

Natural Resources, Governance, and Economic Growth in Africa

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Development economists have found evidence that an abundance in natural resources hinders economic growth, contrary to conventional expectations. This finding is called the resource curse hypothesis. The major questions this paper addresses are: does the resource curse hypothesis apply to Africa? If so, what are its major channels? Our hypothesis is that governance is much more important in Africa than in other regions because of non-democratic and unstable political environments, which are closely associated with natural resources in African countries and hinder economic growth. We find empirical evidence for this argument using GMM with endogenous governance. Our findings shed light on the deleterious role of natural resources in governance and economic growth in Africa.

Key words: natural resource, governance, African economy, economic growth

아프리카의 천연자원이 거버넌스와 경제성장에 미친 영향

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일반적인 인식과는 달리 풍부한 천연자원의 보유가 경제성장에 오히려 장애요인이 되었다는 사실이 많은 실증연구를 통해서 밝혀졌는데, 이런 현상을 흔히 '천연자원의 역설'이라고 부른다. 본 논문의 연구목적은 이런 '천연자원의 역설' 현상이 아프리카에서도 발견되는지를 확인하고, 나타난다면 구체적으로 어떤 과정을 통해서 이런 결과가 나타나지를 밝히는 것이다. 본 논문의 가설은 아프리카에서는 풍부한 천연자원이 정치적 불안정이나 비민주성과 같은 거버넌스 악화를 초래하여 경제성장에 부정적인 영향을 미친다는 점에서 아프리카 이외의 지역과는 뚜렷이 구별된다는 것이다. 본 논문은 거버넌스 혹은 제도와 경제성장간의 내생성을 고려한 모델과 100여 개국의 패널자료를 이용하여 이 가설을 검증하였다. 이 연구결과는 1차산품 가격이 상승하는 최근 상황에서 아프리카의 자원부국이 지속적인 경제성장을 이루기 위해서는 정치적 안정을 달성하는 것이 매우 중요하다는 점을 시사한다.

핵심용어: 천연자원, 거버넌스, 아프리카, 경제성장

I. Introduction

Is abundance in natural resources a blessing or a curse for economic development? Contrary to conventional thoughts, development economists have provided solid evidence that it has worked as a curse. This finding is shortly called ‘resource curse hypothesis’. Why or how does rich resource endowment hamper economic development? On this question, also, various channels were suggested including exchange rate distortion, corruption, rent seeking behavior, bad human capital, and so on all of which stem from resource abundance.

Questions to be addressed in this paper are whether resource curse hypothesis can be proved in Africa and, if so, what its major channel is. Although many people tend to think that African countries are very homogeneous in economic performance and resource endowment, in reality African countries maintain different economic performances for the last a few decades. For instance, the range of annual growth rate of per capita GDP over the last 20 years within Africa is as wide as from -7.4 of Liberia to 4.7 of Botswana. Liberia recorded the slowest growth in the world whereas Botswana achieved rapid economic growth rate similar to those seen in Southeast Asian countries. Without question there is big difference in resource endowment among African countries.

Our point is that difference in resource endowment can account for a large part of difference in economic performance in Africa. Furthermore, we will argue that African countries have a channel of resource curse distinguished from those in non-Africa.

The first and most well known channel from resource to growth is ‘Dutch disease’, which means the over-valuation of exchange rate that is often witnessed in countries heavily dependant on resource export hampers the development of industry. However, we will show that poor political governance caused by rich resource endowment was more harmful to economic growth than ‘Dutch disease’ in Africa. In other words, African countries with richer resource endowments tended to have worse governance and, therefore, lower growth

rates.

Africa has provided many examples in where the greed for natural resources such as minerals or oil has led to civil war, political instability, and corruption. Instead of serving as inputs, natural resources might serve as a catalyst of internal conflict in Africa. The prolonged internal conflicts in Liberia, Sierra Leone, and the Democratic Republic of Congo who all have rich resources can be examples to back up our hypothesis.

In sum, our argument is that even though the resource curse hypothesis is also applicable to Africa, its channel is a lot different than in non-Africa,

In section II, we review earlier studies on relations between natural resources, governance, and growth. In section III, we look into how natural resources have affected institution or governance in Africa. In section IV, cross-country and panel analysis will provide statistical evidence that rich endowment in natural resources causes poor governance, and furthermore, lower economic growth in Africa. And it will also show that the channel of resource curse in Africa is very different than in non-Africa.

II. Literature Review

1. Natural Resources and Economic Growth

It is conventional wisdom that natural resources are a kind of input, so abundance in natural resources are conducive to economic growth. However, we can easily find some countries in Africa, Latin America, and the Middle East that have shown poor economic performance in spite of their abundance in natural resources. Sachs and Warner (1995) empirically prove that a rich endowment in natural resources tends to be harmful rather than conducive to economic growth. Sachs and Warner (1999; 2001) bolster and strengthen the argument of their seminal paper. Thereafter, the resource curse hypothesis has

been tested or elaborated in various ways.

Beyond the hypothesis itself, many papers were written on the channels through which the abundance in natural resource leads to lower growth. That is, it is assumed that abundance in natural resources has an indirect effect on growth by affecting a certain determinant of growth. Recently Papyrakis and Gerlagh (2004) present empirical evidence that abundance in natural resources is not directly detrimental to growth, but if the indirect effect is taken into account, it is harmful to growth. It means that it is more essential to make clear the channel of resource curse than the hypothesis itself.

One of most popular channels is, the so called, 'Dutch disease'. According to this channel, the economic growth that is dependant on the export of natural resources such as minerals or oil induces the appreciation of real effective exchange rate that may impede the development of the manufacture and non-resource sector industry. Corden (1984), Gylfason *et al.* (1999), and Herbertsson *et al.* (1999) deal with this channel.

