



The Interactive Effects of Corruption and Institutional Quality on Economic Performance

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This study was motivated by the quest to investigate how the interaction between corruption and institutional quality affects Nigeria's economic performance by testing the validity of the "sand the wheels" and "grease the wheels" corruption hypothesis through the Barro-type endogenous growth model from the Nigerian perspective which has been ignored by extant studies. Annual time series data obtained from the World Development Indicators (WDI), the Transparency International (TI), and the Central Bank of Nigeria (CBN) from 1970 to 2020 were used to conduct the study's analysis. The study employed the Autoregressive Distributed Lag (ARDL) approach to determine the interactive effects of corruption and institutional quality on economic performance. The study revealed that corruption-institutional quality interaction exerts a negative and significant impact on economic performance. This supports the assertion that institutional quality in Nigeria is feeble and overwhelmed by the magnitude of corruption and the level of individual influences. The trajectory of Nigeria's economic performance is impeded by high level of corruption and weak institutional quality. Therefore, it is imperative for policy interventions to focus on tackling the incidence of corruption, improving institutional qualities which would have ripple positive effects on Nigeria's economic performance.

Keywords: Corruption, institutional quality, economic performance, endogenous growth model, Autoregressive Distributed Lag (ARDL)

JEL: C10, H10, K10

The issues of corruption and state institutions are challenges that manifest in varying degrees in different parts of the world (Pasculli and Ryder, 2019). The adverse effects of corruption and weak institutional quality on economic performance have received increased attention over the past few decades in both advanced and emerging economies (Bacao *et al.*, 2019; Bitterhout and Simo-Kengne, 2020; Lawal and George, 2020).

For instance, Hope (2017) posited that corruption and all institutional quality indicators, except government expenditure, are inversely related to economic performance. Corruption and weak institutional quality reduce human capital, discourage investors, and the multiplier effects transmit into low productivity and low private investment, which translate into poor economic performance (Khan and Naeem, 2020).

Corruption is also viewed as the betrayal of trust by public office holders when the economic key players lack public trust; it could be a barrier to investors, with less investment leading to lower economic

performance and other negative consequences (Boussalham, 2018; Kodongo and Ojah, 2016; Linhartová and Owusu, 2019; Pluskota, 2020).

Against this backdrop, this study was motivated by the quest to examine the interactive effects of corruption and institutional quality on economic performance in Nigeria. Given the motivation behind this study, it is imperative to raise the fundamental research questions to guide the investigation. Does the interaction between corruption and institutional quality significantly affect the performance of the Nigerian economy? Answering this specific question will provide essential insights about the consequences of corruption and weak institutions on the performance of the Nigerian economy to the various economic and political players within and outside the economy.

Several studies with conflicting outcomes have been conducted to examine the effects of corruption on economic performance (Adegboyega, 2017; Campos *et al.*, 2016; Cieřlik and Goczek, 2018; Ogbonnaya, 2018; Ogun, 2018). Some studies advocated the sand to the wheels' hypothesis which contended that corruption stifles economic performance by destroying innovative activities because innovators need government-supplied goods which are exclusively provided by state institutions such as licenses, permits, and import quotas, more than established producers do (Alfada, 2019; Bacao *et al.*, 2019; Lawal and George, 2020). The demands for these commodities are high and inelastic; therefore, they become a primary target for corruption (Ogun, 2018). On the flip, the advocates of the grease the wheels hypothesis contended that corruption could boost economic performance (Chakravorty, 2019; Cieřlik and Goczek, 2018; Khan and Naeem, 2020). Considering the ongoing debate in literature and the paucity of studies that have investigated nexus between corruption, institutional quality, and economic performance from the Nigerian context, this study filled the above reported empirical gap by examining the interactive effects of corruption and institutional quality on Nigeria's economic performance. To the best of our knowledge, extant studies failed to interrogate the interactive effects of corruption and institutional quality in this research space. As such, this study is anchored on the endogenous growth theory (Barro, 1990). The theory enumerates a wide range of policy variables such as government spending, total factor productivity, and human capital development that can have a significant impact on long-run economic performance.

Following this introductory part is the Literature Review, Methodology, Discussion, Conclusion, Implications, Limitations and Direction for future research exploration.

LITERATURE REVIEW

Theoretical Underpinnings

The Barro's (1990) endogenous growth theory, referred to as 'Barro Regression Framework', which is an

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off-shoot of the extended version of the Solow neoclassical growth model (Lucas, 1988; Romer, 1990) underpins this study. Barro (1990) emphasizes the role of investment, total factor productivity and government spending as they affect growth, which enters through various transmission mechanisms. However, Barro's theory and its earlier extensions (Agale-Kolgo, 2018; Lawal and George, 2020; Ogunlana *et al.*, 2016) neglected the roles of institutional quality in their regression model. This study has incorporated institutional quality based on the conclusions that institutional qualities are critical determinants of economic performance (Gründler and Potrafke, 2019; Ubi and Udah, 2014).

$$Y = AK^\beta G^{(1-\beta)} Lgt \quad (1)$$

Where Y=output a proxy of economic growth which is measure in per capita income, A= Total factor productivity, K= investment measured by the gross fixed capital formation and G= government expenditure which is disaggregated into health, education, and ICT as an improvement over Barro (1990) model.

