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An econometric analysis of the impact of Corruption on economic growth in Nigeria

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Over the years corruption has received a considerable amount of attention due to some reasons, prominent is the liberalization of press in many parts of the world and increasing awareness that has been created on the detrimental effect of corruption on economic growth. Nigeria is blessed with abundance of resources and particularly known for her wealth of oil, however, this is not evident in the economy due to the presence of corruption in the country. This study empirically investigates the impact of corruption on economic growth in Nigeria on an annual time series data from 1980-2009 using regression analysis. Also, the Granger causality test and impulse response function was carried out. The empirical results reveal that corruption per worker exerts a negative influence on output per worker directly and also indirectly on foreign private investment, expenditure on education and capital expenditure per worker. Furthermore, the study revealed that there is a one-sided causality where the direction of influence runs from output per worker to corruption per worker. This study therefore recommended a strategy that depends excessively on actions in various sectors in combating corruption in the Nigerian economy as against a single action (establishment of anti – corrupt agencies).

Keywords: Corruption, Economic growth and Regression

INTRODUCTION

Corruption is a global issue which is an endemic to government all over the world. The World Bank website cites corruption as the single most important obstacle to development. It is a subversive force that can topple the most entrenched regimes, it corrodes currencies, markets and investments.

The study of the causes and consequences of corruption is not a recent phenomenon it has a long history in economics, dating back at least to the seminal contributions of the rent seeking literature by Krueger (1974), Rose-Ackerman (1978) and Bhagwati (1982). In fact corrupt practices are not an issue that just begins today; but the history is as old as the world (Lipset and Lenz, 2000).

According to Tanzi (1998) corruption is the intentional noncompliance with arm's length relationship aimed at deriving some advantage from this behavior for oneself or for related individuals. However, not all acts of corruption

result in the payment of bribes. For example, a public employee who claims to be sick but goes on vacation is abusing his public position for personal use. Thus, he is engaging in an act of corruption even though no bribe is paid. The president of a country who has an airport built in his small hometown is also engaging in an act of corruption that does not involve the payment of a bribe.

Corruption has no uniform definition. This is so because what is regarded as corruption depends on the actors, the profiteers, initiators, how and where it takes place. It also depends on the existing laws and regulations guiding certain actions. Some countries define corruption in the broadest form while others legislated on the narrow definition of the term. Irrespective of how a nation perceives the definition of corruption in its economy, corruption is a deterrent to the economic growth of a nation hence a stumbling block to its progress.

Though corruption may not be easy to define, it is generally not difficult to recognise when observed because acts of corruption do not typically take place in broad daylight (Tanzi, 1998).

Corruption in Nigeria

There are different vocabularies used to describe corruption in Nigeria. Some of these are bribery, extortion (money and other resources extracted by the use of coercion, violence or threats), embezzlement (theft of public resources by public officials). It is when a state official steals from the public institution in which he/she is employed), betrayal of trust, unfair advantages, financial malpractices, "egunje", dash, gratification, brown envelopes, tips, emoluments, greasing, softening the ground, inducements, sub-payments, side payments, irregular payments, payment under the table, undocumented extra payments, facilitation payments, mobilisation fees, "routine governmental action," revised estimates, padded contracts, over(under)-invoicing, cash commissions, kickbacks, payoffs, covert exchanges, shady deals, cover-ups, collusion, "10% rule" (bribe surcharge), "50% rule" (sharing bribe within the hierarchy), "let's keep our secret secret," "highly classified" transactions, customary gift-giving, tribute culture, nepotism (a special form of favoritism in which an office holder prefers his/her kinfolk and family members), etc.

Corruption manifests itself in Nigeria in form of abuse of positions and privileges, low levels of transparency and accountability, inflation of contracts, bribery/kickbacks, misappropriation or diversion of funds, under and over-invoicing, false declarations, advance fee fraud and other deceptive schemes known as "419", collection of illegal tolls, commodity hoarding, illicit smuggling of drugs and arm, human trafficking, child labour, illegal oil bunkering, illegal mining, tax evasion, foreign exchange malpractices including counterfeiting of currency, theft of intellectual property and piracy, open market abuse, dumping of toxic wastes, and prohibited goods" just to mention few.

Nigeria remains mired in corruption, crime, poverty, and violence despite the promulgation of several laws like in other countries as the principal mechanism for curbing corruption. The legal instruments used to fight corruption in Nigeria include the Criminal Code, Code of Conduct Bureau, the Recovery of Public Property Act of 1984, the Economic Financial Crime Commissions (EFCC) and the Independent Corrupt Practices and other related Crime Commission (ICPC).

Two major events that have led to a litany of corrupt practices in Nigeria are the rise to public administration and discovery of oil and natural gas. It is interesting to note that pervasive corruption has been blamed on colonialism.

Throughout the colonial period, most Nigerians were stuck in ignorance and poverty. A view commonly held during the colonial days was that the colonist's property (cars, houses, farms etc.) is not our property. Thus vandalism and looting of public property was not seen as a crime against society. This view is what has degenerated into the more recent disregard for public property and lack of public trust and concern for public goods as a collective national property.

During the first and second republics, government officials were in the habit of collecting 10 per cent from contract funds. The era witnessed unprecedented level of venality by high-ranking politicians. Corrupt practices were also manifested in the manipulation of the electoral process, politicization of the judiciary and resort to false accusation charges to intimidate political opponents of the government. Thus, pervading culture of corruption was one of the reasons given by the armed forces when they sacked elected governments in January 1966 and December 1983. However, apart from General Murtala Mohammed and Mohammadu Buhari, other military rulers engaged in large scale corruption with freedom from punishment. Successive military regimes mismanaged the opportunities created by the relatively enormous increases in huge revenue from oil, obtained through compulsory public acquisition of majority shares in the oil-producing companies, as well as through taxation.

