Africa there is a decrease of 7%, Ghana a decrease of 5%, Nigeria 9%, and Botswana 6%. The difference in this result may be due to the fact that in their study they use panel and cross-sectional data. However, we do not find that there is a large difference between our findings here and the findings in Manzano and Rigobon (2001). We find that by

using time series data we can contribute to the literature in terms of isolating the resource curse intensity in each individual economy but we do not find that the model differs drastically from their original findings. This model, however, allows policy recommendations to be taken with a higher degree of efficiency due to the country-specific trends.

2.5 Conclusion

Indeed, the preliminary results of the data show that a resource curse is present in the selected African countries, aside from Botswana, and can be measured using statistical models. Further investigation into these models is required to find the most accurate method of predicting the curse. Moreover, further research is required to amalgamate the models above and extract the best of each model in order to create a single accurate model that contains as few shortcomings as possible.

Certainly, the chapter has shown the extent that the natural resource curse exists and has been statistically modelled. Chapter 2 will now look at some of the reasons for this curse and give policy recommendations as to how to avoid common causes of the curse.

The Cause of the Resource Curse

3.1 Introduction

This chapter will examine competing theories in the literature that explains some of the causes of the resource curse. This chapter tests some of these hypotheses imperially in order to establish a clear pathway to the resource curse. This chapter assesses the same African countries as seen in chapter one in order to establish some possible reasons for the resource curse. We compare models from Mehlum Moene and Torvik (2006), Gylfason and Zoega (2004) as well as Oskenbayev, Yilmaz and Abdulla (2013). This chapter will attempt to isolate the key areas that cause the resource curse to emerge in resource-rich developing African countries.

Establishing the resource curse is the first step in attempting to address the low growth rates in a given country. By isolating some of the key factors that are responsible for the curse, we can begin to make policy recommendations that will allow nations to avoid the curse (Holden, 2013). Furthermore, establishing these factors this chapter can then make policy recommendations for nations where the curse is already present. (Parcero and Papyrakis, 2016)

The gap that exists in the literature existence is the assessment of the causes and severity of the curse from both an empirical and theoretical standpoint. We have found many papers that attempt to prove one or more reasons for the curse (Gylfason and Zoega, 2004; Mehlum, Moene and Torvik, 2006). However, there exists very little literature that makes use of competing models in order to determine the best explanation for the curse. Moreover, the majority of studies have either been conducted on a mass scale using panel data for between fifty to a hundred countries (Warner, 1997; Manzano and Rigobon, 2001). We have found other studies that have been conducted for either individual countries (Hammond, 2011) or for individual regions within a country (Oskenbayev, Yilmaz and Abdulla, 2013). However, there exist very few studies that attempt to take multiple countries and assess each on their own using various models.

Research problem

Many countries that experience the resource curse are dumbfounded when it comes to isolating areas to improve in order to extricate themselves from the curse. Moreover, as nations discover national resources there does not exist a clear guideline for this country to embark on in order to avoid the impending curse. The literature has highlighted some explanations that may explain the resource curse.

Research Questions

i) Can we isolate a single or even multiple variables that will determine that the curse will present itself in developing African economies?

ii) Is there a single solution that can be rolled out to all African developing countries or is the presence of the curse determined individually per nation?

This chapter contributes to the literature by comparing various models that attempt to explain the resource curse (Badeeb, Lean and Clark, 2017). We compare models from Mehlum and Torvik (2006) who explain that institutional strength, as well as other variables, are determinants of the resource curse. Gylfason and Zoega (2004) understand the resource curse to be as a result of lack of education. Moreover, Oskenbayev (Oskenbayev, Yilmaz and Abdulla, 2013) explains that resource abundance is a cause for the resource curse.

Moreover, we look at each country on its own in order to determine whether these models are good fits individually. We look at South African, Ghana, Nigeria, and Botswana as unique cases and establish the best explanation for the resource curse in each country. We establish a model that combines all our models in order to determine the best fit and explanation for each country. (Van Der Ploeg and Venables, 2011)

The structure of the chapter is as follows: Section 3.2 presents a literature review, section 3.3 presents the methodology section that outlines the competing methods of isolating for the explanations of the resource curse, section 3.4 deals with data and analysis and section 3.5 concludes.

3.2 Literature review

Political Explanation

Political theories are significantly more controversial than the economic theories and are the source of much debate on the literature. (Badeeb, Lean and Clark, 2017). These theories rely on "rent-seeking" behaviour, corruption to justify the low levels of growth in these economies. (Cabrales and Hauk, 2011). Furthermore, Cabrales and Hauk (2011) build an economic model to explain the election results from the resource curse.

Sachs and Warner (2011) further model the effects of strong and weak institutions on the growth rate. They find that the resource curse is present when there is a case of weak institutions. (Sachs & Warner, 2001).

Mehlum et al. (2006) argue that there is a grabber mentality when weak institutions exist. (Mehlum, Moene, and Torvik, 2006) They argue that a "game" exists between grabbers and producers and strong institutions must encourage production over grabber mentality. By referencing cases like Botswana that exhibit strong intuitional quality they argue that policymakers are responsible for ensuring the resource doesn't prevail.

Arezki and Van Der Ploeg explore some of the variables used to measure the resource curse and delve into their inherent flaws. (Arezki and Van Der Ploeg, 2007) By scrutinising the pathways that lead from resource dependency towards a resource curse, Arezki and Van Der Ploeg are able to isolate some of the factors that may contribute towards a presence of the curse. Primarily, they identify institutional factors such as corruption and rent-seeking behaviour as a principal contributor to the curse.

Isham (2005) argues that entrenched inequality, fear of modernisation and weak institutions are the primary drivers of the resource curse (Isham *et al.*, 2005). Issues of clientelism and government pressure are drivers of this phenomenon. They argue that the government does not give jobs to qualified and worthy people but rather positions are politically motived. That means that the political financial contributors benefit the most from government victories and in turn benefit from the natural resources.

Rent-seeking behaviour is also seen as the primary driver of the resource curse by Hammond (2011). He argues that by analysing the case of Venezuela we can observe that by avoiding corruption a country can avoid the curse. (Hammond, 2011)

Stevens (2005) takes a unique approach to the resource curse. He assumes that without policy intervention the curse will occur and policy intervention can stop this. Therefore he does not argue what causes the curse but rather what avoids it such as industrialisation incentive policies or developmental state polices. (Stevens, 2005)

Brollo et.al (2013) make use of the case of Brazil in order to prove that rent-seeking behaviour, corruption and political instability can create the resource curse. They argue from the standpoint of moral hazard that an elected official has a large budget and wants to grab as much political rent and uninformed votes so that they can secure re-election. If the budget was not large the motivation to gain political rent and clientelism would be diminished and the corruption would be less enticing. In the case of Brazil, they test the local governments and show that an increase in federal transfers of 10 percent increases the broad measure of corruption by 47 percentage points. (Brollo *et al.*, 2013)

Economic explanation

Guillo and Perez-Sebastian (2015) build a neoclassical model to explain the resource curse. (Guilló & Perez-Sebastian, 2015). They argue that with equal natural resource endowments in the economy there would be no resource curse. Although based on a new classical model the policy implications would imply Marxist resource distribution.