Therefore, the Barro (1990) endogenous growth model was used to estimate the relationship between corruption, institutional quality, and economic performance in Nigeria. The modification in the model was the inclusion of corruption index and introducing institutional quality, domestic investment, human capita and working population growth. An important measure of an economy's performance is efficiency in using productive resources. Corruption affects the efficiency of public and private sector inputs and it also imposes constraints on the total output (Ogunlana *et al.*, 2016). Including institutional quality is justified because institutions are expected to facilitate the generation of ideas, stimulate innovations, lower transaction costs and correct government failures, and by extension, facilitate economic performance (Ubi and Udah, 2014).

The Neoclassical economists emphasize the critical importance of capital accumulation in achieving economic growth because capital is crucial in creating capital-intensive goods, and the consumption of capital-intensive goods is often accompanied by an increase in income (Jabeur and Sghaier, 2018; Semančíková, 2016). Neoclassical theorists also argue that an investment in infrastructure in developing countries is essential for achieving economic performance hence it is incorporated into this study. The growth in a nation's working population reduces the level of unemployment, dependency ratio and migration, which affects economic performance (Peterson, 2017).

Based on the overall effects of working population growth on economic growth; it was included in the econometric model for this study. Including trade openness in the productivity equation is justified because countries that are more open to foreign markets have better productivity outcomes and improved technological innovation (Semančíková, 2016).

Corruption and Economic Performance Nexus

The nexus between corruption and economic performance is not the only subject of descriptive arguments; it also has been empirically and theoretically investigated. Corruption is not only a third-world phenomenon. While it is undeniably more prevalent in undemocratic frontier and emerging economies, also democratic western societies are not entirely free from the scourge of corruption. Using a sample of 81 countries for the period between 1994 and 2017, Baklouti and Boujelbene (2020) assessed the effects of corruption on the growth of output per worker in the United States of America. The study employed a panel ARDL as its analytical technique and revealed that corruption has an adverse and significant impact on economic performance in the United States. Consistent with some earlier studies, they also found that corruption reduced the investment. Ugur (2014) found 327 estimates of corruption's direct effect on per capita GDP growth from 29 studies. The findings of the inquiry indicate that corruption has a negative effect on per capita GDP growth, but the severity of the effect is small and more adverse in low-income countries.

In the Nigerian context, Enofe *et al.* (2016) assessed the effects of corruption in Nigeria, employing a parsimonious error correction mechanism and experimental research approach for data analysis. The finding shows a negative relationship between corruption and output growth in Nigeria with a recommendation for introducing national re-orientation to eradicate corruption in all sectors of Nigeria's economy and socio-political system.

Ibrahim (2015) investigated the socio-economic determinants of corruption in Nigeria, employing a co-integration and vector error correction model. The finding shows a long-run relationship between corruption and the social-economic variables in Nigeria, failing to establish the movement either negatively or positively with the degree of impact. Yusuf *et al.* (2014) studied the relationship between corruption, poverty and economic growth in Nigeria employing the ordinary least squares (OLS) and Granger causality test. The findings show co-integration and a long-run causal linkage between corruption, poverty, and economic performance in Nigeria.

Adegboyega (2017) employed a fully modified ordinary least squares (OLS) method to investigate the effect of corruption on Nigeria's economic growth using secondary data from 1982 to 2015. The findings revealed that corruption had a negative influence on economic growth in the long-run. As a result, the poverty level in the country has been on the increase while investment that could lead to job opportunities continues to reduce. The results of the findings indicate an inverse relationship with growth. Therefore, to join the ongoing empirical and theoretical debate in the literature, the hypothesis stated below will be tested.

On the flip side, the advocates of the grease the wheels hypothesis contend that corruption could boost economic performance (Acemoglu and Verdier, 1998; Erum and Hussain, 2019; Gans-Morse *et*

al., 2018; Sharma and Mitra, 2019). They explained that corruption serves as compensation for bureaucrats, which enforce more effective and efficient facilitation of essential government services, and it provides a leeway for entrepreneurs to bypass inefficient government regulations. Considering the ongoing debate in the literature and lack of consensus among the scholars, this study proposes to test the following null hypothesis:

H₀₁: Corruption does not significantly impact Nigeria's economic performance

Institutional Quality and Economic Performance

Acemoglu and Robinson (2010) contended that institutions are the critical drivers of economic performance and determine the level of development differences across nations. North (1981) described institutions as the recognized rules and regulations established by the society to shape human interaction and constrain individual excesses. The institutions create the incentive system in the society that may determine economic activities. Poor quality institutions may impede the economy by providing a leeway to economic agents to focus on redistributive politics with lower economic benefits rather than growth enhancing economic policies (Khan and Naeem, 2020). Conversely, good quality institutions may nurture structures that lead to higher economic growth by eradicating instability and ensuring efficiency (North, 1990). The output of factors of production in an economy is propelled by its institutional quality (Afonso and Jalles, 2016). Well developed, efficient, and uncorrupt institutions ensure that labor can only be used for productive activities and not wasted in corrupt acts, hence, lead to improved economic performance (North, 1990). Good quality institution raises the ability of a nation to adopt modern technologies invented elsewhere, which plays an essential role in transforming a nation's development process (Nawaz *et al.*, 2014). Based on the absence of conclusion on the likely impact of institutional quality on economic performance in the economic literature, this study proposes to test the following null hypothesis:

H₀₂: Institutional Quality does not significantly affect Nigeria's economic performance.

