THE IMPACT OF NATURAL RESOURCES ON ECONOMIC DEVELOPMENT IN AFRICA

By

Kilton José Luis Lauter Portugal

THESIS

Submitted to

School of Public Policy and Management, KDI

In partial fulfillment of the requirements

For the degree of

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2016

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ABSTRACT

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This paper studied the association between economic development in Africa and natural resource wealth founded on panel data econometric techniques. With three different indicators that could proxy for resource dependence, the outcomes suggested that natural resources were important to predict economic growth in African countries. Some indicators have negative and other indicators have positive coefficients and are not statistically significant in all the models estimated. Overall, the results show that the natural resources were insignificant to predict economic development in Africa, at least over the sample period considered.

The evidence is robust to alternative model specifications such as different sets of control variables and regression methods.

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Dedicated to my beloved parents José Luís Lauter Portugal and Domingas João da Silva

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Table of Contents

1. Introduction…… 1
1.1.Purpose of the study……..…… 2
1.2.Research Question……..…… 2
1.3.Hypothesis……...…… 3
1.4.Statement of Significance……...…… 3
1.5.Research Limitations…….. 4
1.6.Outline of the Study…… 4

2. Literature Review…….…….. 5
2.1.Negative Relationship between Natural Resources and Economic Development……..… 5
2.2.Factors leading to a negative relationship between Natural Resources and Economic Development……..…… 7
2.3.Positive Relationship between Natural Resources and Economic Development……...9
2.4.Management of Natural Resources……..……. 10

3. Background of Economic Development in Africa…… 13
3.1.Trend of the Economic Development…….…….. 13
3.2.The Financial Crises of 2008 in Africa……..…….. 17

4. The Data Collection and Specification……. 19
4.1.Data Collection…….…… 19
4.2.Data Specification……...…….. 19

5. Methodology……...…….. 22
5.1.Econometric Model and Estimation Method Specification……..…… 22

6. Empirical Results…….……. 26
6.1.Main Results……..…26
6.2.Results of the Regression Estimates with year dummy…….27

6.3. Results of the Regression Analysis with dummy variable……..……28
7. Conclusions Remarks.……... 31

Bibliography……..32

List of Tables

Table 1: of Summary Statistics…….…… 21

Table 2: of Summary Statistics with log variables...…… 21

Table 3: Correlation Matrix…….. 21

Table 4: Hausman Test……..……... 25

Table 5: Fixed Effect Model Regression Estimates ……..……..……. 26

Table 6: Fixed Effect Model Regression Estimates with year dummy ……..……. 27

Table 7: Fixed Effect Model Regression Estimates with dummy variable ……..….... 29

List of Figures

Figure 1: Economic Growth and Resource abundance (1970 ~ 1980)…….…….. 6

Figure 2: Commodity prices and Africa GDP……..…… 15

Figure 3: Volume Index of Manufactured Exports from Africa (1980 ~ 2013)……...…… 16

Figure 4: Scatter plot of economic growth and resource dependence…….. 20

Abbreviations

ANS: Negative Adjusted Net Saving;

DRC: Democratic Republic of Congo;

FDI: Foreign direct investment;

GDP: Gross Domestic Product;

KOGAS: Korea Gas Corporation;

LDCs: Least Developing Countries;

MGI: McKinsey Global Institute;

SADC: Southern African Development Community.

1. Introduction

The richness of natural resources should increase economic growth because it contributes to the increase in exports, and thus more capital goods will be imported to construct the economy. Furthermore, income from natural resources can be used to upturn capital investment. Conversely, research has shown that resource-rich countries tend to grow at a slower pace than resource-poor ones, a phenomenon which is known in economic literature as the 'resource curse'.

This complex and dynamic relationship between natural resources and economic development has long been recognized by international research and development organizations and still attracts attention of scholars of all over the world generating an extensive body of literature (Bekalo, Sanginga and Odongo, 2010).

The results of studies examining the association between natural resources and economic growth in the last two centuries have yielded diverse outcomes. During the nineteenth century and the first half of the twentieth century, several development experiences seemed to suggest that natural resources were the engine for economic growth. Indeed, natural resources have had a positive impact on economic growth in countries such as Australia, Botswana, Canada, Norway, the United States and those in Scandinavia (Boschini, Petersson and Roin, 2012; Stevens, 2003). Nevertheless, it is hard to identify experiences where natural resources have had a positive impact on economic development during the second half of the twentieth century, as indicated by Behbudi, Mamipour and Karami (2010). Many studies such as those of Auty (1990), Sachs & Warner (2001), Gelb (1988), Gylfason et al (1999) and Collier (2007) show empirical evidence supporting a clear and strong negative relationship between a country's shares of total natural resources in GDP. Thus, with Africa being one of the most resource rich continents, it is interesting to know whether natural resources would improve economic growth. This is the main purpose of this study.

Using data on fifty-three African countries over the period extending from 2000 to 2014, the study finds that natural resource was not a significant variable in predicting economic growth in African countries. The evidence is robust to alternative model specifications such as different sets of control variables and regression methods.

1.1. Purpose of the study

This paper determines whether the natural resources wealth in Africa is a curse. The paper also emphasizes the interaction between natural resources and their effect on economic development.

1.2. Research Question

As mentioned above, the abundance of natural resources should accelerate economic growth because it contributes to the increase in exports, and thus more capital goods will be imported to construct - the economy; furthermore income from natural resources can be used to raise capital investment. Conversely, research has shown that resource-rich countries tend to grow at a slower pace than resource-poor ones, a phenomenon which is known in economic literature as the 'resource curse', the contradiction supporting that natural resource-rich countries grow a slower pace in comparison with poor ones.

Africa is one of the most resource-rich continents in the world, with enormous reserves of renewable resources, namely fishery, forestry, land and water, as well as non-renewable natural resources, such as minerals, gas and oil. Natural resources in Africa have been the substance of the economy of the continent and continue to represent an important progress opportunity. The region also has the largest arable land mass in the world and more than half of the continent's population is employed in the agricultural sector (African Development Bank, 2015). Nonetheless, in spite of being endowed with such natural resources, Africa remains marginal in the global economy, with countries such as the Democratic Republic of Congo (DRC), Lesotho, Malawi, Mozambique and Zambia among the world's Least Developing Countries (LDCs) (Masters and Kisiangani, 2011).

In the line of aforementioned and considering that Africa is one of the most natural resource-rich regions, the following question arises: Are natural resources a curse for Africa?

1.3. Hypothesis

Ho: $\beta = 0$ "There is no positive and significant effect of natural resource dependence on economic development of Africa";

Ha: $\beta \neq 0$ "There is no positive and significant effect of natural resource dependence on economic development of Africa".