Corruption in Nigeria became legitimised especially during Babaginda and Abacha regimes (1985-1998). During these regimes, there were high but wasteful spending and nothing to show in terms of physical developments. During this period, the culture of corruption through which Nigerians have come to know as a settlement syndrome became part of the country's political culture.

Abacha's regime witnessed the height of all corruption. UNIDC (United Nations Industrial Development) maintained that about \$107 billion were kept in private accounts in Europe and the United States. He completely emptied the national treasury, about ₦400 million was purported to have been looted by him and his military goons.

The civilian administration of former president Olusegun Obasanjo was received with much expectation following the bitter experience of the previous administration before it. The administration on its inception promised to fight corruption to a significant extent, to this end even though the move against corruption started late in the life of the administration; it however yielded results that supersedes those of previous administrations before it ("Standing Up Against Corruption," 2006). In the years that followed among others, was the recovery and repatriation of \$240 million and \$500 million from the Abacha's loot in foreign bank accounts, ₦500 billion was recovered by the EFCC from

corrupt government officials, the removal of two senate presidents, dismissal and prosecution of four cabinet ministers, prosecution and imprisonment of a former inspector-general of police and impeachment and prosecution of two state governors. Though Obasanjo promised that his administration would not be business (corruption) as usual but the attempts by Obasanjo himself to get an unconstitutional third term in office had eroded the anti-corruption gains of his government and the country returned to business as usual.

(Late) President Yar'adua intended to make transparency and accountability the cornerstone of his administration with a view to discouraging corruption. He showed this in a singular act, by being the first Nigerian Leader in the country to publicly declare his assets, by so doing, he equally raised the stakes for all occupants in the public office.

Unfortunately, in 2008 during Yar'adua's tenure, Mallam Nuhu Ribadu the Economic and Financial Crimes Commission (EFCC) chairman was demoted from the rank of Assistant Inspector General (AIG) to Assistant Commissioner of Police. It was observed that Ribadu was being punished for his honest character and unprecedented arrest, arraignment and trial of some powerful big men for corruption.

President Goodluck Jonathan, the current president in a special interview with Jonathan Power, a Swedish journalist in February 2012, viewed Nigerians as among the highly religious-minded human beings on earth, and stated that it remained a marked contradiction to see the pervasive level of corruption that exists in the country. He also believes that corruption human 'greed' is the devil preventing Nigeria's development instead of the widely-believed 'corruption' horror. When he was the governor of his native Bayelsa State, he once argued that corruption committed by lower people in Nigeria is deadlier to the health of the Nigerian state than the sleaze done by higher-ups.

Corruption is largely responsible for stunted economic growth of the country, and for the mass poverty that reigns in the land. The quality of public infrastructure and services has continued to be low as a result of corruption. It undermines democratic institutions, slows economic development and contributes to governmental instability. It attacks the foundation of democratic institutions by distorting electoral processes, perverting the rule of law and creating bureaucratic trap whose only reason for existing is the soliciting of bribes. Also, foreign direct investment is discouraged and small businesses within the country often find it impossible to overcome the "start-up costs" required because of corruption and thus have taken their monies to other countries in the sub region.

UNDP publication in 1999 listed Nigeria as one of the twenty poorest countries in the world. But as an oil-producing nation and indeed the 6th biggest producer of crude oil in the world with oil receipts of over \$280 billion

in just twenty years. It was affirmed that because of its wealth, Nigeria had no business being poor.

Despite the fact that Nigeria is blessed with abundance of resources and particularly known for its abundance of oil and thereby considered a rich nation, it is not evident in the economy due to the presence of corruption in the country.

This research seeks to examine the impact of corruption on economic growth and to determine the direction or otherwise of the causal relationship between corruption and economic growth in Nigeria.

Conceptual and Empirical Issues

Conceptual Framework

The Merriam Webster's Collegiate Dictionary of the English language explains that the root of the word corruption comes from the Latin word "rumpere" to break. Thus, it implies that something is broken, normally a code of conduct that is considered pure or correct.

The World Bank and IMF define corruption as "the abuse of public office for private gains". According to Osoba (1996), he defined "corruption as an anti-social behaviour conferring improper benefits contrary to legal and normal norms and which undermines the authorities' capacity to secure the welfare of all citizens".

Todaro and Stephen (2009) defines corruption is the abuse of public trust for private gain.

Corruption can be defined as "an arrangement that involves an exchange between two parties (the demander and the supplier) which (i) has an influence on the allocation of resources either immediately or in the future; and (ii) involves the use or abuse of public or collective responsibility for private ends" (Macrae, 1982).

Corruption can take many different forms, it can be; Bureaucratic (or petty) or political (or grand), Cost reducing (to the briber) or benefit enhancing, Briber-initiated or bribe initiated, Coercive or collusive, Centralized or decentralized, Predictable or arbitrary, Involving cash payment or not (Tanzi, 1998)

Myint (2000), stress that 3 main factors are responsible for a growing worldwide concern over corruption in present time. These factors are

First, a consensus has now been reached that corruption is universal. Second, allegations and charges of corruption now play a more central role in politics than at any other time. Third, is that corruption can be a major obstacle in the process of economic development and in modernizing a country.