Corruption, Institutional Quality and Economic Performance

Mauro (1996) affirmed, applying the two-stage least square (2SLS) technique on cross-country data from 101 countries between 1980 and 1985, adverse relationship between corruption and economic performance. In countries where the institutional environment is relatively good, it is expected that corruption will mainly take the form of rent-seeking activities that slow down growth. Ubi and Udah (2014) investigate the impact of corruption and institutional quality on economic performance in Nigeria using

Augmented Dickey–Fuller and co–integration econometric techniques, results show that corruption and institutional quality have a significant impact on economic performance of the country.

Afonso *et al.* (2022) examined the effects of corruption on economic activities by assessing the importance of government size among 48 selected countries across the globe. The study employed the dynamic models and Generalized Method of Moments (GMM) technique for a panel analysis from 2012 to 2019. The study revealed that corruption has an adverse effect on GDP per capita growth. However, government size benefits less from corruption reduction. Based on above arguments, the study proposed following hypothesis:

H₀₃: The interaction between corruption and institutional quality does not significantly impact Nigeria's economic performance.

METHODOLOGY

–Sample and Data

This article used annual time series data spanning 50 years between 1970 and 2020 for its empirical analysis. The independent variables comprise corruption index obtained from the Transparency International (TI) database. Contract intensive money (CIM) was used as the indicator of institutional quality. It is described as the degree to which a country's laws protect private property. The data were obtained from the Central Bank of Nigeria (CBN) database. Investment was measured as capital formation as a percentage of GDP, government expenditure was measured as government consumption expenditure as a percentage of GDP, human capital was measured as human development as a percentage of gross national income (GNI). Trade openness was measured as trade as a percentage of GDP while working population was measured as the percentage growth rate of the working force. The data for the depended variable i.e., real gross domestic product growth rate and that some of the independent variables such as investment, government expenditure, human capita, and trade openness and population growth were all obtained from the published dataset statistics of the World Development Indicators (WDI).

–Analysis Techniques

The empirical analysis in this study includes the preliminary analysis, estimation and post estimation. The preliminary analysis includes descriptive statistics, unit–roots test and co–integration test. Regarding the co–integration test (bounds co–integration test) and estimation, the study employed Autoregressive Distribution Lag (ADRL) to examine the short–run and long–run relationships.

There is evidence of a long–run relationship if the computed f –statistics exceed the upper bound

critical value. However, there is no co-integration if the f -statistic is below the lower bound, while the result will be inconclusive for a value within lower and upper bounds. The post estimation tests, which include serial correlation test, heteroscedasticity test, normality test and structural stability (CUSUM) test, were conducted to examine the adequacy and reliability of the specified model. Unlike, other techniques, pretests for unit root are unnecessary under the ARDL cointegration technique. Therefore, the ARDL cointegration technique is preferable for this study's analysis because the variables are integrated of different order, $I(0)$, $I(1)$ or combination of the both. The technique is deemed as robust in the presence of single short-run and long-run relationships between the underlying variables in small and large sample sizes (Pesaran *et al.*, 2001; Louli *et al.*, 2012).

–Model Specification

The model for this study was specified based on its theoretical foundation, the Barro (1990) endogenous growth model and its earlier extensions (Ogunlana *et al.*, 2016; Agale–Kolgo, 2018; Lawal and George, 2020). Thus, the study extends equation 1, reported in literature review, by incorporating other variables to produce the estimated model.

$$RGDPG = (CORPT, INQ, GFCF, GEXP, HC, WPG, TOP) \quad (2)$$

$$RGDPG = \beta_0 + \beta_1 CORPT + \beta_2 INQ + \beta_3 GFCF + \beta_4 GEXP + \beta_5 HC + \beta_6 WPG + \beta_7 TOP + \mu \quad (3)$$

Where RGDPG represents a real gross domestic product growth rate, CORPT stands for corruption, INQ represents institutional quality, GFCF stands for gross fixed capital formation which is the proxy for investment, GEXP is government expenditure, HC indicates the human capital variable, WPG means working population growth rate, and TOP represents trade openness.

β_0 Represents the intercept of the model, $\beta_1 - \beta_7$ are the respective slope coefficients of the model. This shows the partial impact of each independent variable on economic growth μ depicts the error term in the mode; it accounts for omitted variables and measurement errors in the model and variables, respectively.

A-priori expectation: $\beta_1 < 0$; $\beta_2 > 0$; $\beta_3 > 0$; $\beta_4 > 0$; $\beta_5 < 0$; $\beta_6 > 0$; $\beta_7 > 0$

In the growth literature, the effect of corruption on growth is expressed in terms of the time lag for corruption to affect growth through relevant channels. This presupposes that corruption and institutional quality precede economic growth.