The expected result is to reject the null hypothesis, $\beta = 0$, consequently, there is positive and significant outcome of natural resource wealth on economic development of Africa. This paper uses the common level of significance of 5% (0.05). Therefore, if P-value < 0.05, this study rejects the null hypothesis and concludes that there is positive and significant effect of natural resource wealth on economic development of Africa.

1.4. Statement of Significance

The complex and dynamic association between natural resources and economic development has long been recognized by international research and development organizations and has generated an extensive body of literature (Bekalo, Sanginga and Odongo, 2010).

Despite the existence of literature regarding the connection between natural resources and economic growth, there is little research focusing on the relationship in the African context In light of the aforementioned, this study targets to fill the existing gap in economic literature regarding the link between natural resources and economic growth by targeting Africa as the specific region for study. This paper applies panel data econometric models in the analysis of the impact of natural resource abundance on economic development in Africa from 2000 to 2014. Furthermore, this research has policy implications for the prospect management of natural resource in Africa.

1.5. Research Limitations

The first limitation was the choice of control variables. Among the vast literature on natural resources curse, several variables have been used on the regressions analyzes. Given the impossibility of using most of them simultaneously, it was challenging to choose variable for the regression analyses of this paper. However, the variables were selected taking into account economic theories, the African context, and availability of data.

The second limitation is associated to the measurement of resource reliance. Sachs and Warner (1995) propose the use of exports of natural resources in GDP while Sala-i-Martin and Subramanian (2003) suggest the inclusion of - the share of the exports of the base metals natural such as fuels, ores and metals. Being Sachs and Warner one of the pioneers in studying the association between natural resource and economic growth, this paper used the share of - of natural resources rents in GDP (natural resources rents, percentage of GDP) as one of the proxies for resource dependence.

1.6. Outline of the Study

The rest of the paper is organized as follows: Section 2 emphasizes -the literature review on Africa's economic growth; Section 3 focus on the background of economic development in Africa; Section 4 brings the data used and their sources; Section 5 summarizes the Methodology; Section 6 is dedicated to empirical results; Section 7 draws conclusions based on the findings. These sections are followed by the references.

2. Literature Review

The body of literature regarding an intriguing association between natural resource wealth and economic progress has grown to be more focused on developing countries. However, despite this substantial body of literature, little research has been conducted on the Southern African Development Community (SADC), and the results of studies on the association between natural resources and economic development in the last two centuries have yielded mixed results. This section summarizes the different results from the studies about this relationship.

2.1. Negative Relationship between Natural Resources and Economic Development

In the "The Bottom Billion", Paul Collier considers natural resources as one of the "traps" that prevents growth in developing countries which he categorizes as falling into the "Bottom Billion" of the development ladder. According to Collier, "societies of the bottom billion are disproportionately represented in the category of resource-rich poor countries, with about 29 % of people in the bottom billion living in countries in which natural resource wealth dominates the economy" (Collier, 2007: 39).

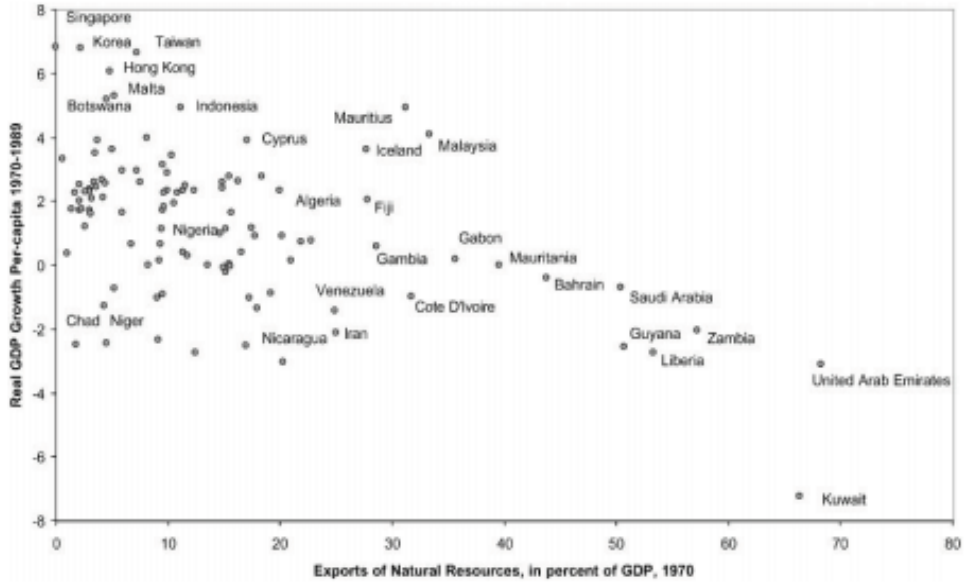
Various other authors like (2007), defend that many natural resource-rich countries have low economic growth and are more depressed than countries that are less endowed. Soros associated this low economic growth with the country's dependence on a particular resource, which in turn negatively influences development and diversification of other industries. Furthermore, dependence on primary products exposes the country to the effects of external price shocks. According to Collier, "the export of resources causes the country's currency to increase in value in comparison to other currencies, thus making the country's other export activities uncompetitive, even though other activities might have been better vehicles for technological progress" (2007: 39).

Sachs and Warner (1995), provide empirical examples where countries possess extraordinary share of natural resource rents to GDP in 1971 that conversely had low growth rates during following years from 1971 to 1989. According to the findings of continual regressions analysis using economic growth data from the period after II world war, resource-

rich countries such as the oil-rich Gulf States, Nigeria, Mexico and Venezuela have not experienced nor sustained rapid economic growth and it was concluded that extreme resource wealth tends to correlate with slow growth.

Although the study conducted by Sachs and Warner (1995) and other studies about the relationship between natural resources and economic growth used cross country data, the present study uses panel data to analyze this relationship .

Figure 1: Economic Growth and Resource abundance (1970-1980)



Source: Sachs & Warner (2001:829)

Figure 1 regarding the relationship between economic growth and natural resource abundance from 1970 to 1980, shows that none of the countries with exceptional abundance of natural resources in 1970 grew rapidly over the above mentioned period. In fact, as we can see, greatest part of the countries that grew fast during the same period were resource-poor countries such as Singapore in the top of the *y* axis (Real GDP growth) and in the beginning of the *x* axis (exports of natural resources).

A report from The World Bank examining the economic accomplishment of countries with enormous mining sectors in the 1990s found that "in countries with medium-sized mining sectors (between 6 and 15% of all exports), the GDP per capita fell at an average rate of 0.7% a year over the decade. In countries with large mining sectors (between 15 and 50 % of exports), GDP per capita dropped by an average of 1.1% a year, while in countries with very large mining sectors (over 50% of exports), GDP per capita dropped by a remarkable 2.3% a year" (World Bank, 2002).

