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A Parametric Debate of Corruption and Economic Growth in Sub-Saharan African Countries

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Abstract:
This paper investigates the determinants of corruption and its impact on economic growth in 39 sub-Saharan African countries. The significance of this study would be to add to extant literature on causes of corruption in sub-Saharan African countries and the results obtain could further raise cautions about casual attempts at institutional reform. In an attempt to empirically investigate on corruption, the corruption index was obtained from the Worldwide Governance Indicators (WGI) and data for the study span from 1996 to 2011. In a Barro-styled economic growth model, the dynamic panel regressions were conducted for both corruption determinants and growth-corruption models. Panel unit root test following lm, Pesaran and Shin W-Stats, Model reliability tests and cointegration test were also conducted. From the model to find the determinants of corruption, empirical result suggests that natural resource (ore, fuel, food and Agriculture), rule of law, secondary school enrollment and foreign direct investment are relevant in explaining spate of corruption. Corruption was important in explaining GDP per capita. Overall, our result suggests that natural resource wealth, irrespective of the types (whether ores, fuel, food and agriculture) tends to consolidate and conserve bad political regimes which undermines appropriate social-cultural changes that in turn breeds corruption via institutional weakness, and in the process distorts economic growth dynamics in countries studied.
Keywords: Corruption, Economic Growth, Barro-Growth Model, Institutional Weakness, Dynamic Panel Regression, Point-Source and Diffused Natural Resource.

1 Introduction

Corruption is one of the greatest inhibiting forces to equitable development and to the combating of poverty and it constitutes the difference between life and death' - World Bank President James Wolfensohn (2003)

The role that institutions and good governance play in stimulating economic growth has been accepted in both economic and political literature. This growing consensus has emerged from a proliferation of empirical measures of institutional quality, governance, and the investment climate, and accompanying research showing the strong development impact of good governance (Governance Matters 2009). Corruption and other forms of rent seeking have been well-documented in every society on earth, from the banks of the Congo River to the palace of the Dutch royal family, from Japanese politicians to Brazilian bankers to the New York City police department (Becker and Stigler 1974 cited in Coolidge & Rose-Ackerman 1996)

Although corruption is a world-wide phenomenon, it said to be costing Africa so much and restricting its development. The consequences and effects are also on the increasing side. While corruption also exists in the private sector, corruption primarily involves government officials. In a bid to improve Africa's reputation and ensure an environment conducive to rapid economic and political change, Africa must be prepared to look inward at tackling the problems that is besetting the continent for a long time, of which corruption and mismanagement is a recurrent feature.

North, D (1990) asserted that institutions are humanly devised constraints that structure political, economic and social interaction. In this regards, institutions provide the incentive structure of an economy; as the structure evolves, it shapes the direction of economic change towards growth, stagnation or decline. Acemoglu et al. (2005) noted that good economic institutions should reflect a stronger rule of law, well defined property rights, amidst the presence of a robust checks and balances.

However, following the rise in failures of orthodox policies, the World Bank remains focus on institutional development as a vital ingredient to stimulate economic development. Hence, the introduction of the Worldwide Governance Indicators (WGI) which measures good governance under six (6) broad categories namely: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption.

This study seeks to explore the determinant of corruption in sub-Saharan Africa countries. A major contribution of this study is an attempt to endogenise corruption. The aim is to investigate and ascertain the main

determinants of corruption in sub-Saharan African countries. Also we will analyze the impact of corruption, amidst other control variables, on economic growth.

The reason is that institution may determine economic performance aside from the usual Dutch disease and rent-seeking approach found in economic literature to explain sluggish economic growth in these countries. The failure to account for the success stories of Norway, Botswana, Indonesia and Malaysia, albeit rich in natural resources, prompted the growing literature of endogenous institutions. Corruption imposes additional costs on growth process as it diverts scarce resources away from viable investment. It increases the degree of uncertainty and risk associated with investment and drives away new investment see Fabayo J. et al (2011).

Mauro (1998) concluded that the bulk of the effects of corruption on economic growth which operate through private investment accounts for about one third of the total growth effects. Countries that are serious about reducing corruption tend to attract more investment, both domestic and foreign, and to accelerate economic growth and poverty reduction. Although, authors remains divided as to a comprehensive definition of corruption, but an instructive definition was given by the Asian Development Bank (ADB, 2010) which defines corruption as a behaviour on part of officials in public and private sectors, in which they improperly and unlawful enrich themselves and or those close to them or induce others to do so, by misusing the position in which they are placed. The World Bank defines corruption as the abuse of public office for private gain (Bardhan, 1997; Rose-Ackerman, 1999).