To estimate the pass-through mechanism of corruption to economic growth, the study specifies

interactive models that show which of the channel's corruption passes to affect economic growth.

$$GDPG = \varphi_0 + \varphi_1(CORPT * INQ)_{t-1} + \varphi_2(GFCF)_{t-1} + \varphi_3(GEXP)_{t-1} + \varphi_4(HC)_{t-1} + \varphi_5(WPOP)_{t-1} + \varphi_6(TOP)_{t-1} + \varepsilon \quad (4)$$

From equation 4, the value of φ_1 and its level of statistical significance determine the effectiveness of the interactive effect of corruption and institutional quality on economic performance.

RESULTS

This section of the study presents the empirical analysis and results. The analysis techniques include descriptive analysis, unit root test, co-integration test using bounds cointegration test, estimation using ARDL, and post estimation tests.

Descriptive Statistics

This section provides the descriptive or summary statistics of the variables being examined in the study, such as real GDP (*RGDP*), corruption (*CORPT*), institutional quality (*INQ*), interaction between *CORPT* and *INQ* (*CORINQ*), gross fixed capital formation (*GFCF*), government expenditure (*GEXP*), human capital (*HC*), working population growth (*WPG*), and trade openness (*TOP*).

Table 1 (see Appendix-I) reports the summary statistics of the variables in the study. Reiterating the measurement units, *RGDP* is expressed in billions of Naira, *GFCF*, *GEXP*, *WPG* and *TOP* are expressed as percentages, while *CORPT*, *INQ*, *CORINQ* and *HC* are given in indices.

The mean values or averages recorded for *GDPG*, *CORPT*, *INQ* and *CORINQ* are ₦32553.93 billion, 0.178 percent, 0.762 percent and 0.150 percent, respectively, for the given sample period. Thus, over the period of 50 years, the average index of institutional quality has surpassed that of the corruption. Similarly, the means of *GFCF*, *GEXP*, *HC*, *WPG* and *TOP* obtained for the sample period considered are 0.159 percent, 3.730 percent, 0.438 percent, 2.597 percent and 33.28 percent, respectively. Apparently, *TOP* appears to have the largest average proportion when expressed percentage of GDP as compared with *GFCF* and *GEXP*.

The maximum *RGDP* of ₦72094.09 billion was recorded in 1970, while the minimum of ₦14306.12 billion was recorded in 1981. The minimum real GDP growth observed suggests the least value worth of economic performance witnessed in Nigeria. The maximum (1.685) and minimum (-0.007) *CORPT* was observed in 2019 and 1970.

Apparently, this suggests that Nigeria had witnessed a substantially growing level of corruption during the period under consideration. Similarly, the maximum (0.915) and (0.621) *INQ* were recorded in 2019

and 1970. Seemingly, improvement in institutional quality appears to be concomitant with the rise in level of corruption during the period under consideration. This implies that the Nigerian government did often establish institutional control centres or strengthen existing centre in the event of rising corruption level.

The series *RGDPG*, *CORPT*, *INQ*, *CORINQ*, *GFCF* and *GEXP* appear to be positively skewed (long right tail) having positive coefficients of skewness (1.054, 3.048, 0.380, 3.249, 0.056 and 0.795, respectively). However, *HC*, *WPG* and *TOP* appear to negatively skewed (long left tail) having a negative coefficient of skewness (-0.241, 0.743 and 0.450, respectively).

Series such as *CORPT*, *CORINQ* and *GFCF* appear to have peaked distributions (leptokurtic) having coefficients of kurtosis (12.240, 13.522 and 3.995, respectively) greater threshold level of 3. Meanwhile, *RGDP*, *INQ*, *GEXP*, *HC*, *WPG* and *TOP* appear to be flat-topped distribution (platykurtic) relative to the normal distribution, having coefficients of kurtosis (2.574, 2.068, 2.166, 1.943, 2.776 and 2.279, respectively) less than the threshold level of 3 with moment distribution. Apparently, corruption (*CORPT*) appears to have the highest peak relative to GDP growth rate and institutional quality for the given sample period.

The Jarque-Bera statistics for normality test indicate that the series *INQ*, *GFCF*, *GEXP*, *HC*, *WPG* and *TOP* are normally distributed since their respective *p*-values (0.2213, 0.4523, 0.0728 0.3342, 0.095 and 0.2504, respectively) are greater than the 5 percent level of significance. However, *RGDP*, *CORPT* and *CORINQ* are not normally distributed, having their *p*-values (0.0081, 0.0000, and 0.0000) are below the 5 percent level of significance.

Unit Root Results

Table 2 (see Appendix-II) presents the result of the unit test using the aforesaid test methods. As revealed in the table, the results are consistent using both the ADF and PP tests for the variables, except for *WOPG* having conflicting results. Thus, the result of the ADF test was reported because it is a reliable choice of unit root testing (Yah and Simo-Kengne, 2018).

However, series such as *GDPG*, *GFCF* and *WOPG* appear to be integrated of order zero, they are *I(0)* series. This also implies that they are stationary in their level forms. Meanwhile, other series such as *CORPT*, *INQ*, *CORINQ*, *GEXP*, *HC* and *TOP* are integrated of order one, they are *I(1)* processes. This suggests that the series had to be differenced once in order to become stationary. Thus, the combinations of *I(0)* and *I(1)* orders of integration of the variables validate the use of bounds co-integration test to examine the existence of a linear combination among the variables as proposed by Pesaran *et al.* (2001), as presented in Table 2.