Akinlabi, et al (2011) citing Olamide (1999) views economic growth as long-term change in an economy's productive capacity. The productive capacity of the economy is the output that could be produced if all of the economy's resources were fully and efficiently employed.

This definition links economic growth to rate of growth of potential output which is related to the rate of growth of labour force and of productivity. The determinants of economic growth in the long run include technological progress and population growth and accumulation of capital.

Friedrich (1972) is of the opinion that growth is an expansion of a system in one or more dimensions without a change in structure and development as a renovating process leading to the structural transformation of the social system.

Also, Investopedia defines economic growth as an increase in the capacity of an economy to produce goods and services compared from one period of time to another.

LITERATURE REVIEW

Various studies carried out on corruption and economic growth has two (2) distinct schools of thought. The first school of thought believes that corruption enhances economic growth. This is based on the fact that corruption (i.e. payment of bribery to bureaucrats in many forms) acts like oil that greases and facilitates the engine of economic growth as it helps government officials to make the process of project approval more efficient. Hence, the proponents of this view including Leff (1964), Huntington (1968), Acemoglu and Verdier (1998), Friedrich (1972) and Nye (1967) suggest that corruption introduces efficiency in the economy and affects economic growth positively. Corruption works like piece-rate pay for bureaucrats, which induces a more efficient provision of government services, and it, provides a leeway for entrepreneurs to bypass inefficient regulations. They have suggested that corruption may help economic growth. They claimed that corruption may allow business actors to work around pervasive and inefficient bureaucratic procedures, reducing some of the adverse effects of red tape.

From this perspective, corruption acts as a lubricant that smoothes operations and, hence, raises the efficiency of an economy. Leff (1964) and Huntington (1968) advanced the view that corruption can be efficiency enhancing because it removes government-imposed rigidities that impede investment and interfere with other economic decisions favorable to growth. Thus, corruption "oils the mechanism" or "greases the wheel." This reasoning was often used to explain the high rates of growth in some countries of South East Asia.

The second school of thought advocates the efficiency reducing argument. Researchers like McMullan (1961), Krueger (1974), Myrdal (1968), Shleifer and Vishny (1993), Tanzi (1997) Gould and Amaro-Reynes (1983) Mauro (1995, 1997), Aliyu and Elijah (2008), United Nations (1989), Tanzi and Davoodi (1997) findings have

claimed that corruption hinders economic growth, distorts markets and allocation of resources. Corruption tends to neglect education and health in favor of sectors where corruption might not be perceived easily. It also tends to increase the size but also reduces the productivity of public investment and that of the country's infrastructure. It has the tendency to reduce tax revenue because it compromises the government's ability to collect taxes and tariffs.

There are numerous empirical studies that have investigated the effects of corruption on economic growth in different countries. Beginning with the pioneering work of Mauro (1995) which examined the effect of corruption on growth rates of per capital GDP of sixteen (16) countries from 1960-1985. The result of this systematic study shows that one-standard deviation decline in the corruption index leads to an increase in annual growth rates of GDP per capital by 0.8 percent. In another study Mauro (1997) shows that the size and composition of government expenditure is significantly affected by corruption. The study found that corruption tends to make public expenditure neglect education and health in favor of sectors where corruption might not be perceived easily. This will have adverse effect on growth in the long run. In the same vein, Tanzi and Davoodi (1997) investigated the effect of corruption on the size and composition of public expenditure and came up with multiple findings which according to Akai *et al* (2005) include the fact that corruption tends to increase the size and composition of public investment, away from needed operations and maintenance like health and education funds. (Mauro, 1997), It reduces the productivity of public investment and that of the country's infrastructure and has the tendency to reduce tax revenue because it compromises the government's ability to collect taxes and tariffs. Empirical evidence suggests that corruption affects economic growth in two ways: first, there appears to be a robust negative correlation between level of corruption and economic growth, Gould and Amaro-Reynes (1983) Mauro (1995, 1997), United Nations (1989), Tanzi and Davoodi (1997) find evidence that bureaucratic malpractice manifests in the diversion of public funds to where bribes are easiest to collect, implying a bias in the composition of public funds towards low-productivity projects at the expense of value enhancing investments. Second, there is a two-way causal relationship between corruption and economic growth: bureaucratic rent-seeking not only influences, but is also influenced by the level of development.

Furthermore, Mo (2001) estimated a direct and indirect effect of corruption on economic growth using a long term growth rates of per capital GDP from 1970 to 1985. The study identified three transmission channels namely, investment, human capital and political stability. The result indicates that one unit increase in the corruption index reduces the growth rate by about 0.545 percentage

point. However, the direct effect of corruption becomes insignificant in both ordinary least squares (OLS) and two-stage least squares (2SLS) estimation after controlling other variables.

Also, Abed and Davoodi (2002) examined the impact of corruption in transition economies using a panel and cross-sectional data for twenty-five (25) countries over the period of 1994-1998. The results show that higher economic growth is associated with lower corruption in both panel and cross-sectional regressions and it shows significance at one percent level. Also, Rock and Bonett (2004) found that corruption significantly promotes economic growth in the newly industrializing economies of East Asia including China, Indonesia, Thailand and Korea. And although Pellegrini and Gerlagh (2004) found that the negative effect of corruption on economic growth, the coefficients of the 2SLS regression model were insignificant.