Corruption is a ravage economic ill whose cost and problem is rampant worldwide, especially among African countries. From the 1997 United Nations' World Development Report, about 5% of industrialized countries' companies pay bribes to win or retain business, while the figure is 40% and 60% in Asia and the former Soviet Union. Corruption is known to raise transaction costs, lowers efficiency of public spending and hinders foreign direct investment. Other effect heightened economic uncertainty and the dissipation of political legitimacy of the State and the consequent distortion the democratic development. (Wei, Shangjin, 2000)

However, recent empirical evidences indicate that resource rich countries, on average, have lower and unsteady growth rates compared to resource poor countries (Mehrara, et al 2011, Sachs and Warner, 1995).Studies have link this occurrence to the fact that rent-seeking behaviour of government tends to undermine institutional quality. This problem is often rooted in the mismanagement and embezzlement of these resources, and the resultant effect has been the growth drag being experienced in many African economies.

The reason provided for this occurrence according to Harford and Klein (2005) is that natural resource abundance and exports damage institutions (including governance and the legal system) indirectly by removing incentives to reform, establish a well-functioning tax system and improve infrastructure. It directly induces civil conflict on resource rent control and poorly-conceived laws.

There is growing evidence that these effects of corruption remain endemic in most African countries which have one form of natural resources but continue to experience economic growth drag, as documented in the Extended Solow Growth Model. It is on the basis of the foregoing that this paper attempts to capture the determinants of corruption and its effect on economic growth in sub-Saharan Africa.

The significance of this study would be to add to extant literature on causes of corruption in Sub-Saharan African countries and the results obtain could further raise cautions about casual attempts at institutional reform. Recall that the main export earnings of most Sub-Saharan African countries are broadly differently. While Nigeria relies on crude oil export for fiscal sustenance, Kenya's export is mainly agricultural produce, although oil was recently discovered in the country. Successive military dictatorships in Nigeria have plundered oil wealth and many suspect transfers of large amounts to undisclosed wealth. Table 1 shows heads of states and looted amount as reported in George Ayittey, 2002.

Table 1 Corruption: Head, Country and Volume

S/N	Head of State	Country	Amount
1	General SaniAbacha	Nigeria	20,000
2	H.Boigny	Ivory Coast	6,000
3	General Ibrahim Babangida	Nigeria	5000
4	Mobutu	Zaire	4000
5	MouzaTraore	Mali	2000
6	Henri Bedie	Ivory Coast	300
7	Denis N'gnesso	Congo	200
8	Omar Bongo	Gabon	80
9	Paul Biya	Cameroon	70
10	Haite Mariam	Ethiopia	30
11	HisseneHabre	Chad	3

Source: George Ayittey, 2002.

.Since corruption is assumed to have a negative impact on economic outcomes (Mauro, 1995; Tanziand Davoodi, 1997), it is important to know the key factors that determine corruption in sub-Saharan Africa.

The paper is organized in five sessions. Following the session 1, section 2 provides a brief survey of existing literature and empirical work on corruption and economic growth. Section 3 discusses theoretical framework and model specification, while Section 4 discusses the regression results of corruption and economic growth models. The last section contains concluding remarks and policy implication.

2 Review of Related Literature

A sustained economic growth requires good governance and equity system under control (Tanner and Liu 1994). The literature is divided about the effect of corruption on economic growth. However, the determinants of corruption are multifaceted as there are many countries. Acemoglu and Verdier (1998) suggested that corruption might be desirable as it may provide a leeway for entrepreneurs to bypass inefficient regulations and hence induce a more efficient provision of government services. Advocates of this view conclude that corruption introduces efficiency in the economy and affects economic growth positively as a result of bureaucratic inefficiencies and thereby make the process of project approval more efficient. This is the 'greasing the wheel' argument.

Opponents contended that corruption hurts innovative activities because innovators need more of government-supplied goods, such as permits and import quotas. Since the demand for these goods is high and inelastic would make them prime situation for corruption. Fresh innovators are often credit-constrained and cannot find the cash to pay bribes and, thus deterred long run stock of producible inputs (Murphy et al., (1993).

In line Ugur, M et al (2011) alluded to conflict in exploring corruption determinants, as authors' interest often come to play. He categorized these variables into 4 broad areas namely: economic and demographic factors; political factors; bureaucracy and judicial system; and geography and cultural factors. Ugur, et al contended that corruption is severe in low income countries that are less integrated with the world economy and are densely populated. He concludes: lack of democracy increases corruption; corruption is also high in countries suffering from a weak judicial system and low quality of bureaucrats who earn low wages; ethnically less fragmented have a low level of corruption; and lastly countries rich in natural resources are more likely to be corrupt.

Mauro (1995) presents some strong empirical evidence to help prove the negative relationship between corruption and long-term growth. Wei (1997) argues that corruption is much more costly than ordinary taxes because it generates uncertainty in addition to the tax burden.

In the presence of corruption, businessmen are often made aware that a bribe is required before an enterprise can be started and, in addition, corrupt officials may also lay claims to one part of the proceeds from the investment. Therefore, businessmen interpret corruption as a species of tax. In addition, they also face secrecy and the uncertainty that the bribe-taker may not fulfill his part of the bargain. Both the tax and the uncertainty will diminish incentives to invest.