The significant rents associated with resource exploitation may lead to corruption. The negative effects of corruption on growth are extensively documented. Leite and Weidermann (1999) provide empirical evidence that corruption is particularly prevalent in oil and mineral-rich countries. Low investment in human capital and education may serve as a channel between resource abundance and poor growth. That is, resource rich countries tend to neglect accumulation of human capital because of widespread rent-seeking activities and corruption. Gylfason (2001) points out that non-diversified industrial structure in resource abundant countries may cause few opportunities to 'learn by doing', and this in turn reduces the benefit of human capital accumulation.

A temporary resource boom such as an oil boom in the 1970s may be harmful to growth by incurring a sudden increase in capital inflow, which leads to excessive or inefficient investment and low productivity of capital. Mikesell (1997) argues that this effect is more significant than 'Dutch disease'. Furthermore, Auty (2001) emphasized that abundance of capital and rent

weakens market discipline and efficient use of resources. In addition, over-expansion of the public sector, high-indebtedness, an under-developed financial sector, over-confidence, low saving ratio, and so on are taken as channels through which the resource curse hypothesis works.

As a channel of the resource curse we will focus on the quality of institutions or governance. Governance in this paper is not restricted to corruption usually referred to in the resource curse hypothesis. It is a more comprehensive concept that embraces the political system, political stability, and government efficiency as well as corruption. In Africa, political stability is deeply related to natural resources and is crucial to economic growth. On this relation more will be discussed in section III.

2. Governance and Economic Growth

Recently economists have focused on the importance of institutions or governance as important determinants of economic growth.¹⁾ Although it is not easy to define institutions as such, it is strongly believed that an effective property rights system and less corruption can encourage efficient investment. Thus these institutions matter for economic growth. Starting from Knack and Keeper's original study (Knack and Keeper 1995), there have been a large number of empirical studies about the relationship between institutions and economic growth. They used five measures for institutional development including corruption in government, rule of law, quality of the bureaucracy, repudiation of contracts, and risk of expropriation to present the level of investment protection and so on to show effective protection for investment, from ICRG (International Country Risk Guide) survey. They find that the quality of institutions is one of the most important factors in explaining the difference of economic growth. Hall and Jones (1999) also use the same index and report that the institutional index is significant in explaining the level of

1) In this study, we prefer using the term, "governance" rather than institutions. However both concepts are broadly similar. See Kaufman *et al.* (2002).

GDP and why some countries produce more than others. In addition, Maruo (1995) uses an index on the level of corruption and finds that there is a strong correlation between economic growth and the level of corruption, in other words, the less corrupt a country is the higher its economic growth rate is.

However one problem of this line of study is that the institutional quality is associated with the level of growth itself. There is interaction between them, which makes the growth regression using an institution variable as an independent variable somewhat biased because of endogeneity problem. Some have attempted to overcome this by using an instrumental variable to proxy the institutional development with exogenous variables to growth. Acemoglu *et al.* (2001) use a variable for settler mortality of colonialists, assuming that western colonialists would have less difficulty in settling down and transplanting their institutions in countries that have better institutions. They find that settler mortality can significantly explain the level of economic growth. Hall and Jones (1999) use the fraction of population who speak English or a western language as an instrumental variable for institutions and find it significant for growth.

The new interest in institutions has encouraged the empirical study on economic growth to develop further, and more work has been done to seek fundamental cause for growth. Rodrik *et al.* (2002) strongly argue that institutions are an essential driver for growth, while other factors such as geography and economic opening are not significant when they are included together with institutions in growth regressions. Most of all, geography indirectly affects economic growth only through the channel of institutions. Although there are other studies to emphasize the importance of geography (Sachs, 2003; Hibbs and Olsson, 2004), it is certain that institutions are at the center of economic growth (Easterly and Levine 2003).

However, in spite of recent enthusiasm for studies of good governance and several efforts to measure institutional development including the work of the World Bank, more work needs to be done. In most cases the institutional quality variable is from the survey of private consulting companies, and just reflects the attitude of investors. Thus, what exactly determines institutions and

how they are related to other variables, above all, growth itself still needs to be studied (Rodrik, 2004). Also, the mechanism through which institutions work in spurring economic growth still remains to be studied further. In this study, we are more interested in the possible effect of natural resources on institutions or governance, and thus on economic growth. It is likely that an abundance of natural resources may lead to serious conflicts and unproductive rent-seeking around resources, which may harm institutional development. The next section surveys the recent empirical studies about this mainly focusing on the African context.

III. How do natural resources affect governance in Africa?

Many recent studies show that abundant natural resources, in particular mineral resources, are detrimental to the development of political governance. Political governance can be divided into several components as follows; political regime, political stability, quality of bureaucracy, transparency and anti-corruption, and so on. We can find various papers to suggest that natural resources have negative effects on each component of governance. For instance, Tornell and Lane (1999) implicate that resource abundant countries are likely to achieve lower growth rate because of rapacious rent-seeking, the so called voracity effect. Torvik (2002) suggests a model that a rich natural resource increases the number of entrepreneurs engaged in rent seeking. The effect of natural resources on corruption is addressed by Leite and Weidemann (1999).

As far as Africa is concerned, we believe that out of all the components of governance, a non-democratic political regime and political instability were crucial obstacles to growth. And these in turn were deeply related with natural resources. Under a non-democratic regime, personal abuse of public assets, corruption, and rent-seeking would be made easier, which hinders the

productive utilization of resources and discourages entrepreneurship for economic growth.

On the other hand, social crashes such as riots, rebellions, and internal conflicts that often lead to civil wars make socio-political environments detrimental to economic development. A civil war, in particular, brings comprehensive and fatal impacts on economic growth, including the destruction of both human and physical capital, the disruption of economic transactions, the distortion of resource allocation by economic agents and higher uncertainty all over the economy.²⁾ African economies seem to have been more affected by non-democratic and unstable political environments than in other regions.³⁾ Thus, we believe that the difference in this political governance led to a gap in growth rate among African countries. Ahead of presenting empirical evidence, we will give more detailed explanations on the relation between non-democratic and unstable political regime and natural resources with the help from studies in political science.