The volatility of the commodity prices is explained by Van der Ploeg and Poelhekke (2009) as a vital factor in determining the resource curse. (van der Ploeg and Poelhekke, 2009). Moreover, by arguing that resource abundance is a positive relationship with the growth they argue that the resource curse exists when there is resource dependence, not resource abundance.

Van der Ploeg and Poelhekke (2009) prove the hypothesis by assessing price volatility in various regions that exhibit a range of issues. They look at sub-Saharan Africa as one category; the Middle East and North Africa as another. They then look at developed countries as one group that they label Western Europe and North America. Latin America and the Caribbean are grouped together and East Asia and the pacific are the fifth categories. The final category is south Asia that stands alone. They argue that the strength of the financial systems in these countries will determine the effect of the price volatility on the group. They conclude that the shocks that price volatile cause is greener than the resource endowment and can happen in all countries. (van der Ploeg and Poelhekke, 2009)

Deacon and Rode (2015) combine both political and economic theories to explain the resource curse. (Deacon and Rode, 2015). They argue that the resource curse is not its own phenomena at all but rather a result of "rent-seeking" behaviour. Moreover, they argue that the primary source of capital is resource capital the country is susceptible to resource price volatility. However, if the capital is not solely based on resources the country can be protected despite its resource abundance.

Mulwa and Mariara (2016) attempt to isolate the specific path from resource abundance to the resource curse. They focus on African countries and attempt to show the path can be either as a result of the Dutch Disease or rather as a result of political factors. They further segment the Dutch disease path between the spending effect and the resource movement effect. The political factors can be institutional defects as well as corruption and rent-seeking. This paper is vital in the African specific climate as it compares both resource-dependent and non-resource dependent countries in Africa. (Mariara and Mulwa, 2016)

Butkiewicz (2010) argues that the resource curse is only present in developing countries. He argues that multiple factors create the resource curse. Moreover, the factors that result in the presence of the resource curse such as resource dependence, weak institutions, rent-seeking and small monopolist groups who control the resources are only present in developing countries. Therefore it is clear that the primary factor that determines the curse must be tested only in developing countries. (Butkiewicz and Yanikkaya, 2010)

Theorist such as Auty (1993) and Isham (2005) made clear that the resource dependence and the economics central focus on the resource is the bedrock of the resource curse. (Isham *et al.*, 2005; Auty, 2007) Other theories such as Oskenbayev et al (2013) argue that the theory is correct but the evidence must be tested using a non-leaner regression. They conclude that the strength of the institutional quality is a gauge of the overabundance of the resource. They argue that these, therefore, create rent-seeking behaviour and therefore do not argue that rent-seeking behaviour results in the curse but rather is a result of the curse. (Oskenbayev, Yilmaz and Abdulla, 2013)

Literature analysis of the models

In the literature, there are three primary methodologies that exist for explaining the resource curse. The literature reveals tens of explanation for the curse but all may fall under the following three categories. The first category is the crowding-out effect first seen with the

Dutch diseases explanation and others that followed. The second methodology is corruption and governance and the final category is price volatility.

Finding the x

A dominant theory used to explain the resource theory is known as the crowding-out effect. The natural resources crowd out some activity X and since X is important for growth, therefore, growth decreases because of the crowding-out effect. Sachs and Warner (2001) Kronenberg (2004) and Parvin and Dezhabkhsh (1988) all attempt to identify factor X that is crowded out. The crowding-out effect is an extension of the Dutch disease, which argues for the factor X to be the manufacturing sector. This is argued by Auty (2002) and other students of the Dutch Disease.

Sachs and Warner

Sachs and warner attempt to prove the resource curse by using repeated regressions using growth data from post ware periods. The findings are that high resource intensity tends to correlate with slow growth. Many observed countries do not have sufficient data but nevertheless, Sachs and Warner (2001) conclude that it is not an accident.

By regressing Exports of natural resources in percent of GDP against Real GDP growth per capita over a 20 year period, Sachs and Warner (2011) show that most countries show that there is strong evidence to prove the curse. Moreover, the countries that are the exceptions Malaysia, Mauritius and Iceland all started as resource-poor countries.

Sachs and Warner (2001) discuss the inherent bias in the regression of real GDP growth and the percentage of exports of natural resources. They explain that countries with high income would, therefore, have lower percentage of natural resource exports and higher growth data whereas countries with low income would appear to have low growth and the percentage of exports of natural resource would be great. This is assuming we began with an equal endowment of natural resources. They, therefore, introduce a proxy for historical growth to take into account growth rates over time. Sachs and Warner (1997) tested this variable and found no evidence that controlling for the previous decade's growth altered the negate natural resource effect.

Sachs and Warner (1999) explain that the resource curse can be explained by the theory of natural resource crowding out effect. Natural resources crowd out a specific activity in the country that was driving growth and therefore growth is harmed. They identify the industry to

be traded manufactured goods as the crowded out activity. The X seems to be according to them as traded manufacturing goods.

Sachs and Warner (1995, 1999) and Sachs (1996) argue that positive wealth shocks from natural resource sectors create a higher demand for non-traded goods and increase the prices of non-traded goods. This further increase the prices of input costs and local wages. Profits begin to decrease of manufacturing goods and therefore prices of the manufactured goods increase to the point where it is no longer competitive in international markets or it doesn't increase profits and can compete in the international markets but creates less profit and therefore less growth.

In order to prove the manufactured goods crowding out hypotheses Sachs and Warner (2001) first show that natural resources abundance is correlated with higher non-traded prices. Because it is difficult to observe non-traded price levels they use general price levels and assume that the price levels are the weighted average of both natural resource prices and non-traded prices. Therefore they assume that a higher domestic price level indicates higher non-traded prices as they assume that traded goods are standards across

They measure relative price levels as a ratio of by GDP in US dollar exchange rate to local currency over GDP by local prices. The log of this ratio is regressed against the log of resource share GDP and the cross-price relationship between income and prices. The results find that there is a positive relationship between relationship and income and resource abundance to the real price level.

Gylfason

Gylfason (2001) identifies education as a primary factor that is crowded out by natural resources. He argues that because education is not necessarily necessary to gain wealth when there is an abundance of resources, the adequate focus is not given to education. Although Gylfason himself does not feel education is the factor X that others speak of, he does argue that crowding out of education is a driver of low growth in resource-abundant states.

Education according to Gylfason (2001) is the commitment to education, not the quality or spend of education, although these may be indications of commitment. He identifies three ways to categorise commitment to education; public expenditure, expected number of years of schooling for females and secondary school enrolment for both genders.