Since rent seeking is often more lucrative than productive work, talents will be misallocated. Financial incentives may lure the more talented and better educated to engage in rent seeking rather than productive work, which in turn results in adverse consequences for the country's economic growth. Ehrlich and Lui (1999) cited in Ugur, M et al (2011) show that some officials spend a substantial amount of time and effort in seeking and accumulating political capital, which is not socially productive.

Karl (1997) cited in Isham et al. stated that the revenues a state collects, how it collects them, and the uses to which it puts them" does indeed "define its nature". This shows that institutions surely matter a lot, but types of

natural resource endowments and the corresponding export structures to which they give rise play a large role in shaping what kinds of institutional forms exist and persist. Most developing countries export mainly primary products ranging from extractive industry to agricultural produce.

Corruption may entice government officials to allocate public resources less on the basis of social welfare than according to opportunities for extorting bribes. Large projects, whose performance is difficult to monitor, may provide lucrative opportunities for rent seeking and bribes. We can expect that it is easier to collect large bribes on large infrastructure projects or high-tech defense systems than on textbooks or teachers' salaries. Mauro (1998) concludes that corruption affects the composition of government expenditure. When corruption is serious, there is much less government expenditure on education than on large infrastructure and defense projects. In addition, Mauro finds that corruption also lowers the quality of infrastructure projects and public services.

In developing countries that receive foreign aid, corruption may reduce the effectiveness of the aid through diversion of funds, and foreign aid may end up supporting unproductive and wasteful government expenditures. As a result, more and more donor countries now focus on issues of good governance. In cases where governance is judged to be especially poor, some donors have cut their assistance.

The recent currency crises of East Asia, Russia and Latin America have stimulated research on their causes. Many authors have argued that the often corrupt "crony" capitalism is partly responsible for the crises. Wei (2000a) argues that corruption is likely to produce certain composition of capital flows that makes a country more vulnerable to shifts in international investors' sentiments and expectations.

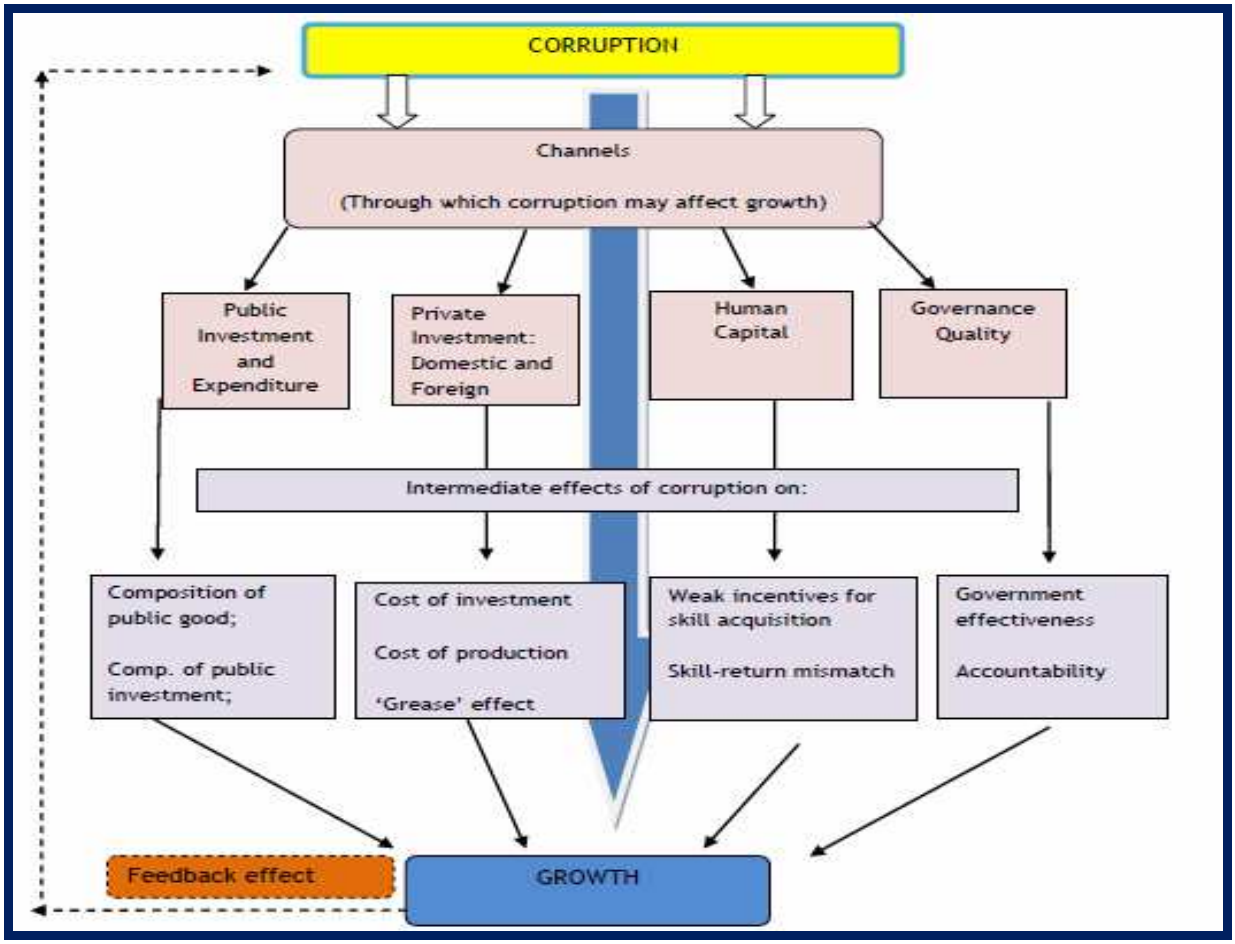
Other possible consequences of corruption include loss of tax revenues because corruption may encourage people to evade taxes. In addition, by reducing tax revenues and increasing public expenditure, corruption may lead to adverse budgetary consequences. Corruption may also cause monetary problems if it takes the form of improper lending by public financial institutions at below-market interest rates.