The implication for political regime of resource abundance has been dealt with in the literature on rentier states. A rentier state is characterized by a high dependence on external rents produced by a few economic actors. Rents are typically generated from the exploitation of natural resources and not from productive utilization of labor and capital. Rentier states tend to be authoritarian because states with large natural resource endowments are more detached and less accountable. In other words, rentier states do not need to levy taxes, which results in a lack of pressure from below for democratic change (Mahdavy, 1970). In addition, Jensen and Wantchekon (2004) emphasize that executive discretion over the distribution of resource rents not only hampers the transition into a democratic regime but makes the consolidation of a democratic regime difficult. In resource abundant countries, politics are dominated by issues

2) According to Collier (1999)'s computation, civil wars reduced the per capita growth rate by 2.2% point during the war period and by 2.1% point during the 5 years following the war.

3) Over the last 40 years nearly 20 African countries or about 40% of Sub-Saharan Africa have experienced at least one period of civil war.

concerning the distribution of resource rents, not ideology. In such circumstances, the ruling party of an authoritarian political system who commands resource rents uses them to maintain support and consolidate their hold on political power. They also insist that even in democratic systems with legitimate political competition, natural resource dependence translates into an authoritarian government by making democratic consolidation difficult. When state capacity is weak and the state cannot enforce the law, incumbent politicians have a large amount of discretion in the allocation of resource rents, which is allocated to voters in return for political support. If the opposition is unable to break this incumbency advantage, resource rents will help the continuation of one-party dominance. Jensen and Wantchekon (2004) apply these arguments to African countries and present empirical evidence to show a negative correlation between the presence of a sizeable natural resource sector and the level of democracy in Africa.

Political science papers on the determinants of civil war have shed light on how natural resources are related with political instability. A civil war is supposed to be waged mostly on account of the conflicts in the area of ideology, ethnicity, and religion. But recently the economic incentive of civil war has drawn much attention. As Collier and Hoeffler (2000) explain, rebellions that mostly collapse into civil wars can be motivated by two main causes, grievance and greed. Grievance-rebellion is caused by hatreds that might be intrinsic to ethnic and religious differences, whereas greed-rebellion is motivated by the rents from the exploitation of primary commodities. Contrary to the usual belief that most of civil wars were caused by ethnic troubles, some recent papers present evidences that economic factors played a more important role in the occurrence and duration of civil war.

In particular, African civil wars in the post-Cold War were closely related to natural resources. Lootable resources were often a cause of both outbreak and duration of civil war. Economic and financial motivation of possessing resource wealth would be the trigger of a civil war. Even if a civil war broke out for a reason other than resource wealth, a rebel leader could mobilize rebel

followers and buy munitions using the money from the sale of resources. In Sierra Leone and Angola, diamonds served this role. Fuel and mineral resources, especially among natural resources, has a property in production and export process that induces predation or a military crash with ease, as Collier (2000) pointed out as follows.

Primary commodity production does not depend upon complex and delicate networks of information and transactions, as with manufacturing. It can also be highly profitable because it is based on the exploitation of idiosyncratic natural endowments rather than the more competitive level playing field of manufacturing. Thus, production can survive predatory taxation. Yet for export it is dependent upon long trade routes, usually originating from rural locations. This makes it easy for an organized military force to impose predatory taxation by targeting these trade routes.

Empirical evidences strengthen this inference that a county heavily dependant on resource production or export is more likely to be caught up in a civil war. Collier and Hoeffler (2000) integrate grievance and greed models taking into account a feedback effect between the two motivations, and examined the determinants of civil war with a comprehensive panel data set of conflict. They found that the extent of primary commodity exports is the largest single influence on the risk of conflict, whereas ethnic and religious fractionalization makes a society safer. It shows the fact that natural resources were a main impetus to civil war or driving force of it. de Soysa (2001) also finds that abundant mineral wealth makes countries highly unstable, whereas scarcity of renewable resources is largely unrelated to civil conflict. Elbadawi and Sambanis (2000) showed that the former results can be applicable to Africa well. Estimating the likelihood of an incident of civil war, they find that African countries face a high risk of civil war and it is not due to the ethno-linguistic fragmentation of African countries, but rather to failed democratic political institutions and economic dependence on natural resources.

The recent studies and empirical evidences above motivated us to investigate whether different resource endowments led to different economic performances

through the channel of governance in Africa, and whether there is any difference in the effect of the channel between Africa and non-Africa.

IV. Data and method

1. Data description

As a proxy for natural resources, we use the data of the share of fuel and mineral resources in the export of each country. This has been the most common measure since Sachs and Warner (1995). Others sometimes use the products of primary industries such as agriculture, however as Isham et al. (2003) and Sala-i-Martin (2003) find the data for fuel and mineral are more significant to economic growth through institutions. This data is from World Development Indicators (WDI) from the World Bank.

We use standard macroeconomic data and institutional variables for our cross-country growth regressions. Macroeconomic data are derived from WDI including the growth rate, inflation, educational attainment and so on. Black market premium data, which indicate how much official exchange rates are overvalued in comparison with parallel ones, are from the Global Development Network database of the World Bank. There are several candidates for variables of institutional development or quality of governance. We use the most popular one called GADP (government anti-diversion policy index), which was used by Hall and Jones (1999). This one is originally constructed by the International Country Risk Guide (ICRG) based on survey data. It is calculated by the average of law and order, bureaucratic capacity, corruption, internal conflicts, and the level of investment protection. Hall and Jones (1999) use this data for the 1980s, however we use new GADP data from 1984 to 2000 from the original source in order to cover the longest time period. In addition, we also use corruption data from the same source to complement the result using our

new GADP index. For benchmark regressions without institutional variables, we use the data from 1976 to 2000, while when we use institutions as an independent variable we focus on the period from 1981 to 2000. Appendix I lists the variables and their sources that we use in this study.