2.2. Factors leading to a negative relationship between Natural Resources and Economic Development

According to Boschini, Petterson and Roine (2007), "natural resources themselves do not harm economic growth, but become a problem in the absence of good institutions. Robinson *et al.* (2006) developed a political economy model which shows that the impact of a 'resource boom' is significantly dependent on the quality of political institutions. Countries with worse-quality institutions are more likely to suffer from a 'resource curse', but strong and effective institutions should be able to offset some of the economic and social problems caused by resource dependence". "However, resource dependence tends to influence institutions themselves, making them more susceptible to conflict. Institutional quality does not depend on a single indicator. In the literature, the term 'institutions' is comprised of a varied range of indicators, including: 1) the enforcement of property rights; 2) political instability; 3) political regimes; 4) social features (including differences in income and in ethnic, religious, and historical background); and 5) social capital (the extent of civic activity and organizations)" (Roy, Sakar and Mandal, 2013).

Researchers regularly trust on one or more of the above indicator to capture the features of institutions, even though each one has a different effect on growth. Nevertheless, the most of studies about institutions, stress the significance of generating an institutional environment that is mostly supports the protection of property rights and enforcement of contracts.

Although the institutional channel has often been declared to be an important potential cause of the negative association between natural resources and economic growth, in the literature about resource curse theory, it has hardly been proved with much accomplishment. Although mentioned above that institutional quality does not depend on a single indicator, it is often simply controlled by measuring corruption (Sachs and Warner, 1995 Papyrakis and Gerlagh, 2004). According to Humphreys, Sachs & Stiglitz, a higher level of corruption is one of the most understandable political jeopardies that can ascend from enormous assets of natural resources (2007: 11). In order to maximize profits and lower costs, Multinational Corporations find it easier to obtain the natural resources at below market value by bribing government officials, instead of figuring out how to extract the resources more efficiently. In some cases, resources are traded to domestic firms at below market value with government officials getting a reward or an ownership share.

Ross (2003: 8) considers that "there is strong evidence which supports the idea that when a government gets more of its revenue from natural resources like oil, minerals, and timber, it is more likely to be corrupt. Ross explains that part of this problem is due to the total volume of resource revenues, which governments cannot absorb or track effectively. Limited amounts of money and resource wealth often flood governments with more revenue than they can effectively manage. Because resource revenues also tend to be collected by governments in ways that are difficult for citizens to track and which are easily intercepted by crooked officials, some of it ends up in off-budget accounts or in the pockets of government agents".

One of the major examples of resource-linked corruption cases in Africa happened in Angola. Due to corruption, in 2001 nearly $1 billion disappeared from the Angolan government's accounts. About 2% and 23 % of the country's gross domestic product, where lost over several years due to fiscal disparities with most of these losses linked to the country's dependence on oil (Ross, 2003: 9).

One of the main problems facing countries that rely on natural resources is the volatility of resource revenues. Because primary export prices tend to be unstable. The global prices of primary commodities have been more unstable in comparison with the prices of manufactured goods during the 20th century Grilli and Yang (198l). In addition to the abovementioned,

Reinhart and Wickham (1994) revealed that this volatility has grown since 1970, meaning that when countries become more reliant on primary commodity exports including those of oil and minerals, making them more vulnerable to economic shocks.

Other researchers such as Bulte, Damania, and Deacon (2005) find that natural resource wealth, particularly of minerals, has an unclear direct effect on a number of measures of human development and little negative indirect effect via two measures of institutional quality: the rule of law and governance efficiency.

2.3. Positive Relationship between Natural Resources and Economic Development

Economic literature also recognizes that there are exceptions to the rule of the resource curse, the contradiction telling that countries with high natural resource wealth tend to grow more slowly than those with less or without natural resources. "Conventional economic reasoning suggests that increasing a country's stock of assets provides greater opportunities for economic growth" (Bulte, Damania and Deacon, 2005: 1029).

Natural resources them self may not be a curse or a blessing. In fact there are various mechanisms through which a natural resource boom can impact on economy. There are numerous studies which advocate that plenty of natural resources should increase economic growth because it raises exports and exports will generate more capital goods which will be imported in order to build up the economy. Marin (1992) and Thornton (1996) establish that countries with a large share of their production being constituted by exports seem to grow faster than others.

In addition to the abovementioned, rents from natural resources can be used to increase capital investment. In spite of the recognition that the abundance of natural recourses often leads to low or negative adjusted net saving (ANS)[1], the World Bank considers that "countries rich in

[1] "Adjusted net saving (ANS) provides a measure of net change in wealth. It is defined as gross saving plus investment in human capital (education expenditures), minus depreciation of produced capital, depletion of natural capital (energy, mineral, and forest assets), and damage from global and local pollution. If ANS is negative, it means

natural resources have an advantage over others in financing economic development. Natural resource rents can be effectively deployed for this purpose, but it is important to reinvest such rents in other types of capital, notably human capital and institutions" (The World Bank, 20013: 24).

There are also resource-rich countries whose economies have, in fact, performed successfully in recent decades. The United States from the mid-19th century to the mid-20th century was the world's leading mining economy and eventually became the world leader in manufacturing and natural resources which were vital to American economic success.

2.4. Management of Natural Resources

The finding of natural resources or a sudden increase in the price of exportable resources may unexpectedly increase revenues; however, many countries have been incapable to well manage these extra gains and end up spending too much and too fast. There is no direct link between income natural resources and expenditure that supports economic development and increase social welfare. The impact of natural resources reliance may be related to economic or political failings in managing the resource revenues (Stevens & Dietsche, 2007: 58).

The World Bank (2013: 24) defines development as a process of building and managing a diversified portfolio of assets that contribute to economic growth and well-being. As pertains to the creation of wellbeing and sustainable growth or development in the long run, the total value of assets must be maintained at a continuous level or improved (The World Bank, 2013: 24). According to the World Bank, in order to have sustainable development based on natural resource abundance; countries must invest natural resource rents in social and institutional capital. According to Hartwick (1977) & Solow (1986), sustainability can be achieved by investing the rents from resources in other forms of riches which guarantee that, in total, the variation in real value of assets is positive.

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that the country is exhausting its resources at the cost of future generations; hence it is on a path of unsustainable development" (The World Bank, 20013: 24).

