# DOES CORRUPTION GREASE OR SAND THE WHEELS OF ECONOMIC GROWTH IN GHANA? AN ARDL BOUNDS TEST

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## ABSTRACT

This paper seeks to ascertain the relationship between corruption and economic growth in Ghana using time-series secondary data for the period 1984–2016. We employ auto-regressive distributed lags (ARDL) model to estimate the long-term relationship between corruption and economic growth in Ghana. Corruption is estimated to have a significant negative effect on per capita growth both in the short-term and long-term. While trade openness shows a positive effect on growth, inflation and capital formation show a significant negative influence on growth. We find the variables to be cointegrated and both the long-run and short-run parameters provide evidence of a negative relationship between corruption and economic growth. While capital formation and inflation also show negative effect on growth, trade openness shows a positive effect. The government should endeavour to effectively combat the destructive phenomena of corrupt practices that weaken the institutional quality through the adoption of functional regulatory measures. Transparency of governmental functions should be enhanced through the active involvement of citizens in governance as well as minimizing the discretion at the disposal of bureaucrats.

**Contribution/Originality:** This paper contributes to the existing literature by introducing corruption in an endogenous growth model in the context of Ghana. The paper is the first attempt to employ unique Ghanaian data to estimate the long-term effects of corruption on economic growth, a focused evaluation than has been previously done.

## 1. INTRODUCTION

Corruption remains a global concern to corporations and governments in both rich and poor countries. It is considered as one of the most critical challenges facing the world. Global corruption is estimated to cost the world $3.6 trillion (United Nations, 2018). As a growing concern among households, businesses and governments all over the world, corruption is a multiplex and diverse phenomenon that is associated with multiple aspects of causes and effects. The phenomenon of corruption usually ranges from single acts of illegal payments to endemic malfunction of political and economic systems. Its definition streams from the broad terms of "misuse of public power" and "moral decay" to strict legal conceptualization as an act of bribery involving a public servant and a transfer of tangible resources (Andvig, Fjeldstad, Amundsen, Sissener, & Soreide, 2000). The Transparency International refers to corruption as "the abuse of entrusted power for private gain" (Kolstad, 2008). The World Bank also

generates indices for control of corruption, which capture perceptions of "the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as capture of the state by elites and private interests" (World Bank).

In recent years an expanding stock of literature has considered the economic consequences of corruption to be remarkable and wide-ranging. Corruption and economic growth are prominent variables in development economics literature, and how the two are related remains a critical question. The link between corruption and economic growth has been widely debated. There have been mixed conclusions on the relationship between corruption and economic growth. Corruption has been found to have dire consequences for economic growth (Mauro, 1995; Mo, 2001; Tanzi, 1998; Wei, 2000). Mauro (1995) reveals a significant negative relationship between corruption and investment, and for that matter, growth. Tanzi (1998) and Blackburn, Bose, and Haque (2006) observe that corruption is harmful to investment and growth and increases economic uncertainty. Guriev (2004) and Kaufmann and Wei (1999) explain that corruption generates uncertainty for investors and increases the risks of investment. According to Guriev (2004) corruption "still results in excessive red tape, even after the bureaucrat reduces red tape in exchanges for bribes". Mo (2001) also observes a negative impact of corruption on economic growth, human capital and investment, especially through the political instability channel. The United Nations (2018) explains that corruption "contributes to instability, poverty and is a dominant factor driving fragile countries towards state failure".

However, the discourse on how corruption impacts on the performance of the economy goes beyond a "moralistic view" that unambiguously condemns corruption as postulated by Leys (1965) and Nye (1967). The moral perspective of corruption may prejudice the appreciation of its economic significance (Méon & Sekkat, 2005). Some previous studies emphasize that corruption has some merits in promoting economic performance, and thus, should not be evaluated only on moral grounds. In most developing countries, where the quality of governance is low, corruption is said to improve the efficiency of bureaucratic approval, enables businesses avoid ineffective regulations, and enhances investment efficiency (Kaufmann & Wei, 1999; Leff, 1964). Leff (1964) contends that corruption may foster economic growth through the relaxation of unproductive and rigid regulations imposed by government. Prior empirical work reports that corruption may make it possible for firms to circumvent regulations, which may help the firms to grow (Beck & Maher, 1986; Caselli & Michaels, 2013; Jiang & Nie, 2014). There are countries like China, South Korea and Vietnam that record high growth their poor ranking in terms of control of corruption (Jiang & Nie, 2014; Stojanović, Ateljević, & Stević, 2016).