2. Method

First, we present a standard cross-country growth regression using the variable of natural resources after controlling for common factors of economic growth. The basic control variables set in this benchmark regression include the initial GDP, the level of education, and the Sub-Saharan Africa (SSA) dummy in the all country sample. After then we add inflation, trade openness and ethno-linguistic fragmentation by turns in the extended control variables set in order to check the strength of the results.

$$Y_i = a + b X_i + c R_i + e_i$$

Y_i : growth rate of per capita GDP

X_i : control variables set

R_i : share of fuel and mineral export

We use data for countries from 1976 to 2000 to find the growth effect of resources. After testing the all country sample, we divide the sample into African countries and non-African countries so as to compare how different the effect of natural resources on growth is. This method will emphasize concern over oversimplification of recommendation for economic policies to spur growth all over the world.

It should be noted that this benchmark regression does not include the variable for governance to show the total effects of resources on growth, direct and indirect through governance. Thus, finally we include the channel variables such as institutions and black market premium, and resources together. If natural resources have a bad effect on governance and maybe exchange rate

alignment, the effect of natural resources on growth should be weaker.

$$Y_i = a + b X_i + c R_i + d I_i + e BMP_i + e_i$$

I_i : governance index, GADP

BMP_i : black market premium of exchange rate

The next step is to examine the relationship between governance and resources, and to analyze the effect of resources more extensively. The hypothesis we attempt to test is that natural resources do harm to governance and bad governance is detrimental to growth. It is relatively simple to test whether natural resources harm governance. However, the interaction between governance and growth is much more complex than the simple causal relationship. Since governance itself could be affected by economic growth as such as more developed countries tend to have better governance, we should treat endogeneity problem in their relationship. For this purpose, this section introduces the two stage least square regression (2SLS) in an attempt to trace the channel through which natural resources affect economic growth.

In the first stage, we regress governance variable on natural resources using instrumental variables and other controlling variables. For an instrumental variable that is not included in the growth regression, we use European settler mortality of the colonial age according to Acemoglu et al. (2001) to assume that higher settler mortality led to worse institutional quality. In the second stage for economic growth regression, we use governance variable and other variables together as explaining variable considering possible simultaneity. And at this stage we use the recent GMM regression rather than the traditional method.⁴⁾

This process will help us to find whether there is an indirect effect of resources on growth through governance channel or not. To shed light on the regional difference of those channels we compare African countries and non-

4) Other studies such as Sala-i-Martin (2003) similarly use 2SLS method to trace the direct and indirect effect of institutions.

African countries.

$$1^{\text{st}} \text{ stage: } I_i = a_0 + a_1 X_i + a_2 R_i + a_3 SM_i + e_i$$

$$2^{\text{nd}} \text{ stage: } Y_i = \beta_0 + \beta_1 X_i + \beta_2 R_i + \beta_3 I_i \text{ (from } 1^{\text{st}}) + e_i$$

SM_i : settler mortality

Instrumental variables: X_i, R_i, SM_i

In particular, our study focuses on African countries and how different they are from non-African countries. Considering that the channel of governance should be more salient in Africa, we compare Africa and other regions, using this first and second stage specification. This will shed important light on the difference in channels through which resources may work. As we limit the sample to one region such as Africa, we may see the specificity of the region more extensively since we analyze countries that have similar historical circumstances.⁵⁾ Different from other studies to cover most countries in the world using the colonial origin variable (Acemoglu et al., 2001; Rodrik et al., 2003), our study may show the effect of natural resources even better after considering endogeneity.

Lastly, we consider another possible channel known as the ‘Dutch disease’ channel. The extent of overvaluation of exchange rate can be measured as black market premium.

$$BMP_i = \gamma_0 + \gamma_1 X_i + \gamma_2 R_i + e_i$$

$$Y_i = \delta_0 + \delta_1 X_i + \delta_2 R_i + \delta_3 BMP_i + e_i$$

Assuming that the indirect effect from resources through ‘Dutch disease’ on growth also varies across regions, we first regress BMP on resources and other

5) In the all country sample, SSA dummy variable is always significant and this means that African countries have some specific characters, which are distinguished from other regions.

control variables such as trade openness. We compare the result between Africa and non-Africa to examine the difference in this process. Next, we add BMP into the specification for growth in order to examine how much the indirect effect of resources through BMP lessens the direct and independent effect on growth, and how this is different across regions. Our specification underscores that the channel that may work should vary across regions because of specific contexts in each region.

We use the panel estimation to complement the result of cross-country regressions. In order to address temporary cyclical effects, 5-year average data are used for each 3 periods including 1986-1990, 1991-1995, and 1996-2000.

V. Empirical results

1. Natural resource and economic growth

The result of our benchmark regression in Table 1 demonstrates that a natural resource curse is a reality for the all country sample. In the first column using the most basic variables including the initial GDP, education and the regional dummy, the sign of coefficients of all variables are consistent with the theoretical expectation. The coefficient of natural resources is significantly negative, and the dummy variable for Sub-Saharan Africa is negative as well.⁶⁾ The result is very robust even with the addition of more control variables although the significance of natural resources decreases as other columns show. Natural resources are negatively significant at 99% even after including inflation and trade openness.

This benchmark regression does not include the most important variable in economic growth, that is, governance or institutions. When it is included, the

6) Because we include the SSA dummy, the variable for geography shows no significance at all.

Table 1. Natural resources and economic growth for all countries
 Dependent variable: per capita GDP growth rate (1976-2000)

Independent Variables	I	II	III	IV	V	VI
Constant	4.028*** (3.291)	4.558*** (3.677)	4.490*** (3.400)	4.167*** (3.779)	2.769** (2.063)	6.973*** (5.921)
LogGDP76	-0.402** (-2.133)	-0.502** (-2.581)	-0.482*** (-2.740)	-0.498*** (-2.900)	-0.304 (-1.533)	-1.418*** (-6.565)
Edu80	0.0251** (2.600)	0.027** (2.569)	0.028*** (2.946)	0.024*** (2.650)	0.021** (2.028)	0.025*** (2.683)
Fuex7600	-0.023*** (-3.817)	-0.023*** (-3.766)	-0.018*** (-3.175)	-0.019*** (-3.430)	-0.012* (-1.916)	-0.008 (-1.403)
SSA	-1.732*** (-3.545)	-1.787*** (-3.690)	-1.579*** (-3.584)	-1.601*** (-3.727)	-1.348*** (-3.040)	-2.348*** (-5.364)
Latitude		0.011 (1.32)	0.004 (0.552)	0.006 (0.818)	0.005 (0.722)	0.005 (0.471)
Inf7600			-0.003*** (-3.494)	-0.003*** (-3.067)	-0.002*** (-3.306)	
TO7600				0.008** (2.400)	0.009*** (2.802)	
Elf60					-0.380 (-0.603)	
BMP8199						-0.462 (-1.234)
GADP8400						0.706*** (5.858)
Adjusted R-squared	0.357	0.384	0.430	0.458	0.488	0.585
No. of observation	102	100	99	99	87	90