According to the theory of sustainability, in order to complement the well-being of the future and the present generations, the natural resource abundant countries, save and invest the income from resource extraction. Gelb and Associates (1988), present evidence showing that in practice many countries find difficult to implement the aforementioned. Normally countries with natural resource wealth often do not diversify and invest in a skilled workforce that can support other economic sectors when the resources finish, causing a decline in a share of national spending in education, In this regard, Humphreys, Sachs & Stiglitz argue that "when a country's wealth depends on investment in manufacturing or other productive activities, human capital investment is an essential part of wealth creation" (2007: 10). On the other hand, when it depends on an endowment, investment in the skilled labor-force is not essential for the existing income.

Collier introduces factors such as the Dutch Disease and instability of the commodity price, as other reason that may possibly impact economic growth in natural resources-rich countries. They inhibit growth even if a country's politics are designed to reap more benefits from natural resources. Collier also believes that natural resource rents are likely to induce autocracy, which is highly detrimental for economic growth in ethnically diverse societies of the "Bottom Billion", as was Saddam Hussein's rule in Iraq. However, he also considers the nature of democracy existing in the resource-rich countries of the "Bottom Billion" as being potentially dysfunctional for economic development, because most of them are transitioning democracies. "There are strong incentives for different groups to compete for elections, but there are not corresponding incentives for them to build restraints" (Collier, 2007: 67).

One of the major problems in the process of natural resource management is related to government spending. According to Humphreys, Sachs & Stiglitz (2007: 9), consuming all revenues without saving or investing will decrease the country's total capital. In this case, the authors suggest changing the greatest part of the natural resource stocks into financial assets, investing the assets in different forms of wealth.

With regards to market shocks due to the volatility of natural resource revenues as mentioned above, Asher (1999) considers that in order to protect the economy against shocks, governments should be able to implement stabilization founds and saving founds, even though

there are evidences showing that in practice, these funds are not well managed and end up doing more harm than good.

3. Background of Economic Development in Africa

This section of the paper presents the historical trend of the economic development in Africa. The purpose is to sightsee the essential aspects that determine the economic development in Africa.

3.1. Trend of the Economic Development

Natural resources have for several decades an important factor for African Economic growth. Africa possesses the third biggest reserve of mineral reserves, a tenth of its oil and produces two-thirds of the world's diamonds. This is one of the reasons for the link between the variation of natural resources prices and economic growth on the continent. When prices for natural resources and export crops rise, also rises the economic growth; when they decrease, so has the continent's economic growth (Masters and Kisiangani, 2011). As an example, The Economist (2015) describes the 1998-99 oil-price falls, where Nigeria's Naira lost 80% of its value and most other African currencies decreased in value during another period of crises in the commodity markets in 2009.

Regardless of the serious challenges faced by African countries, including poverty, disease, and high infant mortality, the continent's collective GDP, calculated approximately in $1.6 trillion in 2008, is roughly compared to Brazil's or Russia's, and the continent is among the world's most rapidly growing economic regions. (Leke, et all, 2015).

Due to Africa's substantial resource reserves, mainly precious and base metals wealth, the continent is becoming an additional significant actor in the world's energy markets. At the end of 2010, Africa had 9.5% of the world's crude oil and 8% of the world's natural gas reserves, with considerable unexploited reserves, in countries such as Ghana, Uganda, Mozambique and possibly Namibia attracting strong interest around the world.

Despite the struggle with the apparently interminable variety of developmental challenges such as civil war, political instability, epidemics, chronic food insecurity and persistent poverty which most of African countries faced in the period after the independency, many of them have

been undergoing economic recovery and becoming emerging economies worldwide. The so called BRICS like Brazil, India, South Africa and China, have recognized Africa as a potential investment destination and a source of natural resources (African Development Bank, 2011: 9). According to The Economist (2015), this economic development has motivated analysts to argue that "the continent has reached a turning point in the history of its development and is poised to play a more significant role in the global economy in the 21st century global economy. The Journal showed that the continent's average annual growth rate of real output increased from 1.8% for the period 1980 to 1989 to 2.6% from 1990 to 2000 and 5.3% for the period 2000 to 2010. Additionally, twelve African countries had an average growth rate above the developing country average of 6.1% for the period 2000 to 2010, and two countries, Angola and Equatorial Guinea had double digit growth rates".

Growth rates for oil importing and oil exporting countries in Africa diverged significantly in 2007 and 2008 with some countries such as Angola getting outstanding achievement of 11.4% and Algeria 4%. However, this difference is set to narrow in 2009 due to the slower growth of oil production in Angola (*Ibid*).

Rising oil prices, minerals, and other commodities have helped boost GDP of many African countries since 2000. A research conducted by the McKinsey Global Institute (MGI), shows that natural resources accounted for about a third of the economic growth in Africa. The remaining part of the growth resulted from factors such as internal structural variations that have inspired the broader national economy in these countries. However, factors like wars, natural disasters, and poor government policies, contributed to inverse these achievements.

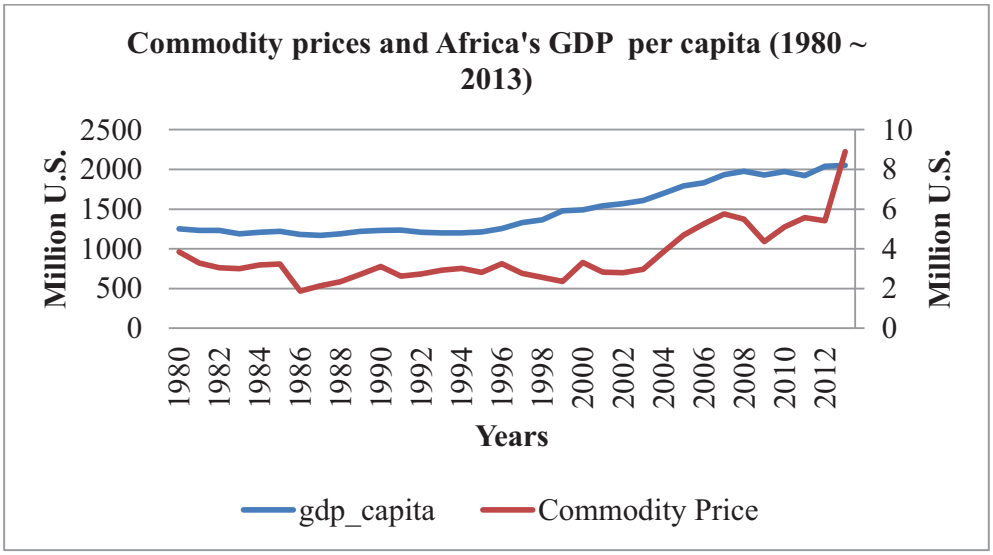
Goldsmith (1998:14) posits that the economic development that Africa has been experiencing is in part due to the shift from the developmental to the institutional focus that the continent has been implementing.