3 Stylised Facts on Corruption and Economic Indices

Corruption imposes additional costs on growth process as it diverts scarce resources away from viable investment. It increases the degree of uncertainty and risk associated with investment and drives away new investment (Fabayo et al (2011).

The schema below indicates the channel though which corruption unleashes its pervasive effect on economic growth.

Corruption-growth relationship: channels causal mechanisms



Source: Adapted from work by Mehmet Ugur et al (2011)

Rahman et al (1999) examining the effects of corruption on economic growth and gross domestic investment for Bangladesh established that corruption is significantly and negatively associated with cross-country differences in economic growth and gross domestic investment (both public and private). One of the channels through which corruption affects domestic investment is through the increased cost of doing business emanating from diverted funds, and consequently poor infrastructure (Tanzi an Davoodi, 1998). To them 'corruption creates perverse incentives for investment in new projects mainly for political rents'. With high cost of doing business, it is quite evident that the inflow of foreign direct investment falls (Wei, 1997 and Rahman et al, 1999).

Table 1 depicts the relationship between corruption, easy of doing business and inflow of foreign direct investment (FDI). It can aptly be seen that corruption and easy of doing business are positively related (i.e. the higher the corruption the higher the cost of doing business), while corruption and level of FDI inflow are negatively related. With the exception of countries like Nigeria and Ghana, other developing countries in Africa, as compared to the developed countries, such as United States, Japan and Singapore exhibit a negative FDI – corruption nexus. Nigeria and Ghana show encouraging trend in terms of the flow of FDI but such flow is largely in mining sector, gold in Ghana and oil in Nigeria. Meanwhile, Ghana is on course in its drive to improve institutional quality, as oppose to evidences from Nigeria where institutional reforms is still relatively weak. In recent times, some industries have relocated from Nigeria to Ghana due to the marked improvement in the country's infrastructure, especially electricity and a relatively stable macroeconomic environment to support both domestic and foreign investors. Table 2 shows Corruption, Easy of Doing Business and Influx of FDI to selected countries.

Table 2 Corruption Perception Index

Country	Corruption Perception Index* (2006 - 2010)	Easy of doing business index (Rank - 2010)	Foreign Direct Investment inflow (2006 – 2010) in $ million
Singapore	9.3	1	25,777.1
United States	7.2	5	33,843.4
Japan	7.5	18	10,084.7
Mauritius	5.7	20	302.6
Botwsana	5.7	52	614.8
Ghana	4.0	67	1,384.8
Kenya	2.1	98	229.8
Tanzania	2.8	128	446.5
Nigeria	2.6	136	5,529.4
Zimbabwe	2.4	157	74.1
Cameroon	2.3	168	170.1
Cote d' Ivory	2.3	169	398.1

*Source: World Bank data set 2010 and Transparency International 2010. *Countries scoring high (10 - highly clean in corruption) and countries scoring low (0 highly – highly corrupt).*

4 METHODOLOGY AND MODEL SPECIFICATION

In this section, we introduce our models. The first model explains the determinants of corruption in sub-Saharan Africa, while the second; shows the effect of corruption on economic growth, amidst other control variables. In this paper, panel data estimation techniques would be used to capture the effect of the explanatory variables on economic growth. Due to data unavailability problem the paper will refrain from the use of traditional time series econometrics analysis which would have been preferred to exhibit the country –specific effect. Amongst the justification for using panel data estimation is that it usually contains more degrees of freedom, very large numbers of observations, and less multicollinearity than other data form.