Public expenditure is an imperfect measure as many nations have private school and others have a high quality of education with a low percentage of GNP. Nevertheless, Gylfason (2001) argues that even though this measure is imperfect it is still a good indication of the negative relationship that exists between an increase in the national capital share and education.

The second regression is the relationship between expected years of school for females and the share of natural capital in national wealth. The negative relationship once again is demonstrated and shown that an increase in capital share decreases female expected years of school. He further states that the corresponding relationship exists for males is "virtually the same" manner.

The final regression is the enrolment in secondary schools for both genders and natural resource abundance. This relationship is significant with a negative relationship between the share of natural capital in national wealth and gross secondary school enrolment. (Gylfason, 2001)

To show the importance of education Gylfason (2011) regresses the enrolment of secondary school and GDP growth. He shows that an increase in secondary school enrolment increases GDP growth.

However, the final regression proves that education increases GDP. Moreover, we know the resource curse exists, resource increase decreases GDP. Therefore the law of transitivity states that an increase in resources will reduce education enrolment. Therefore Gylfason may in fact not be finding X but merely showing a further consequence of the resource curse.

Rent-Seeking and Corruption

Measuring corruption is difficult as by definition it is not observable. Kronenberg (2004) uses the SCI (State Capture Index) to measure the extent of corruption. This index is from the Businesses Environment and Enterprise Performance Survey conducted by the World Bank in 1999. The index measures the extent that government decisions and state body decisions are made by private firms.

Kronenberg (2004) shows the relation between SCI and the share of primary goods in total exports. The regression shows a positive relationship between these variables and shows that as the share of primary goods exports increases so does the SCI. This relationship is shown to be significant with a positive relationship.

In order to prove that the relationship between SCI and GDP growth per capita exists Kronenberg (2004) regresses these variables. He shows a negative relationship exists between corruption and growth. Therefore the law of transitivity once again shows us that an increase in resources abundance leads to corruption leading to negative growth. However, much like Gylfason (2001) the same problem of correlation and causation may apply here. We have seen numerous times that the resource curse exists and we have now shown that the increase in resources increases corruption, who is to say that that is a result of resource increase, perhaps the decrease in GDP leads to more corruption.

Mehlum (2006) expands on Sachs and Warner (1999) research that includes institutional quality as an explanatory variable for the resource curse. He uses the same data as Sachs and Warner (1997) paper to show the impact on the same data as previously tested. The paper focuses on GDP growth as the dependent variable and initial income, openness, resource abundance, investment and institutional quality as the independent variables.

GDP growth, initial income and resources abundance are all staple elements of any resource curse model. What is unique in this paper is the investment, trade openness and institutional quality. Both Investment and openness upon closer inspection are obvious inclusions in the model as they show the income into the country via FDI (Foreign direct investment) and a positive Balance of Payments. However, the strength of the institutional quality is not highlighted in classical growth models and therefore is unique in attempting to explain the resource curse.

In order to show a more robust measure of institutional strength and weakness, Gwenhamo, Fedderke and de Kadt (2012) delve into various measures that can be used to determine the state of political instability. They compare multiple indices that measure levels of freedom and assess the correlation between these indices to determine the extent of the best measure. Further, the highlight property rights as a vital component used to determine the extent of freedom (Gwenhamo, Fedderke and de Kadt, 2012).

Moreover, the measurement of institutional quality is complex and is highly debatable as the strength and the measure is subjective. Mehlum (2006) observes institution strength by using an unweighted average of five indexes based on data from political risk serves; a rule of law index; a bureaucratic quality index; a corruption index and a government repudiation of contracts index.

3.3 Methodology

Mehlum Moene Torvik (2006)

Understanding the extent or the existence of the resource curse needs empirical evidence. By making use of several prominent models in the literature, this paper will explore the extent of the resource curse in African countries.

Mehlum et al (2006) understand the resource curse to be a result of the strength of a countries institutions. They prove that countries that are rich in resource and have strong institutions do not suffer from the resource curse.

The model will be tested as follows.

$$g_Y = \delta_0 + \delta_1(Inc_0) + \delta_2(open) + \delta_3(R) + \delta_4(I) + \delta_5(inst) + \delta_6(\text{int}) \quad (3.1)$$

gy is GDP Growth per capita. Inc is initial income level in period 1and Open an index of a countries openness. R is the resource abundance proxy calculated as resource exports over GDP. i Is Investments calculated as the average ratio of real gross domestic investments over GDP and Inst is the institutional quality the index ranging from 0-6 and calibrated from 0- 1 and int the interaction term that is calculated as resource abundance multiplied by institutional quality.

Institutional quality is difficult to measure as this measure of human behaviour and corruption. In order to measure this Mehlum takes various measures as reported by Mauro (1995) as found in Sachs and Warner (1997). However, this data is no longer available for more recent periods. Therefore, we make use of PRS Group data for *International Country Risk Guide* from 1984 to 2018 and inappropriate various measures in order to quantify institutional quality. (PRS, 2018)

Oskenbayev et al (2013)

The Oskenbayev model analyses the resource curse using both a linear and nonlinear model

$$Log(Y_{ti}) = \alpha_0 + \alpha_1 Inst_{ti} + \alpha_2 Z_{ti} + \varepsilon_{ti} \quad (3.2)$$

Log (Yti) is the per capita income growth rate, Inst, the intuitional quality and Zti the vector of growth predictors. Zti takes into account Sachs Warner (2001) estimator for openness. The

paper breaks down the two chief causes of the resource curse to be institutional quality and the Resource Pull effect otherwise coined “the Dutch Disease” (captured in Z)

In order to model institutional quality, the paper uses Hall and Jones (1999) method

$$Inst_{ti} = \beta_0 + \beta_1 Z_{ti} + \beta_1 NR^2{}_{ti} + \beta_2 X_{ti} + \gamma_{ti} \tag{3.3}$$

Inti is share of natural resource abundance (the share of energy production, agriculture production to GRP), NRti the natural resource and the square root of natural resources is the excess production or the overabundance of natural resources. Xti represents the exogenous variables such as topography and cultural differences.

Gylfason and Zoega (2004)

Gylfason and Zoega revise their estimation in the paper in 2004 from previous estimations. They use a Seemingly Unrelated Regression method to estimate the impact of resource abundance on Economic growth. They use GDP per capita growth as a growth proxy to measure this. The below 4 equations are used in order to prove a relationship between education, investment resource abundance and GDP growth.

$$g_Y = \delta_0 + \delta_1(Nr) + \delta_2(Edu) + \delta_3(I) + \delta_4(Iinc) \tag{3.4}$$

$$Edu = \alpha_0 + \alpha_1(Nr) + a_2(Iinc) \tag{3.5}$$

$$I = \beta_0 + \beta_1(Nr) \tag{3.6}$$

$$g_Y = \chi_0 + \chi_1(Nr) + \chi_2(Iinc) \tag{3.7}$$

We can expect delta one to be negative as well as alpha one and chi one. The second equation that specifies education as its dependent variable is vital as it the basis of this study. It shows that an increase in natural resources causes a decrease in education (secondary school enrolment) and therefore proves that the pathway for the resource curse. The same logic can also be applied to equation three, which shows how savings are impacted by natural resources.