According to The Economist (2015), African countries have been working hard to attract more foreign investors to the continent. As result of this harder work, Foreign Direct Investment (FDI) in Africa rose by 5% in 2012 and 10% in 2013, despite global lack of progress.

The World Bank's annual '*Doing Business*' report brings evidence of this commitment of African governments in working towards economic growth, showing that in 2013/14 Sub-Saharan Africa did more to improve investment regulation than any other region, with Mauritius being ranked 28th on the list of the easiest places to do business and Rwanda deemed as being more investor friendly than Italy.

The Economist (2015) states that apart from better-quality of governance and economic improvements, high commodity prices also contributed to Africa being among the world's fastest rising continents in the previous decade. It was noted that in previous cycles African economies were stationary due to the fall in prices of minerals, oil and other commodities.

Figure 2: Commodity prices and Africa GDP



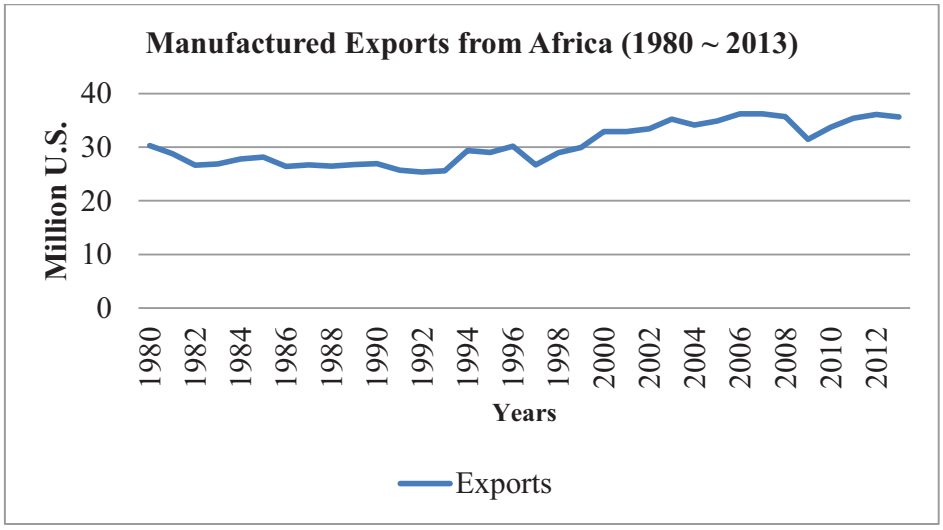
Source: World Bank database

Figure 2 above shows the correlation between commodity prices and the GDP of Africa, and a positive relationship between the commodity prices and GDP for the period 1980-2013.

If one were to consider agricultural commodities, timber, metals and minerals, and hydrocarbons, natural resources have accounted for roughly 35% of Africa's growth since 2000. Resource-based raw and semi-processed goods also accounted for about 80% of total African export products in 2011 (The Economist, 2015).

Although, manufactured exports from Africa have been increasing significantly, mostly during the period from 1990 to 2004, as shown in Diagram 1, Africa's share of global manufacturing production dropped somewhat from 0.9% to 0.8% -from 1980 to 1994 and the impact of manufacturing production to the total national income remains low, with the share of manufacture value added in GDP in 2004 fluctuating from a high of about 20% in Mauritius to as low as 0.5% in Djibouti and an average of only about 9% (Gessese, 2006: 2).

Figure 3: Volume Index of Manufactured Exports from Africa (1980 ~ 2013)



Source: World Bank database

3.2. The Financial Crises of 2008 in Africa

The period of high economic growth in Africa come to the end with the world economic crisis of 2009. The Average economic growth decreased from 6% in 2006-2008 to 2.5% in 2009. The crisis of 2009 had its toughest consequence mostly in Southern Africa, where growth decreased by almost 8% points to negative growth of around 1% for nearly three years. (AfDB, OECD, UNDP, UNECA, 2010)

The economic slowdown was most evident in the mining, manufacturing and tourism sectors once they are the most exposed to the change of commodity prices. The effects of the recession were reduced by income share from agriculture and services sectors. Apart of commodity prices, the financial crises of 2009 also reduced the volume of exports in Africa. As an example, the volume of exports on the continent dropped from nearly 2.5% and volume of imports by 8%. The decrease of the price of commodities in Africa, contributed to the depreciation of continent's terms of trade (AfDB, OECD, UNDP, UNECA, 2011).

During the years after the financial crisis of 2009, the economies of many African countries have managed to recuperate from the collapse which had been caused by the financial crises. As shown by Mthuli, Pezzini, Conceição and Nnadozie (2011: 10), the continent average growth rate increased to 5%, from 3.1% in 2009. However, the continent's economy was soon destabilized by the Arab Spring uprisings, thus, experiencing another downturn growth and felling back from approximately 5% in 2010 to 3.4% in 2011. Part from of the financial crisis of 2009, low demand and high supply also have contributed to the fall of commodity prices in Africa, even though remaining at satisfactory levels for exporters in the continent, considerably beyond the average levels of the five years before the crisis (AfDB, OECD, UNDP, UNECA, 2012)

The collective GDP of Africa grew at 6.6% in 2012 from approximately 3.4% in 2011. This acceleration was partly due to considerable recovery in Libya's GDP, which in 2012 grew by 96% after a sharp contraction of 60% in 2011 following the Arab Spring uprisings. Getting

out the Libyan effect, growth in the continent's real GDP was recorded at 42%. Thus, Libya's economic recovery added more than 2% points to Africa's growth in 2012 (Paepe, 2013).

4. The Data Collection and Specification

This segment of the paper presents the description of the data used to run the regressions analysis.

4.1. Data Collection

To explore whether natural resource dependence would enhance economic development in Africa, there are 106 observations from the dataset consisted of information from fifty-three[2] African countries from the period extending from the year 2000 to the year 2014. The data was taken from the World Bank's World Development Indicators Database (2015).

The choice of the variables and time is determined by the economic literature about the link between natural resources and economic growth as well as data availability consideration.

4.2. Data Specification

The dependent variable in the regression is the economic growth rate denoted as *growth* and is measured as the annual growth rate of real GDP per capita from the period from 2000 to 2014 serving as a proxy for economic development.