Aliyu and Elijah (2008) investigated the impact of corruption on economic growth from 1986-2007. A Barro-type endogenous growth model was adopted so also the Engle-Granger (1987) cointegration and error correction mechanism (ECM) techniques were employed. The core channels through which corruption affects growth were government capital expenditure, human capital development and total employment. Results show that corruption has significant negative effect on economic growth. The study also found that corruption exerts negative impact on both human capital development and total employment, but it positively impacts on government capital expenditure. The positive effect of corruption on capital expenditure is said to be however not surprising because public expenditure figure will always be inflated with the intention of siphoning or embezzling a reasonable proportion of the total value. The paper discovers that corruption exerts both direct and indirect negative effects on economic growth in Nigeria.

Furthermore, Pellegrini and Gerlagh (2004) used the indirect transmission channels of corruption, specifically investments, trade policy, schooling, and political stability, proved to be significant in explaining the deleterious effect of corruption on growth rates. They found that one standard deviation increase in the corruption index is associated with a decrease in investments of 2.46 per cent points, which in turn decreases economic growth by 0.34 per cent per year. The second, by importance, transmission channel is openness: a standard deviation increase in the corruption index is associated with a decrease of the openness index by 0.19, resulting in a decrease in economic growth by 0.30 percent per year. Jointly, the transmission channels explain 81 per cent of the effect of corruption on growth. While combating corruption is a long-term task, an understanding of the transmission channels, through which corruption affects the economy, may suggest ways to limit corruption's negative, but indirect, effects on growth.

Literature further reveals that economic situation being experienced in a country is responsible for the level of corruption. For instance, Shleifer and Vishny (1993) and Ali and Isse (2003) have advocated that in a country where economic condition is poor there is tendency for such country to experience high level of corrupt practices which further worsens the rate of development. They also observe that a country with good macroeconomic performance stands to experience low (if any) level of corruption and develops rapidly. Hindrance to economic opportunity is, therefore, seen as the source of corrupt practices. Lipset and Lenz (2000) argue that such hindrance could be as a result of their race, ethnicity and lack of physical and other human resources. They argue further that cultures that stress economic success as an important goal but which strongly restricts access to opportunities will have higher levels of corruption. This view probably explains the high incidence of corrupt practices among Nigerians as many are highly success-oriented, but possess relatively low access to economic opportunities.

It follows from above that empirical studies indicate at best, mixed and in some instance, conflicting results. This can be attributed in part to problems of methodology in these studies. For instance, while some of those studies used time series data, others used cross-national data thereby making it difficult to control for a number of cultural, historical, institutional, and qualitative differences in administrative rules and practices among others.

THEORETICAL FRAMEWORK AND METHODOLOGY

Theoretical issues

Various theories of economic growth ranging from the classical to the endogenous theories had been propounded to identify and explain the various variables influencing growth. While the classical theorists laid much emphasis on capital as major determinant of economic growth, neoclassical extended the Harrod-Domar classical formulation by the inclusion of labor and the introduction of a third independent variable, technology, to the growth equation, (Solow, 1956 and Swan, 1956). Two major drawbacks of this theory include

The impossibility of analyzing the determinants of technological progress within its framework.

The failure of the model to explain the large differences in the residuals across countries with similar technologies.

These led to a widespread discontentment with the neoclassical models (Todaro, 2003). Endogenous Growth Models were developed as a response to the criticisms of the neoclassical growth model and to offer better explanation of the process of long-run economic growth. The theory views innovation brought about by investment in knowledge generation as the driving force of long term

economic growth (Romer, 1986). More importantly, variants of endogenous growth models including Lucas (1988) Model, Jones and Manuelli (1990) Model, Barro (1990) Model, AK models of Rebelo (1991) have demonstrated that policy variables can have significant impact on long-run economic growth. This paper adopts the famous Barro (1990) model which is an outgrowth of Ram (1986) model. This is because the model permits the inclusion of a wider range of policy variables including corruption. This model provides both the theoretical foundation and analytical tool for analysis of impact of corruption on economic growth in Nigeria. It uses a production function of the form

$$Y = AK L^{1-\alpha} \tag{1}$$

Where:

Y = Total output of the economy

A = Efficiency or total factor productivity parameter

K = Physical capital

L = Labor input

α = Contribution of capital

$1-\alpha$ = Share of labour

The nature of the data used in this study is secondary data. These data were obtained from various sources such as Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics, and World Development indicators (2008). The data used include Gross domestic product (proxy for Economic growth), Government capital expenditure (proxy for Capital), Foreign private investment (proxy for Foreign direct investment), Expenditure on Education (Proxy for Human capital), Total labour force and Bribery and Corruption index (proxy for Corruption)

Model Specification

In line with studies by Mo (2001) and Pellegrini and Gerlagh (2004) in which they identified the direct and indirect effects of corruption on economic growth and in line with Barro's model, this paper adopts the endogenous growth model because it permits the inclusion of more policy variables in economic growth equation. Specifically, the model was modified to include bribery and corruption as one of its explanatory variables.

There are various channels through which corruption affects economic growth. These channels vary from human capital (factor productivity), capital accumulation, investment, political instability to mention a few. But this study adopts three (3) transmission channels which are public investment, human capital, and foreign direct investment.

Thus, four different specifications/ equations were formulated and these are given as follows:

$$\ln y_t = c_t + (\ln fpi_t) + \dot{u}(\ln esp_t) + (\ln cor_t) + (\ln k_t) + \epsilon_{1t} \tag{2}$$

Equation (2) serves as the estimable equation, where all coefficients and variables are as defined,

c_t = constant parameter

ϵ_{1t} = white noise error term.