3.4 Data and Findings

This section will model some of the key areas highlighted than can create the resource curse. By making a comparison to Botswana, a country we established does not have the curse, this paper will show that there are clear and distinct variables that create the curse.

Variables and transformation

Variables in the below models have been primarily calculated from data found in the World Bank data tables (World Bank 2018). Certain variables were taken from alternative data sources where the World Bank Data was unable to provide the necessary information.

Mehlum Moene and Torvik (2006) calculate GDP growth as the growth rate of GDP per capita from the World Bank data table. Initial income is calculated as initial income in 1960 increased over time by a steady growth rate. Open is calculated the same as Sachs and Warner (1995). Resource abundance is the total natural resource rents as a percentage of total labour. Investment is a percentage of GDP. All this data is calculated from the World Bank Data Tables. Institutional quality is calculated from the International Country Risk Guide from 1984 to 2018 and inappropriate various measures in order to quantify institutional quality. (PRS, 2018). The interaction term is resource abundance multiplied by institution quality.

In Oskenbayev (2013) we calculate all the primary variables the same as we have done in other models. GDP growth is GDP per capita growth, open is the measure of a whether a nation is open to trade and resource abundance is the share of natural resource rents as a percentage of GDP divided by total labour. Our instrument variables are calculated as manufacturing production value-added as a percentage of GDP, agricultural production value-added as a percentage of GDP and total natural rents as a percentage of GDP. Natural resource rents are squared as well as agricultural production to accommodate for overabundance. All data is taken from World Bank Data Tables (2017).

Gylfason and Zoega (2004) model calculated using GDP growth as GDP growth per capita, initial income in 1960, rule of law from PRS table and resource abundance calculated as calculated in previous models. Education is the secondary school enrolment rate as a percentage of total eligible school-going children. Investment is a percentage of GDP.

Mehlum Moene Torvik (2006)

We can see for South Africa the resource abundance is significant at a 5 percent level and initial income and rule of law is significant at a 10% level. Just like Mehlum found for African countries the interaction term is not significant as well as investment. The Sachs and Warner Open variable for South Africa is not significant at a level of 17%. We see a low R^2 Adjusted R^2 indicating that our model is not a perfect fit of GDP per Capita growth. Our Stranded errors are reasonably low and the Durbin Watson statistics indicate there is little chance of autocorrelation between the error terms. Furthermore, we find very few variables that are significant at a five or ten percent level. We find the mean square error to be relatively low between 1% and 2 % where we find the term to be very low when it comes to Botswana. This seems to indicate our model is not the best fit of the data and does not explain the resource curse well.

Table 4: Estimated Parameters Mehlum Moene Torvik

Variable	**South Africa**	**Ghana**	**Nigeria**	**Botswana**
Initial income	0.144986** (0.078096)	0.063043 (0.092743)	0.003867 (0.095360)	0.130421 (0.101953)
Open	0.401801 (0.286188)	3.288947 (4.270664)	0.721712 (0.560199)	1.640320 (2.989430)
Resource Abundance	-6.136072** (2.599093)	-7.274637 (5.766288)	0.189306 (1.336703)	-5.937495 (4.026148)
Investment per GDP	-0.478851 (2.146207)	0.037995 (1.143665)	0.235171 (2.409964)	0.265118 (0.356827)
Institutional quality	-2.357818** (1.273552)	-4.114956 (3.555201)	-1.312334 (1.638017)	-3.675818 (2.895814)
Interaction term	9.957797 (6.535496)	14.14147 (13.08474)	1.695199 (4.209284)	9.205930 (6.514205)
R^2	0.302595	0.233466	0.216054	0.201856
Adjusted R^2	0.136546	0.059254	0.037884	0.020460
S.E of Regression	0.116514	0.176452	0.242380	0.100181
Durbin-Watson stat	1.293357	2.209204	2.429334	1.838593
Mean Square Error	0.010559	0.022698	0.046159	0.007886

*Significant at 5% **Significant at 10%

Mehlum Moene Torvik (2006) fined that there is a 6% decrease in economic growth when resource abundance is increased by a single unit. Our findings find this to be accurate in the South African context as well as close at 7% in the Ghanaian environment. However, using this methodology we have not found the presence of the curse in Nigeria and have found this phenomenon in Botswana. This model shows that the resource curse is indeed severe in both Ghana and South Africa. These findings can be a result of the different approach taken in this paper that uses time-series data instead of panel data. It may further be a result of data taken after 2005. However, it seems that the model needs to be tested more robustly for a time series equation as it seems to be a poor fit when we take countries on an individual level.

Oskenbayev et al (2013)

Using Two-stage least regression with the instrument variables of Open, Resource Abundance, Manufacturing production, Services value-added, Agricultural production and natural rents as well as some squared variables to indicate excess we find that our model is not a good fit for our data. Our R^2 and adjusted R^2 are extremely low and our stander error terms are not small enough to indicate an omission of variables. Moreover, our F stat probability seems to indicate there is a high chance of accepting the null hypothesis that our coefficients are equal to zero. We find the mean square error term to indicate that this model is not the best fit of our data. We find that aside for Botswana the term is relatively high and indicates this model is not a good fit.

Table 5: Estimated Parameters Oskenbayev

Variable	**South Africa**	**Ghana**	**Nigeria**	**Botswana**
Initial Income	0.045976	0.021741	0.234450**	0.184837*
	(0.080208)	(0.051330)	(0.118543)	(0.088909)
Rule Law	0.031315	-2.359142	0.524332	0.525659*
	(0.328612)	(1.570448)	(0.657595)	(0.227945)
Resource Abundance	-1.172812*	-1.768113*	1.377743*	-0.358485
	(0.553247)	(0.822705)	(0.495010)	(0.393390)
C	-0.171514	1.350009	-2.413510*	-1.863538*
	(0.751397)	(1.026896)	(1.172569)	(0.891208)
R^2	0.120363	0.382836	0.101416	0.095350
Adjusted R^2	0.005628	0.305691	-0.015791	-0.022648

S.E of Regression	0.125035	0.151512	0.247665	0.104238
Durbin-Watson stat	1.179679	1.555140	2.195199	1.740651
Prob (F-Stat)	0.626836	0.070418	0.165615	0.310856
Mean Square Error	0.013318	0.019676	0.052251	0.009256

*Significant at 5% **Significant at 10%
Instrument Specification: Open, Resource Abundance, Man Prod Sva Agri Prod Agri Prodsqrd Natural Rent Natural Rentssqrd

Oskenbayev et al do not use country panel data like many other studies but rather uses regional panel data for Kazakhstan. It is not supposing to find that our results largely differ from theirs as our associated countries are not included in their study. They do not find the presence of the resource curse in the regional panel data. We, however, find there exists a resource curse using this mythology. We find that for Nigeria the model did not present a curse but for the other countries there was a negative relationship between resource abundance and economic growth. Moreover, we use a time series estimate for each country and do not aggregate a panel series in order to obtain an average result of all the series. We have found that the resource curse is severe in the case of South Africa and Ghana and is present but not severe in the case of Botswana.