Note: 1. t-value in paranthesis

2. *: statistically significant at 90%, **: at 95%, ***: at 99%

effect of natural resources must be weaker if resources exert their impact mainly through governance, making governance worse, on economic growth.

Also, if resources have other channels such as a black market premium, then the independent effect should be smaller together with those variables. Thus, we put two variables that may work as a channel for resources to affect growth, GADP and BMP, together with natural resources. The last column in Table 1 with both of these variables clearly supports our conjecture. It is certain that natural resources are not significant now, which means that the indirect effect of resources is important and thus represses the directly independent effects. Our result is broadly consistent with other preceding studies on the role of natural resources and possible channels such as governance and exchange rate distortion in economic growth.

When we divide samples into African and non-African countries, we find that the resource curse hypothesis is true to both African countries and non-African countries. Even when we add all other control variables they are still negative although the extent naturally decreases in both cases. We simply report the result using many control variables including inflation, trade openness and ethnolinguistic fragmentation comparing African and non-African countries in Table 2.

The comparison of the result between African and non-African countries in Table 2 gives us interesting information about the potential channels for resources that vary across regions. As we expected, the result shows that the variable for governance, GADP, is very significant in explaining economic growth in both African and non-African countries, while the coefficient of natural resources becomes weaker, in comparison with the result without channels, as column 3 and 4 show. It is very interesting that there is a regional difference in this regression together with channel variables, too. In African countries, the significance of resources becomes much smaller after including governance than non-African countries, where resources are still significant even after including GADP. The result is the same when we use the governance variable only without a black market premium. It suggests that natural resources influences growth through governance much more in African countries than in non-African countries. There is a good reason to think that the channel should

Table 2. Natural resources and economic growth: Africa vs. Non-Africa
 Dependent variable: per capita GDP growth rate (1976-2000)

Independent Variables	Africa	Non-Africa	Africa	Non-Africa
Constant	2.151 (0.803)	1.870 (1.155)	2.696 (0.926)	7.003*** (5.841)
LogGDP76	-0.331 (-0.687)	-0.191 (-0.782)	-1.616*** (-2.938)	-1.349*** (-5.961)
Edu80	0.040** (2.430)	0.016 (1.217)	0.049** (2.492)	0.022** (2.186)
Fuex7600	-0.017* (-2.000)	-0.015* (-1.739)	-0.006 (-0.543)	-0.012* (-1.777)
Latitude	0.037* (1.976)	0.003 (0.383)	0.058*** (2.960)	-0.001 (-0.153)
Inf7600	-0.003*** (-3.434)	-0.002 (-0.095)		
TO7600	0.002 (0.208)	0.010*** (2.829)		
Elf60	-1.402 (-1.525)	0.479 (0.588)		
BMP8199			-0.346 (-0.449)	-0.326 (-0.772)
GADP8400			1.112*** (5.055)	0.667*** (4.851)
Adjusted R-squared	0.585	0.208	0.683	0.466
No. of observation	26	61	23	67

be different across regions, and this is what we turn to in the next section.

The comparison between regions demonstrates other interesting differences between those groups, in column 1 and 2 of Table 2. First, inflation is much more significant to the growth rate in African countries than non-African countries. This result is understandable since African countries have suffered from serious macroeconomic instability much more than other countries.

Secondly, the role of trade openness is also different. It is important to growth in non-African countries while it has no positive influence in African countries. Thirdly, the geography variable, or latitude is significant to Africa, however it is not to Non-African countries.⁷⁾ Lastly, ethnolinguistic fragmentation is negative to the growth rate of African countries, while it is not in non-African countries, as Easterly and Levine (1997) also points out. However, its significance is less than usual critical level and its role may be limited. The result from the regional comparison emphasizes that we should consider the specific context associated with economic growth that varies across regions.

We undertook the growth regressions of Africa and non-African regions using the OLS panel and random effects model. The panel results were consistent overall with cross-country results, but it is not introduced here due to the space constraint.⁸⁾

2. Channels of resource curse to economic growth

2.1 Influences of resource on governance and exchange rate distortion

The former section verifies that natural resources are negative to economic growth, and they may work through several channels including governance. This section explores the extensive workings of potential indirect effects of natural resources in African countries and non-African countries. We test the following hypothesis: Resources are more likely to harm the development of governance in Africa and therefore harm economic growth due to internal conflicts and political instability associated with resources.

Table 3 reports the result of the 1st stage regression for governance, using

7) It may be because the African continent has a long distance from North to South, and thus the role of latitude appears more significant to growth. Otherwise, the geography variable may be important to growth since it is associated with diseases such as malaria, which is more serious in Africa.

8) The results are shown in our KIEP working paper (2005).

settler mortality as an instrumental variable and other control variables together. We use GADP index for a proxy for governance and concentrate on the period from 1981 to 2000 since our variable for governance start from the early 1980s’.