Gross domestic product (GDP) is a proxy for Y_t ,

Government Capital Expenditure is a proxy for K_t ,

Total labour force (EMP) is a proxy for L_t ,

Foreign private investment is a proxy for FPI_t ,

Expenditure on education is a proxy for ESP_t

Incidence of bribery and corruption is a proxy for COR_t

Thus,

(y_t) = GDP per worker,

(k_t) = capital per worker,

(esp_t) = expenditure on education per worker

(cor_t) = corruption per worker and lastly

(fpi_t) = foreign private investment per worker.

While the base equation (2) is able to measure the direct impact of corruption on economic output per worker, in line with Dzhumashev (2009) certain adjustments are made to equation (2) to capture the effect of corruption per worker (c_t) on foreign private investment per worker (fpi_t), expenditure on education per worker (esp_t) and amount of capital per worker (k_t).

Other terms included are the interaction terms between the level of corruption per worker (cor_t) and amount of capital per worker (k_t), between the level of corruption per worker (cor_t) and foreign private investment per worker (fpi_t) also between the level of corruption per worker (cor_t) and expenditure on education per worker per worker (esp_t). Thus we have:

The indirect effect of corruption on economic growth via government capital expenditure (GCE) is given as:

$$\ln y_t = c_t + (\ln fpi_t) + \dot{u}(\ln esp_t) + (\ln cor_t) + (\ln k_t) + (\ln k_t \ln cor_t) + \epsilon_{1t} \tag{3}$$

The indirect effect of corruption on economic growth via foreign private investment (FPI) is given as:

$$\ln y_t = c_t + (\ln fpi_t) + (\ln fpi_t \ln cor_t) + \dot{u}(\ln esp_t) + (\ln cor_t) + (\ln k_t) + \epsilon_{1t} \tag{4}$$

The indirect effect of corruption on economic growth via expenditure on education is given as:

$$\ln y_t = c_t + (\ln fpi_t) + \dot{u}(\ln esp_t) + (\ln esp_t \ln cor_t) + (\ln cor_t) + (\ln k_t) + \epsilon_{1t} \tag{5}$$

The estimation method for deriving the measurement of corruption is in line with the method adopted by (Farida and Fredoun, 2007) and (Dzhumashev, 2009) in this paper, the highest level of the incidence of bribery and corruption is normalized as $\overline{COR} = COR_t / COR_{max}$ then the measurement of corruption becomes $(1 - \overline{COR})$ the justification for this is that it makes economic output a negative function of the incidence of bribery and corruption. However one (1) was added to the whole

Table 1. Unit root test result

AT LEVEL (NONE)			
Series	p=1	p=3	p=5
y_t	-2.79908**	-2.43471**	-2.41895**
k_t	-2.40529**	-2.40055**	-2.30133**
fpi_t	-2.53051**	-1.92776***	-2.02678**
esp_t	-1.903	-2.86516**	-3.22804**
cor_t	-1.81201	-3.51729**	-2.41895***

Note : (·) (**) and (***) indicates 1%, 5% and 10% significance level respectively for MacKinnon critical value. (P) Indicates the number of lag used in running the ADF unit root test. The null hypothesis is that there is unit root. Computed by researcher.

measurement of corruption so that a natural log of it can be taken; a prior diagnostic showed that adding one (1) overall to the measurement of corruption does not change its coefficient or statistical significance. While this measurement of corruption is able to circumvent some of the short comings of subjective measurements of corruption, it however has its own short coming since there is a high possibility of unreported cases of incidence of bribery and corruption considering the Nigerian factor.

Estimation Techniques

This study will employ quantitative tools of data analysis. First, The Augmented Dickey-Fuller (ADF) unit root test will be used to test for stationarity. Following this, a co-integration test will be conducted to determine if the time series variables have a long-term or equilibrium relationship between them. The Error Correction Mechanism (ECM) will then be used to correct for disequilibrium which involves reconciling the short-run behaviour of the economic variable with its long-run behaviour. The Vector Autoregressive (VAR) Granger Causality test will be conducted to ascertain the causal relationship between corruption and economic growth, Long run regression results will be obtained by traditional ordinary least square (OLS) technique.

DISCUSSION OF EMPIRICAL RESULTS

Test for stationarity

The time series property of stationarity was tested using the Augmented Dickey Fuller unit root test. The test was conducted on each variable individually at three different

lags of one (1), three (3), and five (5). It was found that the variables are stationary at level at various levels of significance. This is shown in table 1.

As a result of the variables being stationary the co-integration test is not deemed necessary. This is because the essence of co-integration test is to find out if there is a long term relationship between variables that are stationary at different levels of integration. (Gujarati & Porter 2009)

$$iny_t = c_t + (infpi_t) + \dot{u}(inesp_t) + (incor_t) + (ink_t) + \epsilon_{1t} \tag{2}$$

From Eq. (2) (table 2), the independent variables measure about 98.40% of the variation in the dependent variable (economic output per worker). Looking at the coefficients of the independent variables, it is seen that they all have a positive effect on the total economic output per worker except corruption per worker which has a negative effect. Specifically, a unit rise in capital per worker (k_t) will lead to about 32.51% increase in the total economic output per worker; a unit rise in foreign private investment per worker (fpi_t) will bring about a 33.94% increase in total economic output per worker (y_t); a unit rise in expenditure on education per worker (esp_t) will lead to an 18.21% increase in total economic output per worker (y_t); but a unit rise in corruption per worker (cor_t) will bring about a decrease in total economic output per worker (y_t) by 185.37%. All the independent variables were found to be statistically significant at the conventional level. This regression equation therefore shows that capital, foreign private investment, expenditure on education will bring about an increase in economic output, but corruption is a negative factor for economic output. The regression model is statistically significant at both conventional and higher levels of significance with an F-statistic of 384.6016. The Durbin-Watson statistic of 1.6924 connotes the absence of autocorrelation among the variables at 5% significance level.