Despite the improvement in Ghana's economic performance over the last few decades, corruption remains a major challenge. Ghana Integrity Initiative (GII), the local chapter of Transparency International, reports that the country loses around US$3 billion to corruption. Since independence, successive governments in Ghana have undertaken varied governance and anti-corruption reforms to enhance the ranking of the country in terms of corruption perception. This has earned the nation, good positions on various indices of corruption and governance, relative to other countries in Africa, in recent times. Ghana's scoring in Transparency International's Corruption Perception Index from 2010 to 2019 rose from 41 percent in 2010 to 48 percent in 2014, but declined to 40 percent in 2017 and 41 percent in the last two years (as shown in Figure 1). Again, the control of corruption indicator as reported by the World Bank's World Governance Indicators places the nation above the regional average, as well as lower middle-income average and even above the world median as shown in Figures 2, 3 and 4 respectively.

Various studies have sought to depict a relationship between corruption and economic growth adopting cross-country analysis. A few studies have also attempted to study the two variables using single-country data from Bangladesh (Mauro., 1998) Tunisia (Al Qudah, Zouaoui, & Aboelsoud, 2020) and Pakistan (Amin, Ahmed, & Zaman, 2013). No known study empirically investigates the long-run relationship between corruption and economic growth in the context of Ghana. There has been an attempt by Forson, Buracom, Baah-Ennumh, Chen, and Carsamer (2015) to investigate the causal relationship between aid inflows and economic growth in Ghana including

corruption as one of the control variables. Ayee (2016) examines the root causes of corruption in Ghana but did not link to the phenomenon to economic growth. Yakubu (2019) investigates the effect of corruption on bank profitability in Ghana and observes that his findings support the "sand the wheels" hypothesis. The main aim of this paper is to investigate the linkage between corruption and economic growth in Ghana, using secondary data for 33 years covering the period 1984–2016. There has been no attempt to quantify the long-run causality link between corruption and economic growth in the context of Ghana. This study fills this gap and provides evidence to inform policy.

The empirical work on corruption and economic growth usually incorporates institutional approach to economic performance assessment. However, the observations are heterogeneous, which cannot be only attributed to the varied measures of corruption and growth, but also to the variety methods of estimation, sample countries and as well as periods. This has invariably posed a greater challenge to policymakers, analysts and researchers in obtaining testable conclusions about the influence corruption has on growth. It is possible that traditional and cultural norms make Ghanaian concepts of corruption different from those of other parts of the world. This study, therefore, contributes to literature by employing unique Ghanaian data to estimate the long-term effects of corruption on economic growth to eliminate some of the intervening variables and thus, provide a focused evaluation than has been previously done.