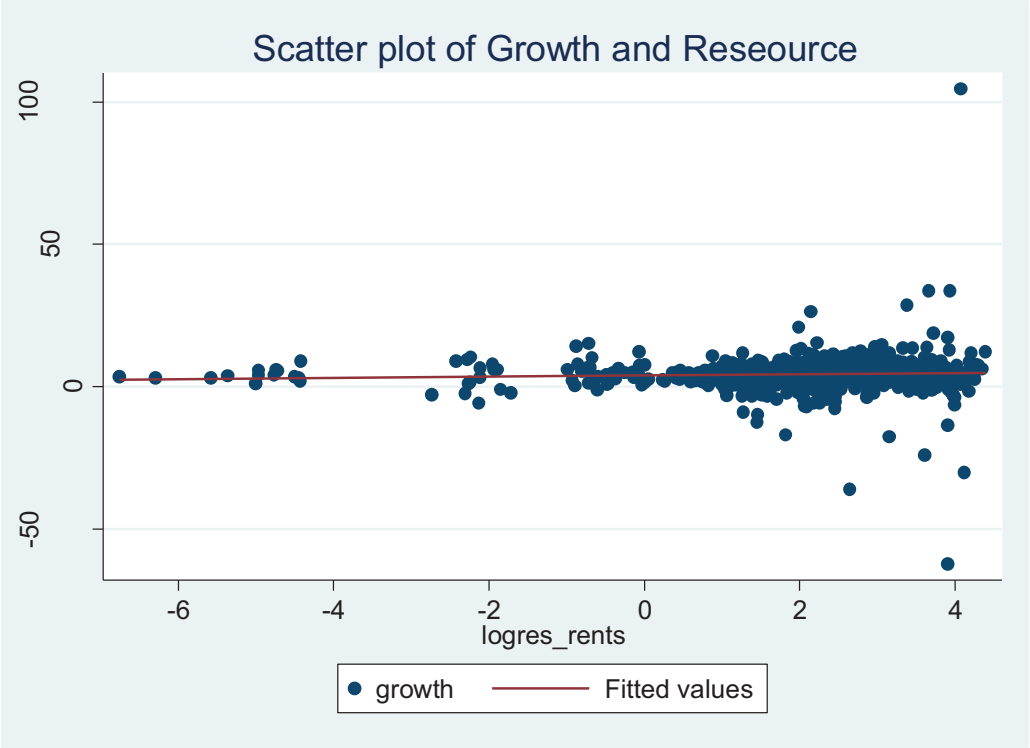
Control variables to mitigate the effect of omitted variables were also included in the regression. These are the log values of GDP per capita (*loggdppc*) to capture the - hypothesis that countries with low income tend to grow faster than countries with high income; total natural resources rents percentage of GDP in terms of millions (US dollars) (*logres_rent)* was used as a proxy indicator for the main independent variable, and measured as percentage of GDP for the period extending from 2000 to 2014. Figure 4 shows scatter plot of economic growth and resource dependence.

Mineral rents have as proxy (*log1plusmineralrent*) to capture the share of mineral production in GDP and natural gas rents (*log1plusgasrent*) to measure the share of natural gas

[2] The African continent contain 54 countries, however, this study analyzes the effect of natural resources on economic development of 53 countries. South Sudan was excluded, hence it is a newly created country, gained its independence from Sudan in 2011 and there is lack of data regarding this country.

production in GDP. Capital formation is represented as a percentage of GDP in millions of US dollars (*investment)* which was used to capture the adding to the fixed assets of the economy plus variations in the level on inventories. The export and import of goods and services (percentage of GDP) in millions US dollars (*trade*) was used to account for all goods and other market services delivered to the rest of the world and for the good and services purchased from the rest of the world. Other control variables included *inflation* which proxy is the percentage changes in the consumer price index to capture the growth effect of inflation and *population* to account for the rate of population growth in each African country.

Figure 4: Scatter plot of economic growth and resource dependence.



It can be seen in the scatter plot above possible outliers, meaning that one or some African countries have much higher economic benefits from natural resources exploitation in

comparison to others. Table 1 and 2 display the summary statistics of variables. Table 3 shows the correlation matrix.

Table 1: of Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
growth	764	4.599	7.009	-62.076	104.486
res_rents	755	15.164	16.230	0.001	80.712
min_rents	777	1.817	5.114	0	44.643
gas_rents	713	0.733	2.425	0	21.259
gdppc	763	1850.316	2826.435	134.816	15912.14
investment	714	22.611	12.683	0	147.879
trade	733	81.145	45.505	19.119	351.106
inflation	748	0.045	0.894	-0.036	24.411
population	795	2.365	0.880	-2.628	5.598

Table 2: of Summary Statistics with log variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
growth	764	4.599	7.009	-62.076	104.487
logres_rent	755	2.004	1.599	-6.758	4.391
log1plusmineralrent	777	0.486	0.826	0	3.821
log1plusgasrent	713	0.251	0.589	0	3.102
loggdppc	763	6.756	1.153	4.904	9.675
investment	714	22.611	12.683	0	147.879
trade	733	81.145	45.505	19.119	351.106
inflation	748	0.045	0.894	-0.036	24.411
population	795	2.365	0.880	-2.628	5.598

Table 3: Correlation Matrix

	growth	*logres_ rents*	*log1plus mrent*	*log1plus grent*	*loggdppc*	*investment*	*trade*	*inflation*	*population*
growth	1.000								
logres_rents	0.052	1.000							
log1plumrent	0.018	0.220*	1.000						
log1plusgrent	0.004	0.312*	-0.174*	1.000					
loggdppc	0.022	-0.347*	-0.093*	0.321*	1.000				
investment	0.341*	-0.069	0.079*	0.106*	0.391*	1.000			
trade	0.129*	-0.166*	-0.046	0.013	0.439*	0.479*	1.000		
inflation	-0.052	0.022	0.074*	-0.019	-0.030	-0.054	0.001	1.000	
population	0.178*	0.499*	0.102*	-0.163*	-0.577*	0.034	-0.251*	-0.048	1.000

5. Methodology

In this segment of the paper, are presented the framework of the empirical procedure used to run the regressions analysis.

5.1. Econometric Model and Estimation Method Specification

To ascertain whether natural resource dependence would increase economic development in Africa, the following regression model will be used by the researcher to estimate the strength of the relationship between variables:

$$growth_{it} = \beta_0 + \beta_1 logres\_dependence_{it} + \beta_2 loggdppc_{it} + \beta_3 investment_{it} + \beta_4 trade_{it}^{(1)} + \beta_5 inflation_{it} + \beta_6 pop\_growth_{it} + u_{it}$$

The main independent variable *res_dependence* is represented by three proxy variables: resource rents (*res_rents*). This is the preferred proxy for resource dependence because it is a better coverage of the income from natural resources; mineral (*min_rents* and *log1plusmrents*); natural gas rents (*gas_rents* and *log1plusgrents*);

Where:

i: 1, 2, 3, …, 53

t: 1, 2, 3, …, 15

growth: is the long-run growth rate of real GDP per capita;

logres_dependence: is an indicator of the income earned from natural resources exploitation;

loggdppc: is the log income level of countries in the beginning period;

investment: measure of the private investment;

trade: is a measure of trade openness;

inflation: is an indicator of the inflation rate;

population: accounts for the rate of population growth in each African country; and

u: the error term or disturbance contains factors other than those mentioned above that affect the dependent variable.