$$iny_t = c_t + (infpi_t) + \dot{u}(inesp_t) + (incor_t) + (ink_t) + (ink_t,incor_t) + \epsilon_{1t} \tag{3}$$

From Eq. (3), when the interaction term between capital per worker and corruption per worker was introduced into the regression equation as seen from table 2, the coefficient of other variables remained statistically significant at conventional levels except the coefficient of capital per worker (k_t) and the coefficient of the interaction term between capital per worker (k_t) and corruption per worker (cor_t). From the result obtained it can be seen that corruption per worker (cor_t) creates inefficiencies and reduces the potential effect of capital per worker (k_t) in the Nigerian economy; as the coefficient of capital per worker (k_t) is positive but the coefficient of the interaction term between capital per worker (k_t) and corruption per worker (cor_t) is negative. Precisely, a unit rise in corruption per worker reduces the effect of capital per worker on economic output per worker by about

Table 2. Result of regression equations

Independent variable	Equ (2) iny _t	Equ (3) iny _t	Equ (4) iny _t	Equ (5) iny _t
c _t	-29.0961 (-3.642336)	-30.1001 (-1.922021)	-39.1273 (-2.040853)	-43.6041 (-2.923119)
k _t	0.325076 (2.60586)**	0.113052 (0.039996)	0.313855 (2.45331)**	0.314523 (2.530391)**
fpi _t	0.339394 (2.093521)**	0.34192 (2.025287)**	-1.48021 (-0.468926)	0.385501 (2.322085)**
esp _t	0.182111 (2.387145)**	0.182407 (2.339987)**	0.183212 (2.368619)**	1.884384 (1.046565)
cor _t	-1.853739 (-4.209135)*	-1.91407 (-2.079056)**	-2.45531 (-2.165655)**	-2.72349 (-3.114282)**
incor _t ink _t		-0.01256 (-0.075087)		
incor _t infpi _t			-0.10976 (-0.577227)	
incor _t inesp _t				-0.12242 (-1.148725)
R ²	0.984009	0.984013	0.984228	0.984843
Adjusted R ²	0.981451	0.980682	0.980942	0.981685
Durbin Watson Statistic	1.6924	1.699475	1.73227	1.72203
F-statistic	384.6016*	295.4446*	299.5414*	311.8782*
No. of Observations	30	30	30	30

Note: (*), (**) and (***) indicates 1%, 5% and 10% significance level respectively and t-statistic in parenthesis under their respective coefficients. Computed by researcher.

1.2%. While the indirect effect of corruption per worker (cor_t) on economic output per worker (y_t) via capital per worker (k_t) may be statistically insignificant, however, it is in consonance with general economic belief. About 98.40% of the variation in the dependent variable is explained by the independent variables, this is seen from the R². This shows that with the introduction of the interaction term between capital per worker and corruption per worker, capital per worker still brings about a positive effect on total economic output per worker but at a reduced rate, thus, implying corruption corrodes capital investment in Nigeria. The regression model is statistically significant at both conventional and higher levels of significance with an F-statistic of 295.4446. The Durbin-Watson statistic of 1.699475 connotes the absence of autocorrelation among the variables at 5% significance level.

$$iny_t = c_t + (infpi_t) + (infpi_t \cdot incor_t) + \hat{u}(inesp_t) + (incor_t) + (ink_t) + \epsilon_t \quad (4)$$

In Eq. (4) the regression model suggests that with the introduction of the interaction term between foreign

private investment per worker and corruption per worker, all other variables remain statistically significant except foreign private investment per worker and the interaction term between corruption per worker and foreign private investment per worker which is now statistically insignificant, this is shown in table 2.

Specifically, the regression model suggests that with the introduction of an interaction term between foreign private investment per worker and corruption per worker; the presence of corruption per worker brings about a negative response of economic output per worker to the effect of foreign private investment per worker over time. Thus, implying corruption per worker reduces the effect of foreign private investment per worker on economic output per worker drastically; where a unit rise in corruption per worker increases the negative impact of foreign private investment per worker on economic output per worker by about 10.9%. The independent variables explain about 98.42% of the variation in the dependent variable in the regression equation. The regression model is statistically significant at both conventional and higher levels of

significance with an F-statistic of 299.5414. The Durbin-Watson statistic of 1.73227 connotes the absence of autocorrelation among the variables at 5% significance level.

$$\text{iny}_t = c_t + (\text{infpi}_t) + \dot{u}(\text{inesp}_t) + (\text{inesp}_t \text{incor}_t) + (\text{incor}_t) + (\text{ink}_t) + \epsilon_t \quad (5)$$

In Eq. (5), when the interaction between expenditure on education per worker and corruption per worker was introduced into the regression equation, from table 2, it was also found that all other variables remained statistically significant at the conventional level, except expenditure on education per worker and the interaction term between expenditure on education per worker and corruption per worker which became statistically insignificant.