The remainder of the paper is organized into four parts. Section 2 reviews related theoretical and empirical literature underpinning the corruption-growth nexus. The two main hypotheses that seek to depict the relationship between corruption and investment, efficiency and economic growth are reviewed in the section. Other empirical works that relate to the corruption-growth nexus are examined in the section. Section 3 examines in detail, the methodological framework within which the study was conducted; it describes the data used, the model specification and how analysis was done. Section 4 presents a detailed chronology of empirical results and discussions with literature linkage. The last part draws conclusions and makes appropriate recommendations; it also spells out the limitations of the study and suggests possible areas for further research.
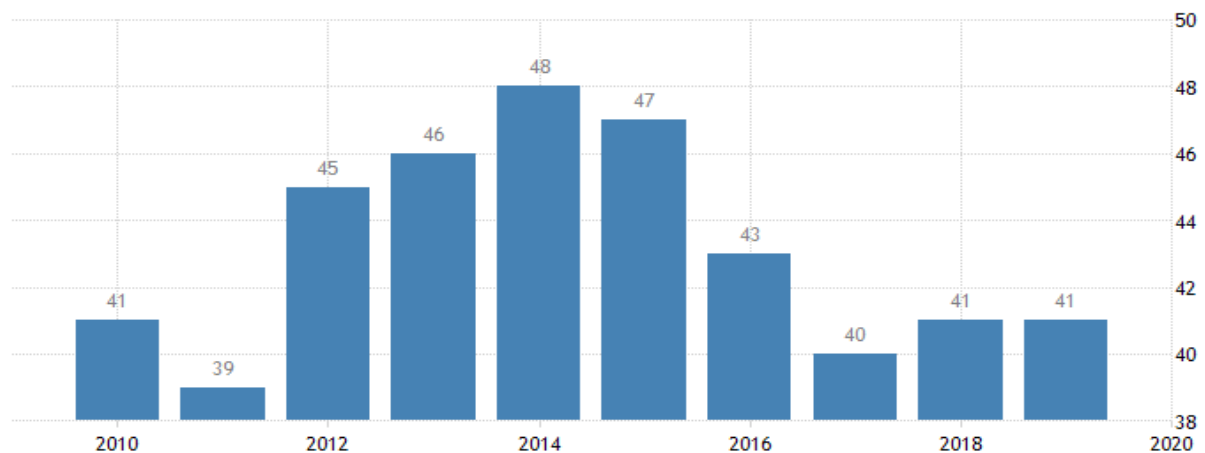


**Figure-1.** Ghana's Corruption Perception Index (2010-2019).
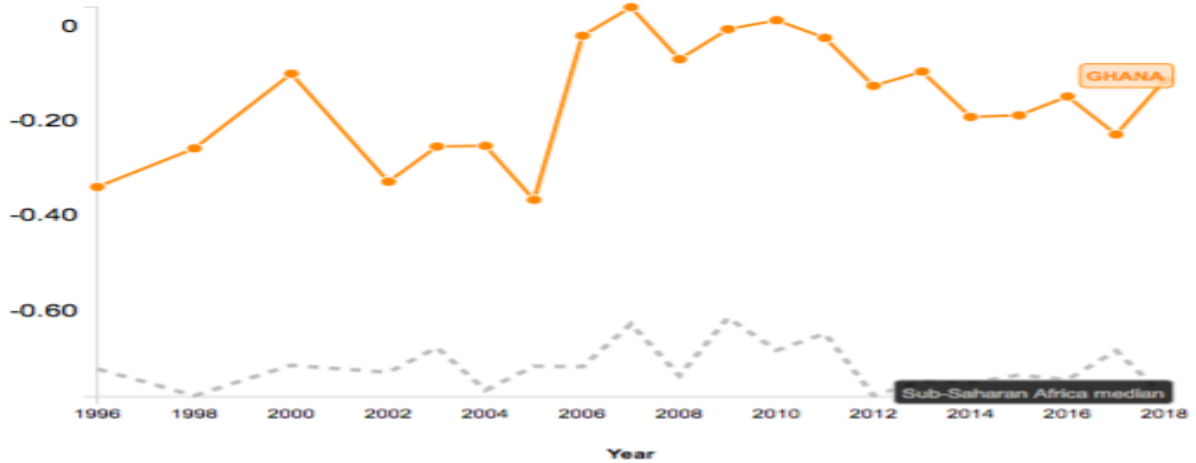**Source:** Transparency International (2010-2019).