Bounds Cointegration Test

Since the f -statistic (10.2960) exceeds all the critical value bounds at all the 1 percent, 5 percent and 10 percent levels of significance for the upper bounds, $I(1)$. This suggests that there is strong evidence of long-run relationship or linear combination among the variables.

f – Statistic:		10.2960
Level of significance	Lower bounds – $I(0)$	Upper bounds – $I(1)$
1%	3.31	4.63
5%	2.69	3.83
10%	2.38	3.45

Source: Authors' Computation using EViews 10

Table 3. Bounds Cointegration Test

Table 3 shows that growth rate of real gross domestic product ($RGDPG$), the interaction of corruption and institutional quality ($CORINQ$), gross fixed capital formation ($GFCF$), government expenditure ($GEXP$), human capital (HC), population growth ($POPG$) and trade openness (TOP) have a long-run relationship, regardless of the different orders of integration among the variables. Thus, both the short-run and long-run relationships were estimated.

Estimation of Interactive Effects

Table 4 (see Appendix-III) presents the result of the short-run form (error correction model) of the ARDL. The coefficient (-0.5693) of the ECT term (error correction term or speed of adjustment coefficient) is negative and statistically significant (p -value = 0.0000) at 1 percent level of significance. As expected, the coefficient lies between -1 and 0 , thereby satisfying a convergence condition. Thus, this suggests that $RGDP$ adjusts to $CORPT$, INQ , $CORINQ$, $GFCF$, $GEXP$, HC and WPG in the long-run. About 56.93 percent of the disequilibrium in the previous periods has fallen back to equilibrium in the current period. Therefore, equilibrium or long-run relationship has been restored among the variables. In addition, corruption, institutional quality and their interaction somewhat exert significant impacts on economic performance ($RGDP$ growth as the proxy) in the short-run. The explanatory power (adjusted R-Squared) of the model is considerably higher (85.09 %) and thus, suggests that $CORPT$, INQ , $CORINQ$, $GFCF$, $GEXP$, HC and WPG are good predictors or determinants economic performance in the short-run. The f -statistics (41.92) showed that all the included variables in the short-run model appear to be jointly significant in explaining $RGDP$ (economic performance) in Nigeria.

Estimation of ARDL Long-Run Coefficients

Table 5 reports the result of the estimated long-run form of the ARDL for the given sample period. The estimated long-run equation shows that *CORPT* and *GEXP* exert negative and statistically significant impacts on *RGDP* (economic performance) in the long-run while institutional quality (*INQ*) exerts positive and significant impact on *RGDP*. Meanwhile, corruption-institutional quality (*CORINQ*) exerts a positive and significant impact (p -value = 0.0046 < 0.01) on economic performance (*RGDP*). However, *HC* and *WPG* appear to exert positive but statistically insignificant impact on *RGDP* while *GFCF* exert negatively insignificant impact on *RGDP* in the long-run. Economic performance responds negatively to the changes in the interaction between corruption and positively to institutional quality in the long-run in Nigeria. However, economic performance responds negatively to corruption-institutional interaction. Thus, a unit rise (fall) in the interaction between corruption and institutional quality has the potential to lead to a fall (rise) in *GDPG* by about 5.23 percent (on average).

Independent Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>CORPT</i>	-4.0146**	0.9868	-4.0682	0.0048
<i>INQ</i>	4.1273**	0.8338	4.9500	0.0017
<i>CORINQ</i>	-5.2323**	1.2756	-4.102	0.0046
<i>GFCF</i>	-0.0041	0.0039	-1.0394	0.3332
<i>GEXP</i>	-0.0549*	0.0226	-2.4278	0.0456
<i>HC</i>	2.6791	3.3353	0.8033	0.4482
<i>WPG</i>	0.0214	0.0984	0.2177	0.8339

Source: Authors' Computation using EViews 10

Note: ** and * denote statistical significance at 1%, and 5%, respectively; Period: 1970 – 2020; Dependent Variable: *RGDP*

Table 5. Estimated ARDL Long-Run Coefficients (With Interaction)

Post Estimation Tests

The post estimation tests include serial correlation test, heteroscedasticity test, normality test, linearity or specification error test (Ramsey RESET test) and stability test (CUSUM test). The results support the absence of serial correlation, heteroscedasticity, mis-specification, non-normality and non-linearity. The CUSUM stability result presented in Figure 1 established that the model is stable and fit for policy formulation.

Table 6 presents the results of the serial correlation test, heteroscedasticity test, normality test, and linearity test. For the serial correlation test, since the p -values (0.1856 and 0.1102, respectively) of both the f -statistic (2.4031) and LM statistic (22.1543) are greater than 5 percent or 10 percent level of significance, the null hypothesis of no serial correlation cannot be rejected since the test statistics are

statistically insignificant. Thus, the model estimated does not suffer from a serial correlation for the considered sample period.