Gylfason and Zoega (2004)

Gylfason and Zoega (2004) method of used identify education as a factor in the resource curse. We find the using Seemingly unrelated regression that there is a strong relationship between natural rents and education. However, this relationship is not negative as stated in Gylfason and Zoega but rather positive. Moreover, we find that the overall fit of the model is weak and the unrelated regressions R^2 are low. We find that the error terms are low and the Durbin Watson test shows that there is little Probability of autocorrelation between the error terms. We find that our signs are correct in the final regression but are not constant in proving there exists a resource curse or a pathway to the resource curse through education.

Table 6: Estimated Parameters Gylfason and Zoega (2004)

Variable	South Africa	Ghana	Nigeria	Botswana
$g_Y = \delta_0 + \delta_1(Nr) + \delta_2(Edu) + \delta_3(I) + \delta_4(Iinc)$				
Independent Variable: GDP Per Cap Growth				

Intercept	-2.532350*	-1.772142	-2.200270	-3.838922*
	(1.279799)	(1.090008)	(1.763375)	(1.670869)
Natural rents	-0.958806	0.451079	0.478860	-1.730172
	(2.726451)	(1.175560)	(0.717479)	(1.305071)
Initial Income	0.320183*	0.322945	0.335114	0.436248*
	(0.157029)	(0.236946)	(0.280942)	(0.191193)
Education	-0.000655	-0.007254	-0.005633	-0.003052**
	(0.004935)	(0.013175)	(0.013741)	(0.001640)
Investment	-1.727551	0.585443	-0.610583	0.469760
	(2.177431)	(1.140736)	(3.129175)	(0.438498)
R^2	0.246262	0.242428	0.230256	0.340503
Adjusted R^2	-0.004983	-0.010097	-0.111853	0.120671
S.E of Regression	0.133236	0.158288	0.274080	0.092011
Durbin-Watson stat	1.418565	1.790641	1.763866	2.210124
$Edu = \alpha_0 + \alpha_1(Nr) + a_2(Iinc)$				
Independent Variable: Education				
Intercept	2.831899	-27.98519	-106.9086*	-668.9226*
	(59.35987)	(19.82042)	(27.82407)	(184.4728)
Initial income	84.38024	60.83540*	12.04400	81.31202*
	(124.1292)	(15.69541)	(14.00277)	(20.54018)
Natural Rents	9.154534	15.12233*	19.84271*	-302.4817**
	(6.771763)	(2.518774)	(3.481825)	(171.1134)
R^2	0.252616	0.721262	0.767972	0.556113
Adjusted R^2	0.145847	0.681442	0.725786	0.492700
S.E of Regression	5.270361	3.218600	4.878247	10.83284
Durbin-Watson stat	0.144856	0.740205	1.083488	0.668227
$I = \beta_0 + \beta_1(Nr)$				
Independent Variable: Education				
Intercept	0.187687*	0.107717*	0.174364*	0.311067*
	(0.015925)	(0.033851)	(0.022487)	(0.018672)
Natural rents	0.565509*	0.193931*	-0.171401*	0.682974
	(0.248100)	(0.140465)	(0.074143)	(0.466576)
R^2	0.099550	0.032918	0.126714	0.043628
Adjusted R^2	0.079540	0.015649	0.101029	0.022375
S.E of Regression	0.048564	0.063492	0.057377	0.080592
Durbin-Watson stat	0.206527	0.293277	0.321187	0.466776
$g_Y = \chi_0 + \chi_1(Nr) + \chi_2(Iinc)$				
Independent Variable: GDP Per Capita Growth				

Intercept	-1.438199**	-0.296145	-1.016820	-0.154591
	(0.755037)	(0.396475)	(0.725464)	(0.691073)
Natural Rents	-1.678970	-0.877076	0.601461	0.063243
	(1.171837)	(0.549018)	(0.549201)	(0.751389)
Initial income	0.163088*	0.078073	0.120088	0.020984
	(0.083932)	(0.053077)	(0.076466)	(0.075461)
R^2	0.098623	0.144548	0.057894	0.008918
Adjusted R^2	0.026512	0.076111	-0.020614	-0.073673
S.E of Regression	0.124143	0.174775	0.248252	0.106807
Durbin-Watson stat	1.188891	1.430063	2.290927	1.711983

*Significant at 5% **Significant at 10%

Gylfason and Zoega (2004) find a 6% decrease in economic growth when a single unit increase in natural rents is increased. We find that this effect is not present when using time series data to isolate each countries time series data individually. Although these countries were included the Gylfason and Zoega (2004) regression we find the results differ drastically from their overall findings. We find that natural rents as an explanatory variable of Secondary school enrolment are consistent with the finds of the paper, overall natural rents as an explanation of GDP growth is not. We may find that South Africa has pulled the average up to 6% as a result of the 9% effect we find in our model showing an increase in the severity of the curse. Moreover, we do not find the presence of the curse for Nigeria and Ghana whereas we do find this presence for Botswana with a significant level of severity. Indeed, the model differences could allow a country to isolate the effect of natural resources on secondary school enrolment and attempt to create policy recommendations to address this using a single time series data set.

Combination of models

We can see that in South Africa the most significant determinant of the curse and a slowdown in GDP is the secondary school enrolment rate. We can understand this phenomenon as explained by Gylfason (2001) when there is easy money available there expected return of education decreases and therefore students are less likely to continue their education, as they do not see the benefits they will receive.

Indeed, for Ghana education is a significant determinant of growth. However, we can further see that trade, institutional strength and distribution of income will also be large determinants of the curse. The institutional determinates are vital in a country that is plagued with

corruption. Although this paper has not addressed the correlation between the distribution of income and corruption, we can understand logically that there would be a relationship. Unequal distribution causes jealousy and poverty, this, in turn, causes people to seek money but means that are not always legal. Indeed, when there is easy money as with abundant resources this can cause an increase in corruption causes a decrease in growth.

Unlike South Africa and Ghana, we do not find that education is significant for Nigeria. Rather the openness to trade and unequal distribution of wealth are the greatest determinants. This is once again logical as if a nation is not open to trade, no amount of resources will help them, as they will not be able to do much with these resources.

In contrast to many papers as well as some of the empirical evidence shown in prior estimates in this paper, we find that the resource curse does exist in Botswana in terms of natural resources independent of income as seen by the variable LogK. However, Natural Rents does not show the existence of the curse. Natural rents are the income from capital as a percentage of GDP and therefore shows a more realistic perspective than LogK. We find that a reliance on resource abundance, weak institutions as well as openness to trade all determinates of GDP growth. We find that our Mean Square Error term is low and indicates a good fit to our model.