**Figure-2.** Control of Corruption, 1996-2018 (Ghana against Sub-Saharan African Median).
**Source:** World Bank (1996-2018).
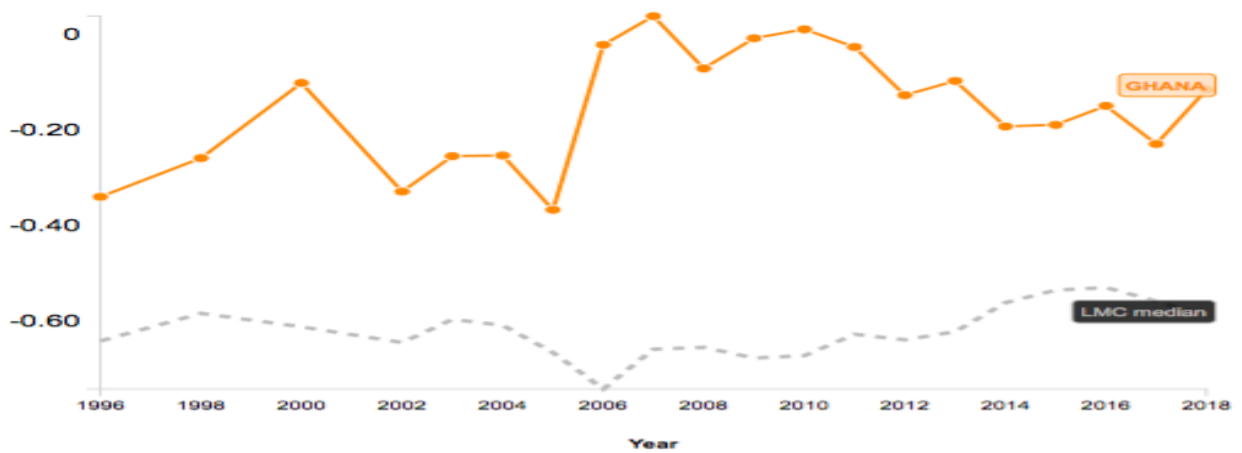


**Figure-3.** Control of Corruption, 1996-2018 (Ghana against Lower Middle-Income Median).
**Source:** World Bank (1996-2018).
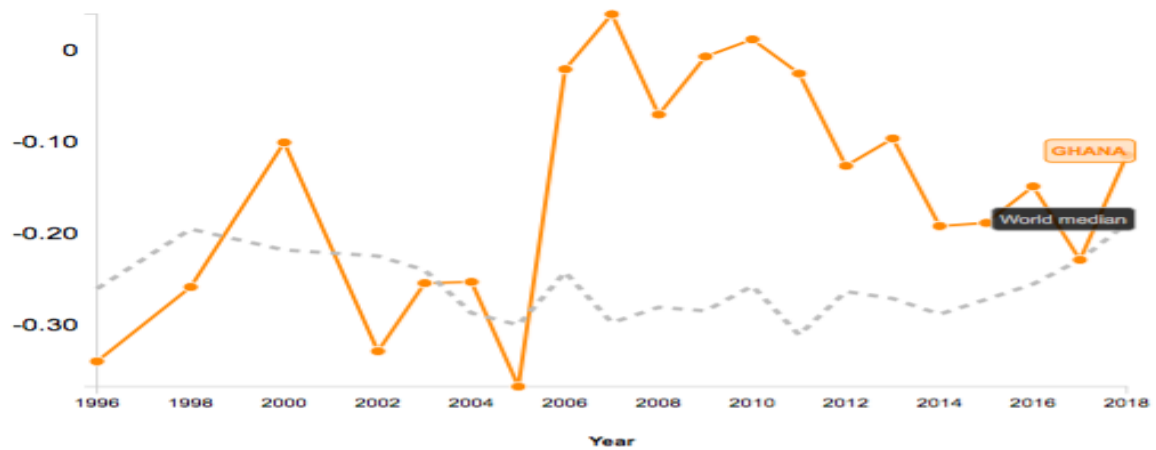