Table 3. Natural resources and governance
Dependent variable: GADP index (1984-2000)

Independent variables	Africa	Africa	Africa	Africa	Non-Africa	All countries
Constant	-2.670 (-1.064)	-2.814 (-0.991)	-2.092 (-0.678)	-1.297 (-0.458)	-0.368 (-0.195)	-2.324* (-1.733)
LogGDP81	1.352** (2.870)	1.392** (2.400)	1.665** (2.335)	1.524** (2.340)	0.880*** (3.278)	1.101*** (5.018)
Edu80	-0.005 (-0.286)	-0.004 (-0.197)	-0.019 (-0.623)	-0.024 (-0.850)	0.020 (1.399)	0.008 (0.654)
Fuex8100	-0.021** (-2.316)	-0.021* (-2.099)	-0.020* (-1.918)	-0.013 (-1.299)	-0.006 (-0.708)	-0.011* (-1.701)
Latitude	0.004 (0.165)	0.003 (0.909)	-0.036 (-0.567)	-0.042 (-0.730)	0.002 (0.181)	0.008 (0.816)
TO8100		-0.002 (-0.128)	-0.006 (-0.360)	-0.005 (-0.290)		
ELF60			-2.083 (-0.691)	-1.805 (-0.659)		
Inf8100				-0.001* (-1.834)		
SM	0.000 (1.140)	0.001 (0.363)	0.001 (1.088)	0.000 (0.642)	-0.015** (-2.747)	0.001 (1.397)
Adjusted R-squared	0.409	0.360	0.331	0.449	0.669	0.558
No. of observation	19	19	19	19	36	55

Note: 1. 1st stage regression using SM as an independent instrumental variable

It is crucial that we do find the significance of natural resources to

governance in the Africa sample but do not find a significant relationship between the quality of governance and abundance of natural resources in the non-Africa sample.⁹⁾ In the African countries' sample, the result is robust to the inclusion of other variables. Although it becomes weaker when we include other variables and becomes insignificant when inflation is added.

In addition we use another index, internal conflict index, as a variable for governance. The higher this index indicates a fewer occurrence of internal conflict. The result with this index in table 4 also shows that richer natural resources are likely to make political environments less stable in Africa, while it is not the case in non-Africa.

Table 4. Natural resources and Internal conflict
Dependent variable: Internal conflict index (1984-2000)

Independent variables	Africa	Non-Africa
Constant	-2.552 (0.713)	-4.989 (1.648)
LogGDP81	1.614*** (3.164)	1.756*** (4.561)
Fuex8100	-0.022* (1.879)	0.001 (0.046)
Edu80	0.007 (0.298)	-0.012 (0.645)
Elf60	1.328 (0.817)	1.051 (0.821)
SM	0.002*** (3.057)	-0.004 (0.571)
Adjusted R-squared	0.617	0.655
No. of observation	19	34

9) We find the same negative relationship between governance and resources in the all country sample as other studies report.

The results of the panel estimations for governance in Table 5 are broadly consistent with those of cross-country regressions. The coefficient of resources from the OLS and random effect model is statistically significant in estimations for governance in African countries, while it is not in non-African countries. This suggests that even in the short run natural resources exert a negative influence on the quality of governance or institutions in Africa.

Table 5. Natural resources and governance: panel estimations
Dependent variable: GADP index (1984-2000, 5-year average)

Independent variables	OLS		Random effects	
	Africa	Non-Africa	Africa	Non-Africa
Constant	-0.189 (-0.134)	0.172 (0.137)	-0.561 (-0.351)	-0.662 (-0.408)
LogGDP5	1.026*** (4.112)	0.750*** (4.166)	1.094*** (3.857)	0.878*** (3.970)
Edu5	-0.005 (-0.557)	0.025*** (2.978)	-0.007 (-0.624)	0.023** (2.347)
Fuex5	-0.019*** (-4.540)	-0.008 (-1.286)	-0.020*** (-4.034)	-0.015* (-1.980)
SM	0.000* (1.921)	-0.013*** (-3.537)	0.001* (1.790)	-0.011** (-2.344)
Adjusted R-squared	0.411	0.654	0.365	0.501
No. of observation	53	106	53	106

Note: 1. 1st stage regression using SM as an independent instrumental variable

Next, we test the overvaluation of the exchange rate as another potential channel associated with natural resources. Since we do not think that economic growth exerts any effect on a black market premium and there is no endogeneity, the regression for BMP is not the 1st stage regression using

instrumental variables for growth regressions but just a simple OLS regression. We use trade openness, government deficit and institutional development as control variables. The more open a country is, the less a black market premium would be. And if a country has good institutions and smaller government deficit, the exchange rate market should be less distorted. Again we compare African, non-African and all countries' samples.

Table 6. Natural resources and black market premium
Dependent variable: BMP (1981-1999)

Independent variables	Non-Africa	Non-Africa	Non-Africa	Africa	All countries
Constant	0.176 (1.639)	0.137 (1.184)	0.680*** (3.313)	0.566*** (3.804)	0.278** (3.367)
Fuex8100	0.005*** (2.685)	0.006*** (3.137)	0.006** (2.600)	0.003 (1.665)	0.004*** (2.995)
Latitude	0.002 (1.159)	0.002 (1.175)	0.006** (2.547)	0.000 (0.020)	0.001 (0.933)
TO8100	-0.002 (-1.637)	-0.002* (-1.667)	-0.002 (-1.308)	-0.006** (-2.503)	-0.002** (-2.604)
Govdef8100		-0.009 (-0.986)	-0.002 (-0.158)		
GADP			-0.009*** (-3.385)		
Adjusted R-squared	0.077	0.103	0.273	0.096	0.086
No. of observation	94	88	75	41	135

As Table 6 shows, we find that natural resources play a significantly negative role to the exchange rate distortion in the sample of non-African countries while African countries do not show this relationship. Thus, we may conclude that natural resources are bad to governance only in African countries and bad to exchange rate alignment in other countries. This result implies that natural resources affect economic growth through different channels across countries.

We need to caution against making generalizations about the growth channel of resources considering the different contexts among countries.

Again, the results of panel estimation in Table 7 are the same to cross-country regressions. Natural resources harm the exchange rate distortion in the non-African countries sample, but we do not find this effect in the African sample.