Table 7: Estimated Parameters Hybrid Model of Best Fit

Variable	**South Africa**	**Ghana**	**Nigeria**	**Botswana**
Logk	-0.862660* (0.101175)	-0.924752* (0.049036)	-0.807452* (0.084834)	-0.931664* (0.038813)
Open	-0.027655 (0.171505)	39.15792* (2.075155)	0.417737** (0.220654)	27.34940* (2.232962)
Inv Per GDP	-2.870639** (1.453550)	0.136076 (0.314737)	-0.841248 (1.188696)	-0.529046 (0.410315)
Rule Law	2.019707 (1.145441)	1.880555** (1.020555)	-1.462842 (1.394269)	4.007173** (2.017089)
GDP Per Worker	7.73E-06 (1.77E-05)	0.000115* (00000.50)	6.52E-05* (2.02E-05)	1.88E-05 (2.08E-05)
Inter	-9.568220 (5.924687)	-5.138547 (3.439836)	3.016617 (4.737410)	-12.28841* (4.737410)
Natural Rents	3.128218 (3.005948)	-4.728145* (1.304608)	-1.486702 (3.118593)	8.886563* (3.118593)

Education	0.026716* (0.006507)	0.022016* (0.003032)		0.003162 (0.003035)
C	20.47701* (2.132870)		20.07782 (2.170740)	
R^2	0.995380	0.988707	0.942480	0.998915
Adjusted R^2	0.990760	0.980802	0.921288	0.998071
S.E of Regression	0.038395	0.030255	0.099234	0.042025
Durbin-Watson stat	1.261793	1.868352	0.965905	1.203945
Mean Square Error	0.000728	0.002062	0.006749	0.000935

Therefore, have shown that using our hybrid model, the curse is present in all our chosen countries. However, the curse is not severe in Botswana and South Africa. Moreover, we find that Ghana is the most affected country following by Nigeria. We can observe from the results in each model that there is not a one solution fits all situation. Indeed, the resource curse is caused by the same root source "easy money," however the way in which the nation reacts to this easy money will determine the policy recommendations and the underlying determinate of the curse.

Policy recommendation

Arezki and Van Der Ploeg make policy recommendations based on the level of institutional weakness. They show that by reducing corruption and improving institutional quality an economy could change the curse into a blessing. (Arezki and Van Der Ploeg, 2007) Moreover, they found that by reducing the curse they not only do the growth rates of an economy stop declining but also the income per capita will increase.

Our policy recommendations would be to address the root cause of the resource curse for each nation. Increase Secondary school enrolment when applicable, open trade routes and increase distribution of wealth. However, it is important to note that there is no one fix for all countries solution. Indeed, the novelty of this study is that each nation and economy reacts differently to a resource boom and therefore different areas of the economy suffer differently. It is important to isolate these areas and then address each issue.

3.5 Conclusion

Having successfully shown the nature of the curse and the variables that create it, we have shown some policy changes that can be made in order to avoid this curse. This chapter has shown that the curse is explained through a multitude of variables and by addressing these issues nations can avoid or escape the curse. It is important to look at policy recommendations that are unique for each economy can be taken in order to create growth while increasing natural resources.

Conclusion

4. Conclusion

This study has shown that for African developing countries there exists a resource curse. We find that Manzano and Rigabon (2001) measurements for the resource curse are the most accurate measure of determining the existence and severity of the curse. We find that indeed, an increase in resource endowment will cause a decrease in GDP growth.

Moreover, this study finds that African developing countries have a severe resource curse problem. This study has shown that the reliance on resources to stimulate economic growth has contributed to the severity of the resource curse we have found. We find that since the early twenty-first centre there has been very little change in the resource dependency of African developing economics. In fact, we have seen a rise in the dependency of natural resources associated with commodity booms in the early 2000s.

The findings of this study are constant with the literature in determining the causes of the resource curse. However, we find that there is not a "one size fits all" cause of the resource curse and each economy can have one or multiple causes. We find that secondary school enrolment can be a determinant of the resource curse. Moreover, resource reliance and income inequality are further reasons for the rise of the resource curse. We find that as there is an increase in natural resource endowment there is less instinctive to save, educate and build the economy. Therefore, we find that a rise in resources can diminish the growth rate through multiple factors depending on the reaction of the people and the economy.

We find that the policy such as school enrolment incentive programs and others can mitigate the effect of the curse. Moreover, we find that reliance on the resources as exports is a primary factor driving the resource curse. Should countries adopt a manufacturing policy and convert natural resources into manufactured goods there would not be a "resource pull" phenomena as well as the other associated ill of the resource curse.

5. Bibliography

Altman, M. (2001) 'Employment promotion in a minerals economy', *Journal of International*

Development, 13(6), pp. 691–709. doi: 10.1002/jid.807.

Arezki, R. and van der Ploeg, F. (2011) 'Do natural resources depress income per capita?', *Review of Development Economics*, 15(3), pp. 504–521. doi: 10.1111/j.1467-9361.2011.00623.x.

Arezki, R. and Van Der Ploeg, F. (2007) 'Can the Natural Resource Curse Be Turned Into a Blessing? The Role of Trade Policies and Institutions; Rabah Arezki and Frederick van der Ploeg; IMF Working Paper 07/55; March 1, 2007'.

Auty, R. M. (1993) 'Sustaining development in mineral economies: The resource curse thesis', *Resources Policy*, 20(1), pp. 77–78. doi: 10.1016/0301-4207(94)90044-2.

Auty, R. M. (1994) 'Industrial policy reform in six large newly industrializing countries: The resource curse thesis', *World Development*, 22(1), pp. 11–26. doi: 10.1016/0305-750X(94)90165-1.

Auty, R. M. (2007) 'Natural resources, capital accumulation and the resource curse', *Ecological Economics*, 61(4), pp. 627–634. doi: 10.1016/j.ecolecon.2006.09.006.

Badeeb, R. A., Lean, H. H. and Clark, J. (2017) 'The evolution of the natural resource curse thesis: A critical literature survey', *Resources Policy*. Elsevier, 51(December 2016), pp. 123–134. doi: 10.1016/j.resourpol.2016.10.015.

Barro, R. and Sala-i-Martin, X. (1996) *Economic growth*, *Journal of Macroeconomics*. doi: 10.1016/S0164-0704(96)80041-3.

Beck, T. (2011) 'Finance and Oil: Is There a Resource Curse in Financial Development?', *European Banking Center Discussion Paper*. doi: 10.2139/ssrn.1769803.

Beckerman, W. (1962) 'Projecting Europe's Growth', *The Economic Journal*, 72(288), pp. 912–925.