**Figure-4.** Control of Corruption, 1996-2018 (Ghana against World Median).
**Source:** World Bank (1996-2018).

## 2. LITERATURE REVIEW

### 2.1. Theoretical Perspective

There are two main arguments underpinning the effect of corruption. These arguments lead to the two testable hypotheses – the "grease the wheels" and the "sand the wheels" (Méon & Sekkat, 2005). The nucleus of the discourse on the two conflicting hypotheses lies in the consideration of corruption and low governance quality put

together. The first stream of literature contends that corruption may occur parallel with poor governance quality and may end up reducing the negatives of such poor quality. This is what is referred to as the "grease the wheels" hypothesis. The opposing stream of literature argues that, despite the fact that corruption may be associated with some benefits if the quality of governance is low, it may as well impose extra costs. The attribution of such costs becomes the basis for the "sand the wheels" hypothesis.

Leff (1964) distinguishes between bureaucratic corruption from bureaucratic inefficiency (that is, failure to achieve set goals). He opines that the effect of corruption must be reevaluated since the validity of the contention that governments of developing countries aim to work smartly to promote economic performance, is disputed. Bureaucratic inefficiency is considered as the prominent inefficiency that corruption is capable of greasing. Corruption perks are capable of making low-waged sectors attractive to competent civil servants (Leys, 1965); (Bailey, 1966). The authors also submit that graft may serve as a hedge against poor public policies, especially if for ideological reasons; the bureaucrat is biased against a concept such as entrepreneurship. The graft will get around inefficient regulation, which may minimize its unfavourable consequences. According to Ehrlich and Lui (1999) autocratic regimes are more likely to execute better policies in an attempt to maximize their rents. Since corruption provides an incentive for better policies in less democratic jurisdictions, countries with autocratic regimes find it more beneficial, all things being equal, than more democratic countries.

Lui (1985) labels bribes as "lubricants" that improve a sluggish economy to bring about efficiency. When bureaucrats are allocating operating licenses to firms, Queueing model contends that they prioritize firms who place premium value to time and are able to influence the bureaucrats to quicken proceedings (Lui, 1985). Lui (1985) demonstrates that corruption can efficiently minimize time spent in queues in a typical formal model. In a bidding procedure, auction model also argues that bribes may do away with competence firms that are capable of paying the highest bribe are considered efficient (Beck & Maher, 1986). It is also said that whenever a bargain exists between public and private actors, private agents are able to buy their way out of politically mandatory inefficiencies.

Despite the enormous studies touting the benefits of corruption especially in the context of weak institutional framework, a large strand of literature emphasizes the additional costs of corruption in a poor institutional context. The sand-the-wheels school of thought stresses that most costs of corruption manifest in defective institutional environment. While corruption perks may attract competent civil servants in low-paid sector, Myrdal (1968) intimates that the corruption perks can be an incentive for the civil servant to deliberately cause delays to be able to get bribes. Such delays can slow down output of the corrupt civil servant, as well as those who require their services. Again, in a sluggish bureaucracy, corrupt officials can create other distortions as an incentive to maintain illegitimate sources of income (Kurer, 1993). Rose-Ackerman (1997) and Mauro (1998) demonstrate that corruption reduces efficiency under various circumstances.

In summary, both the grease-the-wheels and the sand-the-wheels hypotheses indicate a negative effect of corruption on efficiency such that an increase in corruption results in a decline in efficiency in an efficient institutional environment. However, in terms of the impact of corruption on efficiency in a weak institutional environment, the two hypotheses vary. While the grease-the-wheels hypothesis indicates that corruption raises efficiency in a poor institutional context, the sand-the-wheels indicates that corruption reduces efficiency in same context.