It is expected that $\beta_1 > 0$: the higher the total natural resources rents, the higher would be the economic development; $\beta_2 < 0$: the poorer the country, the higher the economic growth rate; where $\beta_3 > 0$: larger investment expenditure implies higher economic development; when $\beta_4 > 0$: the greater international trade, the higher the economic development; where $\beta_5 < 0$: the higher the inflation, the lower the economic growth; where $\beta_6 < 0$: higher population annual growth implies slower economic development.

In order to discover the impacts of resource dependence on economic growth in the period before the financial crises (2000 to 2008) and the period after the financial crises (2008 to 2014), a dummy variable (*ppost08*) to denote the period after 2008 and (*rdppost08*) to represent resource dependence after 2008 were added to the model as shown in the Equation 2 below:

$$growth_{it} = \beta_0 + \beta_1 logres\_dependence_{it} + \beta_2 ppost08 + \beta_3 rdppost08 + \beta_4 logirgdppc_{it} + \beta_5 investment_{it} + \beta_6 trade_{it} + \beta_7 inflation_{it} + \beta_8 population_{it} + u_{it} \quad (2)$$

The proxies of the main independent variable *res_dependence* in the period after the financial crisis of 2008 (*rdppost08*) are denoted as such: (*rrppost08*) for resource rents; (*mrppost08*) for mineral rents and (*grppost08*) for gas rents.

Where:

i: 1, 2, 3, …, 53

t: 1, 2, 3, …, 15

growth: is the long-run growth rate of real GDP per capita;

ppost08: time dummy; 0 for year 2000-07 and 1 for year 2008-14;

rdppost08: interaction of *res_dependence* with *ppost08*;

logres_dependence: is an indicator of the income earned from natural resources exploitation;

loggdppc: is the log income level of countries in the beginning period;

investment: measure of the private investment;

trade: is a measure of trade openness;

inflation: is an indicator of the inflation rate;

population: accounts for the rate of population growth in each African country; and

u: the error term or disturbance contains factors other than those mentioned above that affect the dependent variable.

In order to examine the association between natural resource abundance and economic development, regression analysis of panel data was employed for the period extending from 2000 to 2014. The data used to carry out the regression was taken from the World Bank Development Indicators Database (2015).

After preforming the Hausman test to decide between a random or fixed effect, it was concluded that the fixed effect is best model for this data. The null hypothesis for this test sates than the random effect model is the appropriate and the alternative hypothesis states that the fixed effect is the appropriate model.

Under the specification shown in the results in Table 1 below where the p-value is 0.0001, which is less than 0.05, the null hypothesis of the random effects model is rejected. It has also been concluded that the fixed effects model is the preferred specification for this data; it provides more precise results than the random effects method.

Table 4: Hausman Test

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	Sqrt (diag(V_b-V_B)) S.E.
loggdppc	2.559	-0.160	2.719	1.529
logres_rent	-0.630	-0.381	-0.249	0.564
log1plusmineralrent	0.625	0.552	0.072	0.477
log1plusgasrent	1.014	1.184	-0.169	0.614
investment	0.018	0.062	-0.043	0.018
trade	0.056	0.017	0.038	0.008
inflation	-0.134	-0.198	0.064	0.026
population	1.940	1.761	0.178	0.260

Prob > chi2 = 0.0000

6. Empirical Results

This unit of the paper presents and discusses the empirical findings relating to natural resource and economic development in Africa. Initially, is presented the regression results of three different models with three different proxies for resource dependence. Second, the result of the regression analysis applying year dummies is presented and finally the regression result of three models with dummy variables is presented.

6.1. Main Results

Table 5 reports the robust estimated regression results with fixed effect model. The table is comprised of three columns, with column (1) using resource rents (*logres_rent*) as proxy for resource dependence, column (2) using mineral rent (*log1plusmineralrent)* as proxy for resource dependence and column (3) using natural gas rent *(log1plusgasrent)* as proxy for the main independent variable.

Table 5: Fixed Effect Model Regression Estimates

	(1) growth	(2) growth	(3) growth
logres_rent	-0.354 (0.643)		
log1plusmineralrent		-0.304 (0.592)	
log1plusgasrent			0.808 (0.665)
loggdppc	4.872 (3.213)	1.359 (2.402)	2.085 (2.106)
investment	0.017 (0.038)	0.107** (0.037)	0.032 (0.037)
trade	0.052*** (0.007)	0.067*** (0.014)	0.055*** (0.009)
inflation	-0.126** (0.041)	-0.139*** (0.034)	-0.137*** (0.018)
population	1.960* (0.785)	1.966* (0.750)	2.029* (0.818)
Cons	-36.98 (20.16)	-17.06 (15.83)	-19.71 (13.90)
N	638	660	611
Adj. R-sq	0.099	0.175	0.110

Note: The robust standard errors are stated in parentheses. ***, ** and * indicate significance at 1%, 5% and 10%, respectively

As revealed in table 5, resource dependence was insignificant in contributing towards economic growth despite the addition of more control variables. In column (1) regression the study shows that the coefficient estimate (β_2 = - 0.354) of *res_rent* is negative and statistically insignificant at 5% significance level. In column (2), with mineral rents as the proxy for resource dependence, the coefficient estimate (β_2 = - 0.304) of *log1plusmineralrent* is negative and statistically insignificant at 5% significance level. In column (3), with natural gas rent as proxy for resource dependence, the coefficient estimate (β_2 = 0.808) of *log1plusgasrent* is positive and statistically insignificant at 5% significance level.

6.2. Results of the Regression Analysis with year dummies

In order to control the effect of resource dependence on economic development throughout the years, regression analysis with year dummies with the year 2000 as base was run, the results are displayed in the table 6 showing the fixed effect regression estimates with year dummy.