Serial correlation test:		<i>p</i>-value
<i>f</i> -statistic	2.4031	0.1856
LM Statistic	22.1543	0.1102
Heteroscedasticity test:		<i>p</i>-value
<i>f</i> -statistic	0.3978	0.9602
LM Statistic	21.1899	0.7773
Normality Test:		<i>p</i>-value
Jarque-Bera	0.4653	0.7924
Linearity Test		<i>p</i>-value
<i>t</i> -statistic	1.3842	0.2156
<i>f</i> -statistic	1.9161	0.2156

Source: Authors' Computation using EViews 10

Table 6. Post Estimation Tests' Results

The result of the heteroscedasticity test suggests the acceptance of the null hypothesis of homoscedasticity (i.e., absence of heteroscedasticity) since the *p*-values (0.9602 and 0.7773) of both the *f*-statistic (0.3978) and LM statistic (21.1899), respectively, are greater than 10 percent level of significance (statistically insignificant). Thus, the model estimated does not suffer from heteroscedasticity for the considered sample period.

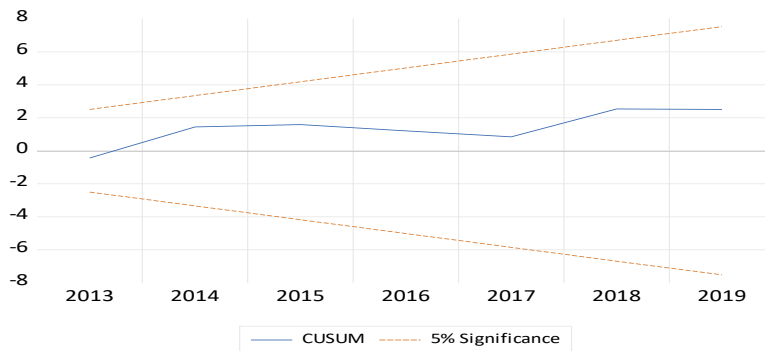
Similarly, the normality test result reveals that the residuals of the estimated model are normally distributed as the *p*-value (0.7924) of the Jarque–Bera statistic (0.4653) is greater than 5 percent level of significance (statistically insignificant).

The linearity test using Ramsey RESET test examines whether there is an existence of a linear relationship between the dependent variable (*RGDPG*) and the explanatory variables (*CORINQ*, *GFCF*, *GEXP*, *HC*, *WOPG* and *TOP*) as well as whether the model is correctly specified.

The null hypothesis is that the model is linear. Thus, since the *t*-statistic (1.3842) and *f*-statistic (1.9161) are not statistically significant (that is, having their respective *p*-values above 10 percent level of significance), the null hypothesis for linearity cannot be rejected. This suggests that the estimated model in this is linear and correctly specified.

Figure 1 presents the result of the test of stability using CUSUM criterion. Since the plot remains within the critical bounds at 5 percent level of significant, thus, the model is structurally stable. The estimated ARDL parameters are stable and appropriate for long-run decision making. Therefore, all the post

estimation test results suggest that the short-run and long-run estimates from the estimated ARDL model are valid and reliable for forecasting and policy making.



Source: Authors' Computation using EViews

Figure 1. Plot of Cumulative Sum (CUSUM) of Recursive Residuals

DISCUSSION

The empirical model examined the effect of the interaction of corruption and institutional quality on economic performance (GDP growth as a measure). The Barro (1990) endogenous growth theory was used to develop the model which estimated the relationship between corruption, institutional quality and economic performance, reconditioned to suit Nigeria's environment. Barro (1990) endogenous growth model posits that economic performance is a function of government spending, total factor productivity and human capital development. However, this study incorporated critical variables such as corruption and institutional quality into the growth model to examine the interactive impact of both on Nigeria's economic performance. However, there are two schools of thought are connected to the effect of corruption and institutional quality on economic performance, as identified in the literature.

The first school of thought embraces the fact that corruption leads to public sector efficiency and has a positive influence on economic performance because approval of projects is speedily given when bribes are paid to bureaucrats (Acemoglu and Verdier, 1998; Chakravorty, 2019; Erum and Hussain, 2019; Gans-Morse *et al.*, 2018; Khan and Naeem, 2020; Sharma and Mitra, 2019). While the second school of thought holds that corruption impedes economic performance, increases transaction costs and reduces profits in business (Adegboyega, 2017; Bacao *et al.*, 2019; Campos *et al.*, 2016; Cieřlik and Goczek, 2018; Ogonnaya, 2018; Ogun, 2018; Pluskota, 2020).

Based on Barro (1990) endogenous growth theory upon which the model for this present study was specified, it was revealed that the interaction between corruption and institutional quality has a negative

and significant impact on Nigeria's economic performance. This conforms to the postulation of the "sand in wheel hypothesis" also known as the moralist theory of corruption. This finding is consistent with the empirical results of (Adegboyega 2017; Baklouti and Boujelbene, 2020; Enofe *et al.*, 2016; Mauro 1996; Ubi and Udah 2014; Yusuf *et al.*, 2014). The moralist theory asserts that once corruption is used to by-pass strict institutional arrangements, corrupt officials only create an additional motive to institute further administrative bottlenecks to ensure that they continue their rent-seeking behaviors.

CONCLUSION

The estimated RGDP growth equation revealed that corruption-institutional quality interaction exerts negative and significant impact on economic performance. Apparently, this supports the assertion that institutional quality in Nigeria is feeble. Thus, the institutions seem to have been overwhelmed by the level of corruption and individual influences.