### 2.2. Empirical Literature

Various studies have found evidence that corruption is detrimental to economic growth (Mauro, 1995; Méon & Weill, 2010; Mo, 2001; Tanzi, 1998; Wei, 2000). Using sample data from developed and developing economies, Mauro (1995); Mauro (1997) analyze the effects of corruption on economic growth. He observes a significant negative effect of corruption on economic growth largely through reduced investment in physical capita. Although Mauro (1995) reveals that corruption reduces growth through its indirect effect on investment, he observes no

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significant relationship between corruption and growth when investment was controlled. This observation contradicts the finding of Knack and Keefer (1995) that a significant negative effect of corruption on growth exists even when investment is considered as a control variable. Thus, apart from the negative effect of corruption on investment, corruption also directly influences economic growth. Tanzi and Davoodi (1997) as well as Tanzi (1998) investigate how corruption influences economic growth and government expenditures. They ascertain that while corruption raises government expenditures, it reduces expenditures on maintenance, and for that matter, economic growth as the unavailability of complementary inputs prevents new capital from being utilized. Their findings also depict that corruption negatively influences private investment. Wei (2000) observes that corruption decreases the inflow of foreign direct investment into a country.

The World Bank identifies corruption as one of the greatest obstacles to economic growth, social development and poverty reduction. Kaufman (2010) observes a strong relationship between corruption and fiscal deficits in industrialized countries. The author discloses that corruption leads to low tax revenues, raises public expenditures while influencing productivity, competitiveness and growth. In the context of Cote D'ivoire, Ouattara (2011) examines the effect of corruption on public and private investment and the ultimate influence on GDP growth. The study finds that corruption through investment has perverse impact on GDP growth in Cote D'ivoire. Using Algerian data covering 1995-2012 and applying an endogenous growth model augmented by corruption, Omrane (2016) analyzes how corruption affects economic growth in Algeria. On one hand, the author observes a significant negative association between corruption and investment; and on the other hand, between corruption and public spending.

Using a sample of 142 countries for the period 1994-2014 and applying GMM methods, Cieślik and Goczek (2018) investigate the effects of corruption on international capital mobility and economic growth. They find that the absence of corruption has a positive and statistically significant effect on real per capital GDP and increased the investment ratio. Thus, corruption directly impedes economic growth by hampering investment. Using new data for 175 countries covering the period 2012-2018, Gründler and Potrafke (2019) re-examine the corruption-growth nexus. They disclose a negative cumulative long-run effect of corruption on real per capita GDP. According to them, the effect is more pronounced in less democratic countries as it decreases the flow of FDI and increases inflation. Al Qudah et al. (2020) investigate the long-run relationship between corruption and economic development in Tunisia using auto-regressive distributed lags (ARDL) technique. They find that corruption has a negative (direct) effect on per capita GDP for the period under consideration. However, their results show positive (indirect) effect of through transmission channel (investment in physical capital).

Gyimah-Brempong (2002) adopts a dynamic panel estimator to analyze the effects of corruption on economic growth and income distribution in Africa. The author observes that corruption causes a decline in economic growth directly and indirectly through reduced investment in physical capital. In the context of sub-Saharan Africa (SSA), corruption is said to have a degenerative impact on income distribution in the sub-region, irrespective of the rate of economic growth (Gyimah-Brempong & De Gyimah-Brempong, 2006; Gyimah-Brempong, 2002). Forson, Buracom, Chen, and Baah-Ennumh (2017) reveal that corruption poses a long-term threat to the sustainable development of 22 economies in the SSA. With data covering 1985-2010, Amin et al. (2013) analyze the relationship between corruption and economic growth in Pakistan and conclude that corruption impedes GDP per capita growth. Using provincial data, D'Amico (2015) reveals that corruption has a significant negative effect on China's economic growth. The author emphasizes the need for provinces to fight corruption with the attention it deserves.

Despite the enormous evidence confirming negative effect of corruption on economic growth, some studies have also found corruption to have positive effect on economic growth (Huntington, 1968; Leff, 1964). Colombatto (2003) explains that corruption removes the harmful conditions in developing countries that impede development, as it may serve as "speed money" under political instability and institutional inefficiency. Incorporating the interaction term of corruption/quality of governance and economic freedom, Méon and Sekkat (2005) as well as

Méndez and Sepúlveda (2006) observe a beneficial effect of corruption on growth in free countries with good governance. Méon and Weill (2010) reveal that corruption is less detrimental to a less effective economy and may be positively related to efficiency in countries with incredibly ineffective institutions. Biru (2010) reveals a positive link between corruption and growth in Bangladesh after embarking on a market economy in 1997 but failing to ensure bureaucratic reforms.