Table 6: Fixed Effect Model Regression Estimates with year dummy

	(1) growth	(2) growth	(3) growth
logres_rent	-0.323 (0.600)		
log1plusmineralrent		0.538 (0.580)	
log1plusgasrent			0.232 (0.701)
loggdppc	7.557 (5.526)	5.547 (4.448)	3.403 (3.656)
investment	0.0424 (0.0353)	0.140** (0.0450)	0.0434 (0.0320)
trade	0.0477*** (0.00684)	0.0619*** (0.0138)	0.0505*** (0.00902)
inflation	-0.142* (0.0537)	-0.160*** (0.0435)	-0.160*** (0.0392)
population	2.262* (0.877)	2.323* (0.899)	2.193* (0.894)
Cons	-56.72 (36.00)	-47.31 (30.12)	-29.78 (24.20)
N	638	660	611
Adj. R-sq	0.137	0.216	0.142

Note: The robust standard errors are stated in parentheses. ***, ** and * indicate significance at 1%, 5% and 10%, respectively

According to the table 6, taking the year of 2000 as a base, from 2001 to 2014, resource dependence had no significant influence on economic growth in African countries. As can be seen from the column (1) of the table 5, the coefficient estimate (β_2 = - 0.323) of *res_rent* is negative and statistically insignificant at 5% significance level. In column (2), the coefficient estimate (β_2 = 0.538) of *log1plusmineralrent* is positive and statistically insignificant at 5% significance level. In column (3), the coefficient estimate (β_2 = 0.232) of *log1plusgasrent* remains positive and statistically insignificant at 5% significance level.

6.3. Results of the Regression Analysis with dummy variable

Since the financial crises of 2008 occurred during the period of this analysis (from 2000 to 2014), it is important to observe how the variables of the model of this study and resource dependence in particular contributed toward economic growth in African countries for different periods of time from before and after the financial crises of 2008.

The time is divided into two different periods of the pre financial crisis of 2008 (2000 to 2007) and post financial crisis of 2008 (2008 to 2014). Dummy variables (*ppost08*) to represent the period after 2008 and (*rdppost08*) to represent resource dependence after 2008 were added to the model and a regression was carried out for each period to find if the variables of the model have significance contribution towards economic growth in African countries.

Table 7 reports the robust estimated fixed effect regression results with dummy variables. As in the two other regression result tables above, table 7 is comprised of three columns, with column (1) adding resource rents after 2008 (*rrppost08*) as proxy for resource dependence, column (2) using mineral rent after 2008 (*mrppost08)* as proxy for resource dependence and column (3) using natural gas rent after 2008 *(grppost08)* as proxy for the main independent variable.

Table 7: Fixed Effect Model Regression Estimates with dummy variable

	(1) growth	(2) growth	(3) growth
logres_rent	0.432 (1.379)		
log1plusmineralrent		-0.142 (1.534)	
log1plusgasrent			-0.254 (1.150)
ppost08	0 (.)	0 (.)	0 (.)
rrppost08	-0.035 (0.061)		
mrppost08		-0.036 (0.159)	
grppost08			0.220 (0.292)
loggdppc	23.82 (14.32)	22.54 (12.52)	9.052 (5.953)
investment	0.023 (0.079)	-0.013 (0.079)	0.085 (0.061)
trade	0.029 (0.015)	0.028 (0.015)	0.014 (0.013)
inflation	17.10 (66.19)	-19.21 (56.67)	-55.47 (46.11)
population	-0.154 (0.462)	-0.081 (0.488)	-0.072 (0.498)
Cons	-161.0 (98.19)	-151.3 (85.40)	-60.43 (40.59)
N	298	305	263
Adj. R-sq	0.174	0.148	0.080

Note: The robust standard errors are stated in parentheses. ***, ** and * indicate significance at 1%, 5% and 10%, respectively

Table 7 shows that resource dependence remains insignificant for the period after the 2008 financial crises. In column (1), the coefficient estimate (β_2 = 0.076) of *res_rent* is positive and statistically insignificant at 5% significance level. In column (2), the coefficient estimate (β_2 = - 0.142) of *log1plusmineralrent* is negative and statistically insignificant at 5% significance level. In column (3), the coefficient estimate (β_2 = -0.254) of *log1plusgasrent* is negative and statistically insignificant at 5% significance level.

Table 6 also shows that none of the control variables of the model were insignificant in contributing towards economic development in Africa after the financial crisis of 2008. In the

Column (1) regression, the study shows that the coefficient estimate (β_4 = 23.82) of *loggdppc* is positive and statistically insignificant at 5% significance level. The coefficient estimate (β_5 = 0.028) of *investment* is positive and statistically insignificant at 5% significance level. The coefficient estimate (β_6 = 0.026) of *trade* is positive and insignificant at 5% significance level. The coefficient estimate (β_7 = 17.57) of *inflation* is positive and insignificant at 5% significance level. The coefficient estimate (β_8 = -0.163) of *population* is negative as expected and not significant at 5% significance level.

In the Column (2) of the table 7, the study shows that the coefficient estimate (β_4 = 22.54) of *loggdppc* is positive and statistically insignificant at 5% significance level. The coefficient estimate (β_5 = -0.013) of *investment* is negative and statistically insignificant at 5% significance level. The coefficient estimate (β_6 = 0.028) of *trade* is positive and not significant at 5% significance level. The coefficient estimate (β_7 = - 19.20) of *inflation* is negative as predicted and not significant at 5% significance level. The coefficient estimate (β_8 = -0.081) of *population* is negative as expected and not significant at 5% significance level.

In the Column (3) of the table 7, the study shows that the coefficient estimate (β_4 = 9.052) of *loggdppc* is positive and statistically insignificant at 5% significance level. The coefficient estimate (β_5 = 0.085) of *investment* is positive and statistically not significant at 5% significance level. The coefficient estimate (β_6 = 0.014) of *trade* is positive and not significant at 5% significance level. The coefficient estimate (β_7 = -55.47) of *inflation* is negative as predicted and not significant at 5% significance level. The coefficient estimate (β_8 = -0.072) of *population* is negative as expected and not significant at 5% significance level.

7. Conclusions Remarks

The abundance of natural resources in Africa should accelerate economic growth because it contributes to the increase in exports, and thus more capital goods will be imported to bolster economic growth. Additionally, revenue from natural resources can be used to increase capital investment, however, research has presented that countries with natural resources wealth- tend to grow at a slower pace in comparison to those with less or without natural resources wealth, a phenomenon which is known in economic literature as the 'resource curse'.

Using data on 53 African countries over the period extending from 2000 to 2014, the study finds that natural resources is not important in contributing towards economic growth in African countries during this period. The evidence is robust in the sense that alternative model specifications such as different proxies for the main independent variable, resource dependence and different control variables were used and the results did not change.

Different from what many other studies about the association between natural resources and economic development a negative association for some and positive for others the results of this paper reinforce findings that show that the influence of natural resources on economic development of resource-rich countries is not the same for all countries and that it varies from country to country.

Although this study finds robust evidence that the variables of the model of this analysis, resource dependence in particular is not important in contributing towards economic growth, the study will not conclude that resource dependence has a negative correlation with economic growth in African countries; instead, this paper suggests the use of different control variables in future research about the relationship between natural resource dependence and economic development in Africa. As mentioned above, the choice of the variables is determined in part based on the existent economic literature about the relationship between natural resources and economic development in developing countries which is most of the times different from the African countries context.

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