Bhatt, V. . (1993) 'ON FINANCIAL SECTOR REFORM AND DEVELOPMENT: A CASE STUDY OF GHANA', *African Review of Money Finance and Banking*, 1(1), pp. 5–26.

Boschini, A., Pettersson, J. and Roine, J. (2013) 'The Resource Curse and its Potential Reversal', *World Development*. Elsevier Ltd, 43(x), pp. 19–41. doi: 10.1016/j.worlddev.2012.10.007.

Brollo, F. *et al.* (2013) 'The Political Resource Curse', *The American Economic Review*,

103(5), pp. 1759–1796.

Brouthers, L. E. and Xu, K. (2002) ‘Product stereotypes, strategy and performance satisfaction: The case of Chinese exporters’, *Journal of International Business Studies*. doi: 10.1057/palgrave.jibs.8491038.

Brunnschweiler, C. N. (2008) ‘Cursing the Blessings? Natural Resource Abundance, Institutions, and Economic Growth’, *World Development*, 36(3), pp. 399–419. doi: 10.1016/j.worlddev.2007.03.004.

Brunnschweiler, C. N. and Bulte, E. H. (2008) ‘The resource curse revisited and revised: A tale of paradoxes and red herrings’, *Journal of Environmental Economics and Management*, 55(3), pp. 248–264. doi: 10.1016/j.jeem.2007.08.004.

Butkiewicz, J. L. and Yanikkaya, H. (2010) ‘Minerals, Institutions, Openness, and Growth: An Empirical Analysis’, *Land Economics*, 86(2), pp. 313–328. Available at: http://search.proquest.com/docview/304962227?accountid=13828.

Cabrales, A. and Hauk, E. (2011) ‘THE QUALITY OF POLITICAL INSTITUTIONS AND THE CURSE OF NATURAL RESOURCES’, *The Economic Journal*, 121(551), pp. 58–88.

Corden, W. M. and Neary, J. P. (1982) ‘Booming Sector and De-Industrialisation in a Small Open Economy’, *The Economic Journal*, 92(368), p. 825. doi: 10.2307/2232670.

Daniel Lederman and William F. Maloney (2009) ‘In Search of the Missing Resource Curse’, *Economía*, 9(1), pp. 1–56. doi: 10.1353/eco.0.0012.

Danquah, F. K. (2003) ‘Sustaining a west african cocoa economy: Agricultural science and the swollen shoot contagion in Ghana, 1936-1965’, *African Economic History*. doi: 10.2307/3601946.

Deacon, R. T. and Rode, A. (2015) ‘Rent seeking and the resource curse’, *Companion to the Political Economy of Rent Seeking*, pp. 227–247. doi: 10.4337/9781782544944.00022.

Florentini, R. and Hassan, M. A. (1994) ‘Giordano Dell-Amore Foundation PRICES , MONEY AND SUPPLY SHOCKS IN THE SUB-SAHARAN AFRICA : THE CASE OF GHANA / PRIX , MONNAIE ET CHOC DU CÔTE DE L ’ OFFRE DANS L ’ AFRIQUE SUB- SAHARIENNE : LE CAS DU GHANA Author (s): Riccardo Florentini and Mohamed Ab’, *Savings and Development*, 18(1), pp. 65–80.

Gao, G. Y. *et al.* (2010) 'A "strategy tripod" perspective on export behaviors: Evidence from domestic and foreign firms based in an emerging economy', *Journal of International Business Studies*, 41(3), pp. 377–396. doi: 10.1057/jibs.2009.27.

Gelb, A. (1988) *Oil windfalls - Blessing or curse?* Washington, DC: World Bank. Available at: http://documents.worldbank.org/curated/en/536401468771314677/Oil-windfalls-Blessing-or-curse.

Gwenhamo, F., Fedderke, J. W. and de Kadt, R. (2012) 'Measuring institutions: Indicators of political rights, property rights and political instability in Zimbabwe', *Journal of Peace Research*, 49(4), pp. 593–603. doi: 10.1177/0022343311434326.

Gylfason, T. (2001) 'Natural resources, education, and economic development', *European Economic Review*, 45(4–6), pp. 847–859. doi: 10.1016/S0014-2921(01)00127-1.

Gylfason, T., Tryggvi, H. T. and Gylfi, Z. (1999) 'A Mixed Blessing: Natural Resources and Economic Growth', *Macroeconomic Dynamics*, 3(2), pp. 204–225. doi: http://dx.doi.org.libraryproxy.griffith.edu.au/.

Gylfason, T. and Zoega, G. (2004) 'Natural Resources and Economic Growth: The Role of Investment, Dynamics, Economic Growth, and International Trade', (June), pp. 7–15.

Haessel, W. and Vickery, E. (1975) 'The social profitability of subsidies for agricultural exports: the case of Ghana', *American Journal of Agricultural Economics*, 57(1), p. 11. doi: 10.2307/1238835.

Hammond, J. L. (2011) 'The Resource Curse and Oil Revenues in Angola and Venezuela', *Science & Society*, 75(3), pp. 348–378.

Hawkins, E. K. (1958) 'Marketing boards and economic development in Nigeria and Ghana', *The Review of Economic Studies*, 26(1), pp. 51–62. doi: 10.2307/2295857.

Holden, S. (2013) 'Avoiding the resource curse the case Norway', *Energy Policy*. Elsevier, 63, pp. 870–876. doi: 10.1016/j.enpol.2013.09.010.

Humphreys, M., Sachs, J. and Stiglitz, J. E. (2007) 'Escaping the Resource Curse', *Initiative for Policy Dialogue at Columbia*, pp. xviii, 408 p. doi: 10.1080/02255189.2010.9669299.

Iimi, A. (2016) 'Escaping from the Resource Curse : Evidence from Botswana and the Rest of the World', 54(4), pp. 663–699.

Isham, J. *et al.* (2005) 'The varieties of resource experience: Natural resource export structures and the political economy of economic growth', *World Bank Economic Review*, 19(2), pp. 141–174. doi: 10.1093/wber/lhi010.

Jian, T., Sachs, J. D. and Warner, A. M. (1996) 'Trends in regional inequality in China', *China Economic Review*, 7(1), pp. 1–21. doi: 10.1016/S1043-951X(96)90017-6.

Jones, S. (2008) *DIIS · DANISH INSTITUTE FOR INTERNATIONAL STUDIES STRANDGADE 56 · 1401 COPENHAGEN K · DENMARK SUB-SAHARAN AFRICA AND THE " RESOURCE CURSE ": LIMITATIONS OF THE CONVENTIONAL WISDOM Sam Jones © Copenhagen 2008 Danish Institute for International Studies , DI*, *Simulation*.

Kronenberg, T. (2004) 'The curse of natural resources in the transition economies', *Economics of Transition*, 12(3), pp. 399–426. doi: 10.1111/j.0967-0750.2004.00187.x.