For this paper, we conducted a panel unit root and used the panel least square (fixed effect) methods in our model to eliminate unobserved effects, the panel likelihood result will also be presented in the analysis section to back up the use of fixed effect model as opposed the random effect means of modelling. This is because data used in this study are obtained for each specific country, hence does not satisfy the random selection of sample requirement which is an important criterion for using random effects technique. The panel data is unbalanced and a typical panel data model is given below:

$$Y_{i,t} = \alpha_i + \sum_{j=2}^{K} \alpha_j X_{j,i,t} + \sum \vartheta_p Z_{p,i} + \delta_t + \mu_{i,t} \qquad (1)$$

$$Y_{i,t} = \alpha_i + \vartheta_p Z_{p,i} + \alpha_i X_{i,t} + \delta_t + \mu_{i,t} \qquad (where \quad i = 1, 2 \cdots N; \quad t = 1, 2, \cdots T)$$

Where Y is the dependent variable, the X are observed explanatory variables, and the Z are unobserved characteristics. The index "i" refer to the unit of observation, t refers to the time period, and j and p are used to differentiate between different observed and unobserved explanatory characteristics. u is a disturbance term assumed to be independently and identically distributed, $\mu_{i,t} \approx N(0, \sigma^2)$.

4.1 Determinants of Corruption

The causes and determinants of corruption were selected from suggestive literature in related subject. We based our model in line with Rehman and Naveed (2007) panel analysis specification. In addition, we included export product concentration index and gross national savings variables as improvement on the model. Also, variable to capture point resource and diffused resource were also included in this study. The idea is as noted previously in the introduction. This essentially is a departure from Rehman et al model.

Endogenising corruption within a regression is daunting. This is because capturing corruption is almost impossible since it is an underground activity. Literature provides two main indicators for corruption namely Transparency's International Corruption Perception Index (CPI) and the World Bank's Control of Corruption

Index (CCI) – used in this study. The explanatory variables were selected from literature on related subject. The model to be estimated is given as:

$$Corpt_{i,t} = \alpha_i + \delta_1 N\,\mathrm{Re}\,s_{i,t} + \delta_2 Topenn_{i,t} + \delta_3 Rulaw_{i,t} + \delta_4 Polstb_{i,t} + \delta_5 FDI_{i,t} + \delta_6 GDPp_{i,t} + \delta_7 POPg_{i,t} + \delta_8 SSE_{i,t} + \varphi_i + \mu_{i,t} \quad (2)$$

Where NRes is natural Resources$_i$ constitutes - (Ores, Fuel, Food, Agriculture)

4.2 Effect of Corruption on Economic Growth

To ascertain the relationship between corruption and growth, we adopted Mauro's (1995) model which was a modification of the Barro (1991) cross-country growth regression framework. We applied unbalanced panel data fixed affect method in our analysis. The functional form is given below:

$$GDPpc_{i,t} = \alpha_i + \beta_1 N\,\mathrm{Re}\,s_{i,t} + \beta_2 Topenn_{i,t} + \beta_3 Rulaw_{i,t} + \beta_4 Polstb_{i,t} + \beta_5 FDI_{i,t} + \beta_6 Corpt_{i,t} + \cdots + \beta_7 POPgt_{i,t} + \beta_8 SSE_{i,t} + \beta_9 GDPg_{i,t} + \beta_{10} LFP_{i,t} + \beta_{11} GCON_{i,t} + \beta_{12} INF_{i,t} + \cdots + \phi_i + \mu_{i,t} \quad (3)$$

Where Natural Resource$_i$ constitutes - (Ores, Fuel, Food, Agriculture)

It has been observed that differences in institutional quality cause the differences observed in economic performance (income levels or income growth). Some influential papers like Sokoloff and Engerman (2000), Hall and Jones (1999), Acemoglu, Rodrik, Subramanian and Trebbi (2004) points to this fact.

4.3 Implied Endogeneity Problem and Solution

Both corruption and economic growth may simultaneously be determined by a common error term or an omitted factor according to Rehman, et al. The existence of this omitted factor results in biased estimates of Least Square regression. The occurrence of the endogeneity problem may be due to legal framework and the historical peculiarities of economies. In literature, Ethno Linguistic Fractionalization (ELF) index is often used to correct this bias, but the variable is known to correlate directly with economic growth (Easterly and Levine, 1997). In this study, we correct the endogeneity problem by taking a two-year average of observations to eliminate the time varying relationship. Our data is unbalanced and the panel data Least Square technique was used for estimation.

5 Regression Results and Analysis

In this section we have presented some empirical results, based on the model development in previous section. The aim of this study is to investigate the determinants of corruption in sub-Saharan Africa, and specifically its relation with economic growth. The first section of the analysis segment showcased the unit root and the likelihood tests.