Therefore, these findings are supported by Gründler and Potrafke (2019), whose findings indicated that ineffective government, political instability and the weak rule of law would heighten the adverse effect of corruption on investment and that corruption retards growth in economies experiencing weak governance.

This study also aligns with the revelations of Ubi and Udah (2014) that corruption and institutional quality have a significant impact on economic performance. However; it revealed that institutional quality exerted a significant impact on economic performance, contrary to this study's findings. Similarly, the outcome of this study is consistent with the findings of Ajie and Oyegun (2015), who investigated the impact of corruption on economic growth in Nigeria for the period 1996-2013, employing the OLS regression.

Findings show a negative relationship between the dependent variable (GDP) and the corruption level in Nigeria and recommend that anti-corruption agencies in Nigeria be strengthened. In the same vein, the finding of this study also supports the outcome of Ogunlana *et al.* (2016) that examined the nexus between government spending, corruption and output growth in Nigeria and employed aggregated data from 1980 to 2011. The result shows that corruption influenced output growth negatively. This also validates the findings of Enofe *et al.* (2016) that assessed the impact of corruption on the growth of the Nigerian economy using time series data from 1960 to 2012 and revealed that corruption has an adverse impact on Nigeria's economic growth.

As such, the finding from the first model of this analysis supports the view of the moralist theory of corruption, which opines that corruption is "sand in wheels" of economic performance. The moralist assumes that indeed corruption is detrimental to economic performance. The moralist theory asserts

that once corruption is used to by-pass strict institutional arrangements, corrupt officials only create an additional motive to institute further administrative bottlenecks to ensure that they continue their rent-seeking behaviors.

IMPLICATIONS

Following the adoption of the Barro (1990) endogenous growth model as the theoretical basis for this empirical examination, the findings of this study align with the proposition of the “sand to the wheels” school of thought, which contended that corruption is detrimental to economic growth as a result of the weak quality of institutions in Nigeria. Therefore, the trajectory of Nigeria’s economic performance is disrupted by high level of corruption and weak institutional quality. Nevertheless, this study revealed that human capital development, trade openness and working population growth exerted positive and significant impacts on Nigeria’s economic performance. By implication, the Nigerian economy reacts positively to changes in human capital development, trade openness and population growth in the long-run. This suggests that, with the availability of appropriate policies and resources, human capital development, trade openness, and the workforce have the potential to enhance Nigeria’s economic performance in the long-run.

It is extremely difficult to develop novel policy recommendation to tackle the hydra-headed menace of corruption based on our empirical findings because it is an open secret that the Nigerian economy might perform optimally if the nation’s anti-corruption crusade is sustained as suggested by the World Bank (d’ Agostino *et al.*, 2016). However, this study recommends policy interventions aimed at tackling the incidence of corruption, improving institutional quality, and human capital development. The Nigerian state must also focus on policies that can stimulate trade expansion, which would have rippled positive effects on Nigeria’s economic performance in the long-term.

LIMITATIONS AND FUTURE DIRECTIONS

One limitation of this study is that the Barro (1990) endogenous growth theory, which underpins the study, only focuses on a few growths enhancing macroeconomic channels including investment, government spending, human capital accumulation, and labor productivity. Second, although the concept of corruption and institutional quality was incorporated into present study, however, the economic losses attributed to corruption and weak institutional quality were ignored. The findings of this study cannot be generalized across other emerging and frontier economies because it is a country-specific inquiry.

Future studies can focus on broadening the growth enhancing macroeconomic channels by incorporating other critical variables to ensure robustness of the model. Further studies can expand this study by conducting a cross-country investigation of other emerging and frontier economies to guarantee the generalization of the findings.

Future research endeavor can focus on exploring the economic losses attributable to corruption and institutional quality. This study focused on bureaucratic corruption; it did not analyze political and grand corruption. Political and grand corruption have several complex power relationships, and this type of corruption may have a destructive effect on economic performance. Therefore, assessing the motivations and the environment behind political and grand corruption cases can provide interesting results.

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Variables	Statistic								
	Obs.	Mean	Max.	Min.	Std.	Skewness	Kurtosis	JB Stat.	<i>p</i> -value
<i>RGDPG</i>	50	32553.93	72094.1	14306.12	18606.4	1.054	2.574	9.644	0.008
<i>CORPT</i>	50	0.1781	1.6805	-0.0071	0.346	3.048	12.340	259.15	0.000
<i>INQ</i>	50	0.7628	0.9151	0.6214	0.0859	0.380	2.068	3.017	0.221
<i>CORINQ</i>	50	0.1503	1.5379	-0.0047	0.311	3.249	13.522	318.62	0.000
<i>GFCF</i>	38	0.1593	40.3887	-30.1716	13.587	0.056	3.995	1.587	0.452
<i>GEXP</i>	39	3.7295	9.4483	0.9112	2.838	0.795	2.166	5.241	0.072
<i>HC</i>	39	0.4379	0.539	0.311	0.068	-0.241	1.943	2.192	0.334
<i>WPG</i>	50	2.5973	2.9940	1.8970	0.270	-0.743	2.776	4.699	0.095
<i>TOP</i>	50	33.281	53.278	9.1358	12.030	-0.450	2.279	2.769	0.250