Specifically it shows that corruption per worker increases the negative impact of expenditure on education per worker on economic output per worker; a unit rise in corruption per worker increases the negative relationship between expenditure on education per worker and economic output per worker by about 12.2%. About 98.48% of the variation in the total economic output per worker is explained by the independent variables. The regression model is statistically significant at both conventional and higher levels of significance with an F-statistic of 311.8782. The Durbin-Watson statistic of 1.72203 connotes the absence of autocorrelation among the variables at 5% significance level.

The policy implication of the emerging results is that corruption per worker is a direct negative factor for economic output per worker and the indirect impact of corruption per worker on economic output per worker is channeled through the negative impact on capital per worker; foreign private investment per worker and expenditure on education per worker.

Causality Test

The aim is to investigate whether there exists a causal relationship between corruption per worker and economic output per worker and if there exists such relationship, is it a unidirectional or bilateral causality and also what is the direction of causality?

The study tries to find out if corruption determines the direction and likely future occurrence of economic growth, or if it is economic growth that determines the direction and likely future occurrence of corruption.

We consider the following regression equations:

$$y_t = C_1 + \sum_{i=1}^n \alpha_i \text{cor}_{t-i} + \sum_{j=1}^n \beta_j y_{t-j} + \epsilon_t \quad (9)$$

$$\text{cor}_t = C_2 + \sum_{i=1}^n \lambda_i \text{cor}_{t-i} + \sum_{j=1}^n \delta_j y_{t-j} + v_{2t} \quad (10)$$

In order to assess the possibility of a causal relationship between corruption and economic growth,

the method of Vector Autoregressive model (VAR) is adopted since it enables one to circumvent some of the extemporized procedures used in simultaneous equation models; where unclear classifications of exogenous and endogenous variables are sometimes often carried out.

In line with (Gujarati and Porter, 2009) that the direction of causality may depend critically on the number of lagged terms included in the VAR, the VAR lag order selection criteria was conducted and this is seen in table 3. From the selection criteria, it is seen that the lag of one (1) had more number of selection; it was selected by five (5) criteria. Therefore, the number of lagged terms included was one (1).

Also, from table 4, it is seen that there is a causal relationship between total economic output per worker and corruption per worker. This causal relationship is unilateral and the direction runs from total economic growth per worker to corruption per worker.

The emerging picture from the causality test suggests that there is a unilateral causal relationship between total economic output per worker and corruption per worker in Nigeria. Therefore, previous levels of economic output per worker can provide information about future levels of corruption per worker. Thus, suggesting that the direction of precedence is from economic output per worker to corruption per worker.

Analyses of Impulse Response Function Under Var Model

Impulse response analysis in time series analysis is important in determining the effects of shocks on the variables of the system. Simply put, an Impulse Response Function (IRF) shows how changes in one variable at the beginning affect another variable through time. An impulse response function also investigates the response of a variable to shocks from itself and other variables in the VAR model.

Of paramount importance in the analysis of IRF, is how variables respond to innovations or shocks in other variables and shocks from itself within the same VAR model.

Thus, we set to investigate the relationship between economic output per worker and corruption per worker respectively by investigating the responses of these various time series variables to shocks from each other and also themselves.

Looking at the IRF above corruption per worker responds negatively to innovations and shocks in total economic output per worker overall (Figure 1). In the first period there is no response, but as it moves to the second period it responds sharply, and becomes fairly constant till the end.

This shows that corruption in Nigeria responds negatively to innovations and shocks in economic growth.

Table 3. VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-25.50802	NA	0.030961	2.200641	2.298151	2.227687
1	32.10508	101.3991*	0.000426*	-2.088407*	-1.795876*	-2.007271*
2	35.79635	5.906026	0.000440	-2.063708	-1.576158	-1.928482
3	39.48858	5.316811	0.000460	-2.039086	-1.356516	-1.849770
4	42.35871	3.673763	0.000522	-1.948696	-1.071106	-1.705290
5	45.54735	3.571285	0.000593	-1.883788	-0.811177	-1.586292

* indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion; Computed by researcher

Table 4. Pairwise Granger causality tests result

Null Hypothesis	F-statistic	Probability
INYT does not Granger Cause INCORT	26.5955	0.000022
INCORT does not Granger Cause INYT	0.01962	0.88968