Huang (2016) investigates the relationship between corruption and economic development in 13 Asia-Pacific countries and observes that South Korea and China are record progress in economic advancement despite the rise in corruption cases. Jiang and Nie (2014) also report China's miracle of progressive economic growth despite the increasing trend of corruption. Ondo (2017) investigates the relationship between corruption and economic growth in the member countries of the Economic and Monetary Community of Central Africa (EMCCA). The study reveals that over the period of 2005-2015, corruption has a positive effect on economic growth by eliminating the administrative bottlenecks that impede access to basic public goods, as well as the creation and development of private enterprises.

On the impact of corruption on firm performance, Ayaydın and Hayaloglu (2014) also reveal that corruption positively correlates with firm growth in Turkey. With panel data from Indonesian manufacturing firms, Vial and Hanoteau (2010) observe that corruption has a positive effect on the output of firms. In the African context, Faruq, Webb, and Yi (2013) observe corruption reduces productivity as less productive firms are more likely to corrupt public officials. Kato and Sato (2015) provide evidence of a "greasing the wheels" effect of corruption on firm performance in India. Using the World Bank Enterprise Survey data for 40 African countries covering 2006-2013, Williams and Kedir (2016) analyze the impact of corruption on firm performance. Their results clearly show that corruption has a significant positive effect on annual sales and growth in productivity. Though they show clear evidence of a positive effect of corruption at firm level, they maintain that consideration of corruption as beneficial is not an optimal option at the aggregate country level. Boukou (2017) also employs World Bank Enterprise Survey data of Chinese firms spanning 2011–2013 to investigate the effect of bribe payment on firm performance. The empirical results confirm that corruption does not contribute negatively to firm growth as firms perceived to be corrupt and those perceived not to be corrupt both attain higher growth and performance.

The empirical findings on the direct effect of corruption on economic growth continue to be mixed and seemingly inconclusive. The difficulty stems from measurement issues as an estimation of the effect of corruption depends on the methodology, data sample and study period considered. Some scholars opine that corruption may be more beneficial to large engineering and infrastructural projects than administrative areas (Mauro, 1997; Shleifer & Vishny, 1993). The inconclusive empirical findings have also stimulated some empirical works to consider the indirect effect of corruption through other variables. Aidt, Dutta, and Sena (2008) submit that the effect of corruption on growth is influenced by the quality of governance. Thus, governments that practise good governance experience harmful corruption while corruption shows a positive effect where there is poor governance. Ugur (2014) observes the indirect effect of corruption through public finance and human capital and reveals that corruption impedes economic development in low-income economies with deficient bureaucratic conditions. Achim (2017) investigates the effect of corruption on the ease of doing business, the level of entrepreneurship as well as market capitalization of 185 countries over the 2012-2015 time period. The author observes that corruption has a negative effect on the selected indicators for business development, and ultimately impacts economic growth.

In summary, the various studies suggest that the effect of corruption on economic growth can be either positive or negative. Nonetheless, none of the studies reviewed makes specific reference to the effect of corruption on economic growth in the context of Ghana. It is possible that traditional and cultural norms make Ghanaian concepts of corruption different from those of other parts of the world. Using the peculiar Ghanaian data to investigate the long-term effects of corruption on economic growth may eliminate some of the intervening variables and thus, provide a focused evaluation than has been previously done. Despite the fact that the studies reviewed do

not specifically concentrate on Ghana in isolation, they provide some fundamental perspectives to how corruption influences economic growth; corruption either retards or promotes economic growth. Again, corruption influences economic growth through its effect on channels such as private investment in physical capital as well as in human capital. The long-term relationship between corruption and economic growth in Ghana is an empirical issue that this study seeks to investigate.