5.1 Correlation Statistics, Panel Unit Root Test and Likelihood Test

The correlation statistics of the dataset used are depictd in Table 1; more so, the table consists of the unit root tests of the group series. The unit root test was conducted using three approaches but the values of the Lm, Pessaran and Shin W-Statistics was reported due to structural divergence presence in the dataset as reported by the pooled statistics in the Hausman test to be discussed later in the interpretation of empirical results. Other unit root test conducted by the study include the Augmented Dickey Fuller – Fischer Chi Square and Phillip Perron – Fischer Chi Square, these two test statistics supported the reported test by showing that all the variables were found stationary at levels except population growth which was as a result of its use as base measure of control in the panel least square results. The correlation matrix both positive and negative values for all the series employ. On a general look, the correlation coefficients of these series were found to be less than 60 percent which ruled out the issue of multicollinearity in our estimations. The Likelihood Test revealed that both cross section and fixed effects were significant which suggest the adoption of the panel fixed effect modeling.

Table 3
Correlation Matrix and Unit Root Results

Details	CORPT	ORE	FUEL	FOOD	AGRIC	TOPENN	RULAW	POLSTB	FDI	GDPP	POPGT	SSE
Corruption (CORPT)	1	-0.18632	-0.29311	-0.09221	0.152266	-0.05864	0.852924	0.666694	0.017044	-0.31949	-0.58213	0.712334
Ore (ORE)		1	-0.1549	-0.32947	-0.08326	0.104718	-0.24737	-0.04729	0.019894	0.381415	0.191298	-0.24109
Fuel (FUEL)			1	-0.31517	0.050902	0.327725	-0.27974	-0.23601	0.25531	0.247187	0.056564	-0.06996
Food (FOOD)				1	-0.07988	-0.17894	-0.00748	-0.18737	-0.1424	-0.21046	0.140629	-0.02356
Agric (AGRIC)					1	-0.39668	0.058323	-0.12086	0.373962	-0.1688	-0.16599	0.349315
Trade Openness (TOPENN)						1	-0.12653	0.053173	0.044151	0.185262	0.045112	-0.13499
Rule of Law (RULAW)							1	0.762597	-0.01397	-0.23311	-0.49856	0.669298
Political Stability (POLSTB)								1	-0.07919	-0.15911	-0.42218	0.529729
Foreign Direct Investment (FDI)									1	-0.05194	-0.0881	0.118451
GDP per capita (GDPP)										1	0.198988	-0.22782
Population Growth (POPGT)											1	-0.71177
Secondary School Enrolment (SSE)												1
Panel Unit Root Test												
W-Stats	-1.5363	-16.5731	-1.6675	-2.3117	-4.311	-2.374	-5.0817	-4.302	-6.1203	-4.6136	-3.0355	-4.6138
Prob.	0.0062	0	0.0477	0.0104	0	0.0088	0	0	0	0	0.0012	0

Source: Authors' Compilation

Table 4
Panel Likelihood Estimates

Panel Likelihood Test: Redundant Fixed Effects Tests			
Effects Test	Statistics	Degree of Freedom	Probability Value
Cross-section F	15.5612*	31, 207	0
Cross-section Chi-square	306.7905*	31	0
Period F	2.1674**	9, 207	0.0256
Period Chi-square	22.9646*	9	0.0063
Cross-Section/Period F	12.5826*	40, 207	0
Cross-Section/Period Chi-square	314.4098*	40	0
**Significant at 0.01 level*			
***Significant at 0.05 level*			

Source: Authors' Compilation

5.2 Determinants of Corruption Modeling, Results and Interpretation

In this model, corruption was the considered endogenous, with variables for natural resource, GDP per capita, trade openness, rule of law, political stability, FDI, secondary school enrollment were explanatory variables. The result is reported in table 3 below.

Table 3
Corruption – Determinants Models

Variable	***CORPT1***	***CORPT2***	***CORPT3***	***CORPT4***
Constant term	*-0.156099*	*-0.52609*	*-0.298871*	*-0.07688*
Ore (ORE)	*0.000426**	*0.004845**	*3.49E-05**	*0.000844**
Fuel (FUEL)	*0.004879***	*0.006143***	*0.005829**	*0.00719***
Food (FOOD)	*0.003097***	*0.002927***	*0.000817***	*0.000179***
Agriculture (AGRIC)	*0.00000118****	*0.00000172****	*8.05E-11***	*1.07E-10***
Trade Openness (TOPENN)	*-6.94E-02*	*-0.073851*		*-0.091498*
Rule of Law (RULAW)	*-0.618336****		*-0.54142****	*-0.587747****
Political Stability (POLSTB)	*0.059416*			*0.014212*
Foreign Direct Investment (FDI)		*-8.29E-12*		*6.32E-12***
GDP per capita (GDPP)		*5.38E-07*		*1.27E-09*
Population Growth (POPGT)			*4.32E-02*	*0.025971*
Secondary School Enrolment (SSE)			*-0.002084***	*-0.000794***
R-squared	*0.92621*	*0.897014*	*0.927954*	*0.932866*
Adjusted R-squared	*0.909455*	*0.871699*	*0.905966*	*0.909344*
S.E. of regression	*0.171833*	*0.203253*	*0.170178*	*0.168714*
Sum squared resid	*6.112007*	*7.394789*	*4.459947*	*3.899607*
Log likelihood	*113.8742*	*64.17526*	*98.50064*	*95.51043*
F-statistic	*55.28169*	*35.43395*	*42.20262*	*39.6602*
Prob(F-statistic)	*0.0000*	*0.0000*	*0.0000*	*0.0000*
D-Watson stat	*1.061449*	*0.97429*	*1.248912*	*1.28439*