Table 7. Natural resources and black market premium: panel estimations
Dependent variable: BMP (1986-2000, 5-year average)

Independent variables	OLS		Random effects	
	Africa	Non-Africa	Africa	Non-Africa
Constant	0.280 (0.897)	0.531*** (5.058)	0.361 (1.326)	0.682*** (5.930)
Fuex5	0.002 (1.159)	0.003** (2.393)	0.001 (0.439)	0.003** (2.100)
TO5	-0.002 (-0.879)	-0.001* (-1.850)	-0.001 (-0.437)	-0.002** (-2.351)
Govdef5	-0.025 (-1.398)	0.015** (2.128)	-0.025 (-1.672)	0.012** (2.148)
GADP5	-0.026 (-0.589)	-0.041*** (-3.761)	-0.051 (-1.482)	-0.056*** (-4.811)
Adjusted R-squared	0.019	0.141	0.066	0.161
No. of observation	40	186	40	186

Note: 1. Govdef5: average ratio of fiscal balance to GDP for each 5-year period

2.2 Different channels to economic growth

This section extensively examines both the direct and indirect effect of resources on growth, including through governance, comparing Africa and other countries. We report the second stage regression using GADP as a channel of

resources, and the simple result using the exchange rate distortion, another possible channel. Table 8 reports the result of the second stage regressions that attempts to address endogeneity problems of governance using instrumental variables.

Table 8. Natural resources, governance, and growth
Dependent variable: per capita GDP growth rate (1981-2000)

Independent variables	Africa	Non-Africa
Constant	6.558* (1.983)	4.246*** (3.028)
LogGDP81	-2.997** (-2.224)	-1.015*** (-2.981)
Edu80	0.084*** (3.669)	0.010 (0.875)
Fuex8100	-0.003 (-0.158)	-0.009 (-1.393)
Latitude	0.128*** (5.840)	0.006 (0.527)
GADP	1.560 (1.666)	0.753** (2.184)
Adjusted R-squared	0.579	0.357
No. of observation	19	35

Note: 1. 2nd stage regression, using GMM.

2. Instrumental variables: settler mortality and other control variables

We find that the coefficient of governance after being instrumentalized is significant to some extent at more than 88%, however that of natural resources is not significant now for Africa. This implies that the direct effect of resources is dominated by indirect effect through governance in the case of Africa. We also check the same specification for non-African countries. In the non-African countries case, we find that the direct effect of natural resources on growth is much clearer, and significant at more than 80%, and so is the effect of

Table 9. Natural resources, black market premium, and growth
 Dependent variable: per capita GDP growth rate (1981-2000)

Independent variables	Africa	Africa	Africa	Non-Africa	Non-Africa	Non-Africa
Constant	-1.858 (-0.516)	-1.623 (-0.433)	-3.167 (-0.987)	2.405* (1.899)	3.258** (2.451)	2.765** (2.070)
LogGDP81	0.281 (-0.687)	0.258 (0.697)	0.489 (0.819)	-0.090 (-0.640)	-0.218 (-1.085)	-0.262 (-1.315)
Edu80	0.050* (1.745)	0.048 (1.578)	-0.001 (-0.030)	0.004 (0.702)	0.008 (0.720)	0.010 (0.371)
Fuex8100	-0.049*** (-3.697)	-0.047*** (-3.244)		-0.023*** (-3.092)	-0.018** (-2.349)	
Latitude	0.036 (1.405)	0.036 (1.377)	-0.006 (-0.246)	0.009 (0.976)	0.011 (1.213)	0.194 (1.118)
BMP8199		-0.285 (-0.290)	-0.981 (-1.147)		-0.795* (-1.838)	-0.942** (-2.227)
Inf8100			-0.003*** (-2.967)			-0.002 (-1.211)
TO8100			0.013 (0.868)			0.006 (1.559)
Adjusted R-squared	0.266	0.240	0.415	0.102	0.131	0.115
No. of observation	33	33	34	76	76	78

governance. As we already saw in the first stage regression, the effect of governance on growth is independent of resources and there is little indirect effect of resources on growth through governance for the non-African sample. This result suggests that governance is not an effective channel through which natural resources affect growth for non-African countries, which is different from results from African countries.¹⁰⁾ Thus, we find that the effect of

10) When the specification is tested for all countries, the result is somewhat puzzling, though not reported. The institutions variable is not significant maybe because institutions are strongly endogenous. Natural resources are very significant, and thus the direct impact of resources seems to be much more dominant. This result is

resources through governance works only in African countries, where natural resources exert an important negative influence on governance, thereby doing serious harm to economic growth.

In the case of non-African countries, we have already reported natural resources lead to much larger overvaluation of exchange rate while it is different in Africa. It is likely that natural resources may have another impact on growth through this ‘Dutch disease’ channel at least in non-African countries. In an attempt to test this possibility, we simply put the black market premium variable instead of the natural resources variable into the specification for growth with the OLS method. In addition, we also put both of BMP and resources together in the specification to see whether the role of resources is depressed by the BMP variable in spite of the possible problem of multicollinearity. And we do not use the GMM with instrumental variable, since there is no justification that the growth rate affects exchange rate distortion, which could be an exogenous variable.

As we expected, we find that the coefficients of natural resources become less significant in both samples including Africa and non-Africa because of indirect effects of the exchange rate distortion. However, it is certain that the change of significance of natural resources is much larger in non-African countries in comparison with African countries. It suggests that resources affect economic growth negatively in part through ‘Dutch disease’ in the case of non-African countries, while they do not have this kind of effect in Africa. Besides, the coefficient of BMP as such is significant to growth in non-African countries, and this might partly be due to additional effect on BMP by resources. When we use only BMP without resources variable in the column 3 and 6 of table 9, we find that ‘Dutch disease’ is significantly negative to growth rate in non-Africa while it is not the case in Africa. It suggests that non-Africa economic growth is possibly retarded due to the overvaluation of exchange rate, which is not the case in Africa.

different from Sala-i-Martin (2003). It may stem from the difference in specifications, time periods, and methods.