Kwaramba, M., Mahonye, N. and Mandishara, L. (2016) 'Capital Flight and Trade Misinvoicing in Zimbabwe', *African Development Review*, 28(1963), pp. 50–64. doi: 10.1111/1467-8268.12181.

Lam, R. and Wantchekon, L. (2002) 'Political Dutch Disease', *Unpublished Paper*, pp. 1–21. Available at: http://www.nyu.edu/gsas/dept/politics/faculty/wantchekon/research/dutch.pdf.

Manzano, O. and Rigobon, R. (2001) 'Resource Curse or debt overhang? Working Paper 8390, NBER, Cambridge', (February), pp. 2–26. Available at: http://web.mit.edu/rigobon/www/Robertos_Web_Page/CV_files/resourcecurse.pdf.

Mariara, J. and Mulwa, R. (2016) 'Natural Resource Curse in Africa : Dutch Disease and Institutional Explanations', *AGRODEP Working Paper*, (June), p. 26. Available at: http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/.

Mehlum, H., Moene, K. and Torvik, R. (2006) 'Institutions and the Resource Curse', *The Economic Journal*, 116(508), pp. 1–20.

Nataraj, Geethanjali and Tandon, A. (2011) 'China's changing export structure: A factor-based analysis', *Economic and Political Weekly*. doi: 10.2139/ssrn.2705291.

Nataraj, GEETHANJALI and Tandon, A. (2011) 'China ' s Changing Export Structure :', *Economic and Political Weekly, Vol. 46, No. 13 (MARCH 26-APRIL 1, 2011), pp. 130- 136 Published*, 46(13), pp. 130–136.

Neumayer, E. (2004) 'Does the "resource curse" hold for growth in genuine income as well?', *World Development*, 32(10 SPEC.ISS.), pp. 1627–1640. doi: 10.1016/j.worlddev.2004.05.005.

Obeng-Odoom, F. (2012) 'Problematising the Resource Curse Thesis*', *DEVELOPMENT AND SOCIETY*.

Obi, C. (2010) 'Oil as the "curse" of conflict in Africa: Peering through the smoke and mirrors', *Review of African Political Economy*, 37(126), pp. 483–495. doi: 10.1080/03056244.2010.530947.

Ofosu-Mensah, E. A. (2016) 'Mining in Colonial Ghana: Extractive Capitalism and Its Social Benefits in Akyem Abuakwa', *Africa Today*, 63(1), pp. 23–55. doi: 10.2979/africatoday.63.1.0023.

Olarinmoye, O. O. (2018) 'Politics Does Matter: The Nigerian State and Oil (Resource) Curse', *Africa Development / Afrique et Développement*, 33(3), pp. 21–34.

Oskenbayev, Y., Yilmaz, M. and Abdulla, K. (2013) 'Resource concentration, institutional quality and the natural resource curse', *Economic Systems*. Elsevier B.V., 37(2), pp. 254–270. doi: 10.1016/j.ecosys.2012.11.001.

Owusu-Koranteng, D. (2008) 'Mining investment & community struggles', *Review of African Political Economy*, 35(117), pp. 467–473. doi: 10.1080/03056240802411115.

Parcero, O. J. and Papyrakis, E. (2016) 'Income inequality and the oil resource curse', *Resource and Energy Economics*. Elsevier B.V., 45, pp. 159–177. doi: 10.1016/j.reseneeco.2016.06.001.

Parvin, M. and Dezhbakhsh, H. (1988) 'Trade, technology transfer, and hyper-dutch disease in opec: Theory and evidence', *International Journal of Middle East Studies*, 20(4), pp. 469–477. doi: 10.1017/S002074380005385X.

van der Ploeg, F. and Poelhekke, S. (2009) 'Volatility and the natural resource curse', *Oxford Economic Papers*, 61(4), pp. 727–760. doi: 10.1093/oep/gpp027.

Van Der Ploeg, F. and Venables, A. J. (2011) 'Harnessing Windfall Revenues: Optimal Policies for Resource-Rich Developing Economies', *Economic Journal*, 121(551), pp. 1–30. doi: 10.1111/j.1468-0297.2010.02411.x.

PRS (2018) *International Country Risk Guide*. Available at: https://epub.prsgroup.com/products/icrg/icrg-historical-data.

Romer, P. M. (1986) 'Romer - Increasing returns and long run growth.pdf', *Journal of Political Economy*, pp. 1002–1037.

Ross, M. L. (1999) 'The political economy of the resource curse', *World Politics*. doi: 10.1017/S0043887100008200.

Ross, M. L. (2015) 'What Have We Learned about the Resource Curse?', *Annual Review of Political Science*, 18(1), pp. 239–259. doi: 10.1146/annurev-polisci-052213-040359.

Sachs, J. D. and Warner, A. M. (1995) 'Natural Resource Abundance and Economic Growth', *NBER Working Paper Series*, 3, p. 54. doi: 10.3386/w5398.

Sachs, J. D. and Warner, A. M. (1999) 'The big push, natural resource booms and growth', *Journal of Development Economics*, 59(1), pp. 43–76. doi: 10.1016/S0304-3878(99)00005-X.

Sachs, J. D. and Warner, A. M. (2001) 'The curse of natural resources', *European Economic Review*, 45(4–6), pp. 827–838. doi: 10.1016/S0014-2921(01)00125-8.

Sachs, J. D. and Warner, A. M. (2009) 'Economic Convergence and Economic Policies', *Ssrn*. doi: 10.2139/ssrn.1479610.

Scott, R. E. (1993) 'Flat Earth Economics: Is there a new international trade paradigm?', *Challenge*, 36(5), pp. 32–39.

Shao, S. and Yang, L. (2014) 'Natural resource dependence, human capital accumulation, and economic growth: A combined explanation for the resource curse and the resource blessing', *Energy Policy*. Elsevier, 74(C), pp. 632–642. doi: 10.1016/j.enpol.2014.07.007.

Stevens, P. (2005) 'Resource curse and how to avoid it?', *The Journal of Energy and Development*, 31(1), pp. 1–20.

Summers, R. and Heston, A. (1991) 'The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988', *The Quarterly Journal of Economics*, 106(2), p. 327. doi: 10.2307/2937941.

Warner, J. D. S. and A. M. (1997) 'Natural Resource Abundance and Economic Growth', *Journal of Chemical Information and Modeling*, 53(9), pp. 1689–1699. doi:

10.1017/CBO9781107415324.004.

Wijnbergen, S. van (1984) ‘The `Dutch Disease’: A Disease After All ?’, 94(373), pp. 41–55.

Zhao, H. and Zou, S. (2002) ‘The impact of industry concentration and firm location on export propensity and intensity: An empirical analysis of Chinese manufacturing firms’, *Journal of International Marketing*. doi: 10.1509/jimk.10.1.52.19527.

Ziorklui, S. Q. and Barbee, W. (2003) ‘Financial sector reform and financial savings in Sub-Saharan Africa: The case of Ghana’, *Savings and Development*, 27(1), pp. 63–78.