Source: Authors' Computation and Compilation

, **, * indicates statistical significance at 10%, 5% and 1% levels. CORP (corruption), GGDP (GDP Growth), ORES (ores and metal exports), Fuel (Crude mineral exports), Food export, AGR (Agriculture export), RULW (Rule of Law), POLST (Political Stability), FDI (Foreign Direct Investment),SSE (Secondary School Enrollment rate), TOPEN (Trade Openness)*

The panel least square results paraded the manipulation surrounding the modeling of determinants of corruption presented in Table 3. The likelihood and hausman specification tests results supported the adoption of the Panel Least Square (fixed effect) model. Model 1 display the without control variables corruption-Determinants model while model 2 consider foreign direct investment and GDP per capita to see the effects of their inclusion on the focal variables – natural resources. The third model included social variables such as rule of law, population growth and human capital development proxy by the secondary school enrolment. The last model (model 4) weighs the effect of macroeconomic (GDP per capita, trade openness and foreign direct investment) and social issues (rule of law, political stability and population growth); the model also consider secondary school enrollment to measure the effect of human capital development on coefficients of the focal factors.

Going by the model selection criteria such as the Akaike Information Criterion, AIC, Schwarz Bayesian Criterion, SBC and Hannan Quinn Criterion (HQC) model 4 was selected as it portrays the best of all the four models mined. However, all the models were presented for pedagogue.

From the result, it was found that natural resource wealth, irrespective of the types (whether ores, fuel, food and agriculture) tends to consolidate and conserve bad political regimes which undermines appropriate social-cultural changes, breeding corruption in the process via institutional weakness. This idea is that large oil deposits, for example, can induce a voracious rent-seeking attitude that erodes institutional development.

However, Leite & Weidmann (2003) found that fuels and ores positively correlated with corruption (as in our study), but found that agriculture and food negatively correlated with corruption.
The coefficient of trade openness and political stability, foreign direct investment, GDP per capita and population growth were, though insignificant at the conventional level of significance, but were correctly signed and true to expectation. As countries engage more in trade and globalization takes place in a stable political environment, the incidence of corruption recedes in line with global standard and expectations.
Countries more open and better rule of law tend to be less corrupt (Sala-i-Martin and Subramanian, 2003. This variable performed remarkably well, even at the 1% significance level. Foreign Direct Investment was significant and positive. This indicates that FDI tends to thrive in sub-Saharan African countries amidst wide-spread corruption and political uncertainties. This tends to support the 'greasing the wheel' effect of corruption. GDP per capita income, population growth were all insignificant at the respective significance test levels in all models.
Morestill, secondary school enrollment, our variable to capture level of education, was significant. It shows that as level of education and awareness of rights increases, spate corruption tends to decline, this adjudicate the negative sign attached to the variable in the model. However, the low level of education in SSA, amidst a high growth in population, would likely provide a vent for corruption to instigate a virulent civil conflict.
Overall, the results show that inclusion of several control variables at each stand of the model posse no significant difference in signs and reliability measure of the focal variables, however, significant changes in magnitude was observed considering all selected control variables in a single specification (see model 4). Our model was also corrected for the presence of Heteroskedasticity problem and the autocorrelation measure (Durbin Watson Statistics) reports the existence of positive autocorrelation within the system including model 4 considered in our analysis. The model also passed the cross-section and period fixed effects test using the Panel data likelihood estimation test and Hausman specification test methods which signifies the consideration of each country's characteristics in the analysis.

5.3: Corruption and Economic Growth Results

The corruption - growth model was based on the Barro (1991) type equation. This model is estimated by employing panel data least square (fixed effect) technique. The result obtained is used to analyze the effect of corruption on growth, including other control variables. Table 4 demonstrates the five models specified to describe various modifications made on the Barro-style model. From the result, we find that an increase in corruption as depict by the index reduces GDP per capita by about 20% on the average across all the models specified. Political instability and rule of law are both avenues through which corruption affects economic growth; this was justified by the result of the model on determinant of corruption.
Components of natural resources were rarely significant, except coefficients of food and agriculture. This is in line with George Mavrotas, et al (2011) submission that point-source, such as oil and minerals, exhibit concentrated and capturable revenue patterns, while revenue flows from resources such as agriculture are more diffused. This makes countries known to have comparative advantage in agricultural production more likely to progress economically compared to resource rich countries. This may justify the so-called Resource curse hypothesis. Hall and Jones (1999) noted that point source resources (fuel and minerals) are most detrimental to institutional quality as opposed to diffuse resources (agriculture).
FDI and inflation were broadly insignificant and both coefficients were positive. FDI induces growth, but remain insignificant as most investments are most linked to extractive industries, which are essentially enclave with little linkage with other sectors of the economy. A positive inflation indicates a structural bottleneck in the region which acts as a drag (cost) on economic growth path. Government consumptive expenditures carried a negative sign, indicating the unproductive nature of such spending. The coefficients of labour participation rate and secondary school enrolment were highly significant. As more and more people gets educated and join the work force would result in improvement in GDP per capita. The magnitude of the effect of the explanatory variables was highlighted in table 4 below.