The result of this section demonstrates that channels through which natural resources influence the growth rate vary across countries, although natural resources are harmful to economic growth in general. In African countries, governance is crucial to economic growth and natural resources have a negative influence on growth through governance. In contrast, in non-African countries, exchange rate distortion is more important to economic growth, and resources exert a negative effect on growth indirectly through ‘Dutch disease’ as well as a direct negative effect.

V. Conclusion

The role of natural resources has always puzzled economists. Against common sense, many have reported that the growth rate of countries with richer natural resources is lower than that of countries with poorer resources. This so-called ‘resource curse hypothesis’ has encouraged scholars to understand how this happens in reality. Recently, studies have been developed to examine potential channels through which resources affect economic growth, including ‘Dutch disease’, corruption, and others.

This paper studies the economic effects of natural resources on growth very extensively. In particular, we study the difference in channels from natural resources to economic growth across regions, focusing on African countries. We compare African countries and non-African countries by examining the varying role of natural resources according to specific contexts across regions. First of all, we find that natural resources do have a negative impact on economic growth in both African and non-African countries. However, there is a regional difference in factors for economic growth. For example, inflation is significant to growth while trade openness is not in Africa. The results emphasize the need for an economic policy that takes into account regional differences.

Secondly, we examine how different channels are between African countries

and non-African countries. Our hypothesis is that the governance channel is much more important in Africa than other countries because factors, such as non-democratic and unstable political environments which are closely associated with natural resources in African countries, were important factors that hindered economic growth. We find the empirical evidence for this argument using GMM considering endogeneity of governance. In Africa, natural resources are significant to governance, and the independent effect of resources on growth are dominated by indirect effect through governance, while in non-Africa we do not find this feature. Interestingly, ‘Dutch disease’ effect seems to be much more important channel for resources to exert a negative impact on growth in non-African countries. Our finding shed light on the important role of resources in worsening governance, and thereby worsening economic growth in Africa. African countries should make more efforts to address bad governance structure that is usually associated with natural resources.

Appendix

Data and Sources

BMP8199: average black market premium calculated by $(\text{parallel exchange rate}/\text{official exchange rate} - 1) * 100$ from 1981 to 1999. From World Bank’s Global Development Network database

Edu80: secondary school enrollment ratio in 1980. From World Bank’s WDI

Elf60: index of ethnolinguistic fragmentation in 1960. From Easterly and Levine (1997)

Fuex8100 (7600): average share of fuel, ores, and mineral export in total export from 1981 (or 1976) to 2000. From World Bank’s WDI.

GADP8400: average of government anti-diversion index from 1984 to 2000, calculated by ‘weighted average’ of 4 indexes including investment profile, law

and order, corruption, and bureaucracy quality (the same weight given depending on the full score). From International Country Risk Guide (ICRG)

Govdef8100: average share of fiscal balance to GDP from 1981 to 2000. From World Bank's WDI

GR8100 (7600): average growth rate of real per capita GDP from 1981 (or 1976) to 2000. From World Bank's WDI

IC8400: average of internal conflict index from 1984 to 2000. From International Country Risk Guide (ICRG)

Inf8100 (7600): average growth rate of consumer price index from 1981 (or 1976) to 2000. From World Bank's WDI

Latitude: absolute value of the latitude of the country, scaled to take values between 0 and 1, where 0 is the equator.

LogGDP76 (81): natural logarithm of per capita GDP in 1976 (or 1981). From World Bank's WDI

SM: European settler mortality of the colonial age. From Acemoglu *et al.*(2001)

SSA: dummy variable for Sub-Saharan African countries

TO8100 (7600): average ratio of export and import to GDP from 1981 (or 1976) to 2000. From World Bank's WDI

Descriptive statistics of variables

	Africa					non-Africa				
	mean	max.	min.	std. dev.	obs.	mean	max.	min.	std. dev.	obs.
GR8100	-0.11	4.67	-7.42	2.33	42	1.55	8.21	-5.89	2.02	99
Fuex8100	33.36	96.96	0.07	33.08	45	21.87	98.88	0.00	27.13	128
Inf8100	81	1739	3	303	43	77	1444	0	208	117
TO8100	69.60	159.91	24.95	32.74	50	84.54	329.58	8.77	46.52	135
Govdef8100	-4.82	9.36	-20.99	4.90	39	-3.58	7.49	-41.70	5.17	112
Edu80	20.2	75.9	2.7	17.3	42	62.8	126.6	4.1	28.9	108
GADP8400	5.11	8.00	1.71	1.39	36	6.20	11.05	0.62	2.91	103
BMP8199	0.31	1.64	0.00	0.39	49	0.18	3.55	-0.24	0.42	138
Elf60	0.61	0.93	0.04	0.27	41	0.29	0.89	0.00	0.25	66
SM	390	2004	16	451	26	72	170	9	45	37

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대외경제정책연구원 동서남아팀장을 맡고 있으며 주로 아프리카와 중동지역 연구를 담당하고 있다. 서울대학교에서 박사 학위를 받았으며 U.C. Berkeley에서 박사후 과정을 하였다. 그 후 서울대학교 등에서 강의하였으며 대통령 자문 정책기획위원회에서 전문위원으로 활동하였다. 주요 연구업적으로는 『1990년대 이후 중동의 경제개혁』(2004, 대외경제정책연구원), “Hedge fund leverage before and after the crisis”(Journal of Economic Integration, 2002) 등이 있다.

李康國

일본 立命館대학교 교수로 재직하고 있으며 이 대학원에서 발전경제학과 국제금융론을 강의하고 있다. 서울대학교에서 학사와 석사학위를 받고 미국 매사추세츠 주립대학에서 박사학위를 받았다. UN대학교 산하 세계개발연구소(World Institute for Development Research)에서 연구하였다. 주요 연구업적으로는 “Korea, Northeast Economic Hub Country?”(Ritsumeikan Journal of International Affairs, 2004), “A Political-Economic Analysis of the Failure of Neoliberal Restructuring in Post-Crisis Korea”(Cambridge Journal of Economic, 2002) 등이 있다.