Computed by researcher

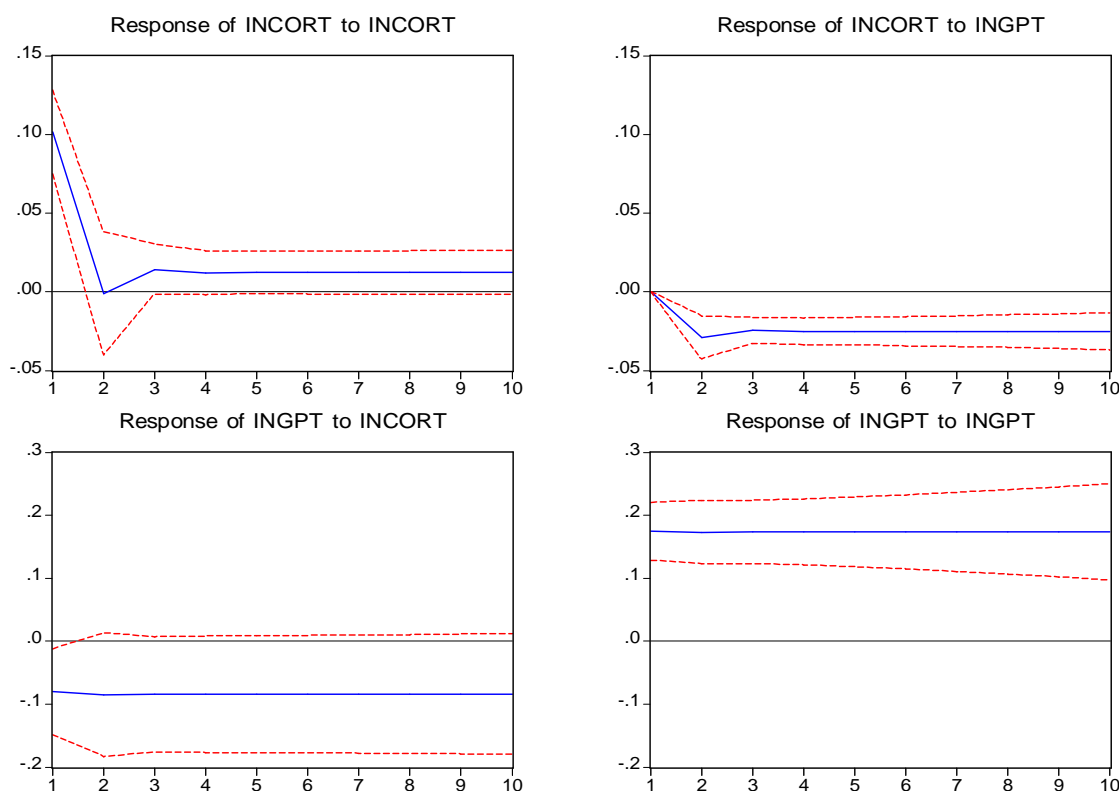


Figure 1. Response to Cholesky One S.D. Innovation \pm 2 S.E.

Corruption per worker responds highly positive to innovations and shocks itself in the first period but as it enters the second period, it declines sharply and is fairly constant till the end. This depicts that corruption in

Nigeria responds positively to innovations and shocks itself.

Total economic output per worker responds positively to innovations and shocks in itself at a constant rate till

the end of the period. Total economic output per worker responds negatively to innovations and shocks in corruption per worker at a fairly constant rate till the end of the periods. This depicts that economic growth in Nigeria responds negatively to innovations and shocks in corruption at a fairly constant rate over periods of time.

SUMMARY, RECOMMENDATIONS AND CONCLUSION

Summary

The empirical result of this study is summarized as follows:

- The regression analysis conducted showed that corruption has a direct negative impact on economic growth, which is statistically significant.
- The indirect impact of corruption on economic growth is transmitted via its negative impact on foreign private investment, expenditure on education and capital expenditure.
- The impact of corruption on economic growth is indirectly channelled through the negative impact on expenditure on education which in turn affects the quality of human capital in Nigeria.
- The impact of corruption on economic growth is indirectly channelled through the negative impact on foreign private investment which further affects the level of foreign direct investment (FDI). This is because if investors were to choose between two countries with different levels of corruption, they may choose not to start their business in a more corrupt country since the profit in that country will be reduced.
- This study also suggests that there exists a unilateral causal relationship between economic growth and corruption in Nigeria, where the direction of influence runs from economic growth to corruption.
- An additional emerging result under the variance decomposition, suggests that economic growth is a likely determinant of corruption in Nigeria.
- Overall, this study discovers that corruption exerts both direct and indirect negative effects on economic growth in Nigeria via various transmission channels.

Policy Recommendations

The Nigerian government effort in tackling corruption over the years had been channelled only into the establishment of anti-corruption agencies. Based on this, this study suggests not a single action in tackling corruption but rather a combination of various actions in

tackling this monster that is so deep rooted in the Nigerian economy.

- In the analysis, it was found that corruption reduces the potential effect of capital expenditure on economic growth in Nigeria; as corruption increases the amount spent on capital expenditure increases, but its desired impact is not achieved. This study therefore suggests Monitoring and Evaluating (M&E) agencies should be set up to monitor that the federal capital expenditure approved in the budget yearly are judiciously and effectively used for the advancement of the Nigerian economy instead of being siphoned for private gains.
- It was discovered that as corruption increases in Nigeria, the level of foreign private investment and expenditure on education reduces. This has a negative impact on economic growth. The implication is that monies appropriated on education are actually not spent on procuring educational equipment but are embezzled. Also as regards foreign investment, once the monies allocated to providing infrastructures necessary to aid investment are embezzled and too much bribes are needed to establish and import necessary equipment, economic growth will be hampered. Thus Government should ensure the provision of the necessary infrastructures especially power supply and reduce the long bureaucratic impediments to importation and legalities involved in setting up industries.
- Furthermore, looking at the overall economic performance of Nigeria over a period of time could provide information about future levels of corruption wherein adequate measures can be taken to arrest the situation. This is supported by the result of the Granger-Causality test which is in consonance with the general belief that the level of economic growth influences the level of corruption in an economy especially LDCs.
- Government should make policy changes that reduce the corruption both at the demand and supply side. from the demand side, this can be achieved by scaling down regulations and other policies such as tax incentives, and by making those that are retained as transparent and as nondiscretionary as possible; and from the supply side, corruption can be reduced by increasing public sector real wages, increasing incentives toward honest behaviour, and instituting effective controls and penalties on the public servants since corruption majorly takes place at the public sector.

In conclusion, corruption is a major deterrent to the progress of any economy with the Nigerian economy not being an exception. As such stringent measures must be taken to drastically reduce the negative impact it has on economic growth and development.

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