Table 4 Corruption - Growth Models

Variable	***GDPP1***	***GDPP2***	***GDPP3***	***GDPP4***	***GDPP5***
Constant term	*23.83769*	*14.7113.8*	*10.13816*	*24.12947*	*-23.9918*
Corruption (CORP)	*-0.2219**	*-0.23916.8**	*-0.20101**	*-0.1992***	*-0.2001***
GDP growth rate (GGDP)				*1.129669***	*2.9345****
Ore (ORES)	*-0.378.16*				*-0.3272*
Fuel (FUEL)	*-0.428.19*		*-0.60703*		*-0.7609*
Food (FOOD)	*0.368.78*		*1.261475**		*0.1369**
Agriculture (AGRIC)	*0.12E-03*		*1.19E-05**		*2.09E-05**
Rule of Law (RULW)		*-3576.012***	*31755.51**	*31871.53****	*32166.92***
Political Stability (POLST)		*20630.4*			
Foreign Direct Investment (FDI)			*1.65E-06*	*3.67E-07**	*2.06E-06*
Inflation (INF)				*0.473643*	*0.5900*
Labour Participation Rate (LFPR)		*1.5425****			*6.4185***
Secondary School Enrolment (SSE)			*3.330582****		*3.3147****
Government Consumptive Expenditure (GCON)					*-4.27E-07**
Trade Openness (TOPEN)	*-19440.62*	*-16094.86*	*3664.643*	*-14092.5*	*-1406.978*
R-squared	*0.991313*	*0.990773*	*0.993856*	*0.989442*	*0.994539*
Adjusted R-squared	*0.989382*	*0.989433*	*0.991837*	*0.987553*	*0.99226*
S.E. of regression	*34019.65*	*31612.08*	*26334.2*	*33565.07*	*26778.68*
Sum squared resid	*2.40E+11*	*3.51E+11*	*9.50E+10*	*3.09E+11*	*8.25E+10*
Log likelihood	*-2984.836*	*-4719.597*	*-2095.864*	*-3809.065*	*-1875.641*
F-statistic	*513.4911*	*739.0324*	*492.4375*	*524.0153*	*436.3602*
Prob(F-statistic)	*0*	*0*	*0*	*0*	*0*
D-Watson stat	*0.570832*	*0.559076*	*0.46008*	*0.519534*	*0.533399*

Source: Authors' Computation and Compilation

, **, * indicates statistical significance at 10%, 5% and 1% levels. CORP (corruption), GGDP (GDP Growth), ORES (ores and metal exports), Fuel (Crude mineral exports), Food export, AGR (Agriculture export), RULW (Rule of Law), POLST (Political Stability), FDI (Foreign Direct Investment),SSE (Secondary School Enrollment rate), TOPEN (Trade Openness, LFPR (Labour Participation Rate and GCON (Government Consumptive Expenditure)*

6 Conclusion and Policy Implications

The fundamental economic problem faced by many African resource rich economies is how to transform sub-soil assets into a portfolio of other assets – human capital, domestic physical capital, and perhaps also foreign financial assets – that yield a continuing flow of income to citizens (Ploeg and Venables, 2011).

Overall, the evidence presented in this paper supports two arguments that corruption is significantly and negatively associated with cross-country differences in economic growth. It is a channel that tends to limit FDI influx into sub-Saharan economies. The study also confirmed the resource curse hypothesis, with point-source natural resource undermining economic growth via corruption and institutional weakness.

To this end, corruption becomes a social and economic problem that must be critically and seriously addressed because it constitutes greatest hindrance to the moral uprightness of the citizens and economic development. The causes of corruption are many and rooted in country's policies, bureaucratic traditions, political development and social history (World Bank, 1998). Corruption flourishes under lax standard and control, as well as undue rent seeking attitude.

From the study, rule of law, FDI, political uncertainties, secondary school enrollment are major determinants of corruption in sub-Saharan Africa. Also corruption is a key determinant in the bizarre and subdued level of GDP

per capital in these countries. In the growth model, FDI was insignificant to stimulate growth per capita but provided evidence of massive investment in the extractive sector of the economy.

Implied for policy is the urgent need to boost investments in education and proper management of revenues from natural resource exports. Institutional arrangement should be strengthened to support FDI inflows to engender upward spiraling economic growth equilibria amongst sub-Saharan African countries.

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