Source: Authors' Computation using EViews 10

Table 1. Descriptive Statistics (Sample Period: 1970 – 2020)

Variable	Test form	ADF-Test Statistics			PP-Test Statistics			<i>I(d)</i>
		Constant	Constant & Trend	None	Constant	Constant & Trend	None	
<i>GDPG</i>	<i>Level</i>	0.6526	-1.3679	2.4482	2.2223	-1.2136	2.9542	<i>I(1)</i>
	Δ <i>GDPG</i>	-2.2661	-2.4717	-2.6538**	-5.3870**	-5.5115**	-4.6103**	
<i>CORPT</i>	<i>Level</i>	1.2591	-0.0449	1.9012	-0.1435	-1.8999	0.3600	<i>I(1)</i>
	Δ <i>CORPT</i>	-9.1596**	-9.5739**	-8.9267**	-5.6059**	-7.2199**	-5.6380**	
<i>INQ</i>	<i>Level</i>	-1.0852	-1.4724	1.3780	-1.2818	-1.9831	1.2742	<i>I(1)</i>
	Δ <i>INQ</i>	-9.5411**	-9.4265**	-9.2989**	-9.3577**	-9.2541**	-9.0886**	
<i>CORINQ</i>	<i>Level</i>	1.8938	0.5230	2.5429	0.4281	-2.1984	0.5519	<i>I(1)</i>
	Δ <i>CORIINQ</i>	-9.8792**	-10.5105**	-9.5606**	-5.2197**	-5.9928**	-5.2973**	
<i>GFCF</i>	<i>Level</i>	--5.1334**	-5.5622**	-5.1900**	-5.7114**	-6.1222**	-5.7930**	<i>I(0)</i>
	Δ <i>GFCF</i>	-	-	-	-	-	-	
<i>GEXP</i>	<i>Level</i>	-1.1130	-2.8549	-0.1761	-1.2948	-1.9936	-0.3328	<i>I(1)</i>
	Δ <i>GEXP</i>	-5.6976**	-5.6169**	-5.7276**	-5.7444**	-5.6700**	-5.7760**	
<i>HC</i>	<i>Level</i>	-1.6670	-2.3488	6.2628	-5.4098**	-1.6255	5.8129	<i>I(1)</i>
	Δ <i>HC</i>	-5.1874**	-5.2353**	-3.1067**	-5.4465**	-8.6056**	-3.0798**	
<i>POPG</i>	<i>Level</i>	-5.1783**	-2.6172	-5.1643**	-2.3785	-2.9270	0.8566	<i>I(0)</i>
	Δ <i>POPG</i>	-	-	-	-	-	-	
<i>TOP</i>	<i>Level</i>	-2.8381	-2.7923	-0.6856	-2.9370**	-2.9094	-0.6161	<i>I(1)</i>
	Δ <i>TOP</i>	-7.8635**	-7.7898**	-7.9435**	-7.8635**	-7.7898**	-7.9435**	

Source: Authors' Computation using EViews 10
Note: ** denotes statistical significance at 1%.

Table 2. Unit Root Tests (Sample Period: 1970 – 2020)

Independent Variable	Coefficient	Std. Error	t-Statistic	p-value
<i>C</i>	3.0277	0.2960	10.2282	0.0000
<i>Trend</i>	0.0213	0.0021	10.3061	0.0000
$\Delta CORPT$	0.6791	0.1412	4.8103	0.0019
$\Delta CORPT_{t-1}$	-1.0185	0.1429	-7.1256	0.0002
ΔINQ	0.1916	0.1113	1.7219	0.1288
ΔINQ_{t-1}	-1.5884	0.2037	-7.7978	0.0001
ΔINQ_{t-2}	-0.8700	0.1305	-6.6687	0.0003
$\Delta CORINQ$	-0.9158	0.1708	-5.3626	0.0010
$\Delta CORINQ_{t-1}$	1.3553	0.1811	7.4856	0.0001
$\Delta CORINQ_{t-2}$	-0.0347	0.0227	-1.5317	0.1695
$\Delta GFCF$	0.0002	0.0004	0.5245	0.6161
$\Delta GFCF_{t-1}$	0.0010	0.0004	2.3545	0.0508
$\Delta GFCF_{t-2}$	0.0008	0.0004	1.9459	0.0927
$\Delta GEXP$	0.0051	0.0040	1.2537	0.2502
$\Delta GEXP_{t-1}$	0.0098	0.0045	2.1801	0.0656
$\Delta GEXP_{t-2}$	0.0096	0.0046	2.1095	0.0728
ΔHC	-1.8529	0.7651	-2.4218	0.0460
ΔHC_{t-1}	-4.7716	0.7987	-5.9739	0.0006
ΔHC_{t-2}	-3.8399	0.7833	-4.9021	0.0017
ΔWPG	0.0505	0.0238	2.1209	0.0716
ECT_{t-1}	-0.5693	0.0559	-10.1869	0.0000
R-squared	0.9360			
Adjusted R-squared	0.8509			

Source: Authors' Computation using EViews 10
 Dependent Variable: RGDP

Table 4. ARDL Short-Run Coefficients (With Interaction) (Sample Period: 1970 – 2020)