## 3. MODEL SPECIFICATION, DATA AND METHODOLOGY

### 3.1. Model Specification and Data

From the review of corruption-growth literature, we adapt the endogenous growth model in specifying a model that can depict the effect of corruption on growth. This study is consistent with Hall and Jones (1999) in adopting the view that total factor productivity (TFP) mainly reflects market efficiency. We assume real aggregate capital stock at any point in time, $K_t$, is composed of both physical and human capital. We assume the real aggregate level of output produced in the economy at time t, $Y_t$ follows a function of the TFP, real aggregate capital stock ($K_t$), labour (L), savings rate and efficiency of the economy as follows: $Y_t = AK_t$. The aggregate Cobb-Douglas production function is therefore, given as:

$$Y_t = A_t K_t^\alpha L_t^\beta + \mu \tag{1}$$

Several macroeconomic variables influence economic growth of a country and including most of these variables into a model enhances its fitness. However, loading too many variables into a model may also decrease the degrees of freedom. This study adopts a model which utilizes one independent variable − corruption. The study uses a regression analysis to estimate the dependent variable given the predictive variables. Real GDP as a proxy for economic growth, denotes the dependent variable. The OLS regression model will be specified as:

$$GDP_t = \beta_0 + \beta_1 CORR_t + \beta_k Z_t + \mu_t \tag{2}$$

Including the control variables depicted by Z, Equation 2 is respecified as follow:

$$GDP_t = \beta_0 + \beta_1 CORR_t + \beta_2 TRADE_t + \beta_3 CAP_t + \beta_4 INF_t + \beta_5 GSIZE + \mu_t \tag{3}$$

A log-linear functional specification is assumed based on Gujarati (2009) that transforming a model into a log-linear can compress the scale in which the variables are measured; thereby reducing a tenfold difference between two values to a twofold difference. Equation 3 is given as:

$$lnGDP_t = \beta_0 + \beta_1 lnCORR_t + \beta_2 lnTRADE_t + \beta_3 lnCAP_t + \beta_4 lnINF_t + \beta_5 lnGSIZE_t + \mu_t \tag{4}$$

where subscripts t denotes year. The traditional production function is augmented by the inclusion of corruption (CORR). Equation 1 also includes Z, a vector of some control variables − trade openness, capital, inflation and government size. Finally, $\beta_0$ represents the intercept and $\mu_t$ is error term.

**Table-1.** Description of variables.

| Variable | Definition | Measurement | Source |
|----------|------------|-------------|--------|
| GDP | Gross Domestic Product | GDP per capita growth | World Bank |
| CORR | Corruption | Corruption in the political system | ICRG/WGI |
| TRADE | Trade Openness | Sum of imports and exports to GDP | WDI (2018) |
| CAP | Capital | Capital formation | WDI (2018) |
| INF | Inflation | Consumer price index | WDI (2018) |
| GSIZE | Government Size | General government expenditure | WDI (2018) |
| $\beta_1$-$\beta_5$ | Coefficients of predictors | | - |
| ln | Natural logarithm | | - |
| ε | Error term | | - |

### 3.2. Methodology

In the empirical estimation, this study employs the autoregressive distributed lag model (ARDL) approach to cointegration. The ARDL bounds test of cointegration is suitable irrespective of the order of integration of the variables involved. Nevertheless, the absence of second-order cointegration $[I(2)]$ variable is relevant to avoid

spurious results from ARDL procedure. It, thus, becomes imperative to test for unit root in the data series before applying the ARDL cointegration methodology. We, therefore, employed the Augmented Dickey-Fuller unit root test to analyze the time-series properties of the data.

The possibility of a bidirectional relationship between corruption and economic growth presents a potential problem of endogeneity in empirical estimations. As a result, we employ the ARDL technique, which has the potency to correct simultaneity issues through the inclusion of an unrestricted number of lags for the regressed and regressors. The application of ARDL estimator is also informed by the fact that it is very efficient in studies adopting small or finite samples (Pesaran, Shin, & Smith, 2001). In applying the ARDL bounds test approach to cointegration to determine the long-run relationship between economic growth and the other variables we initially estimate Equation 4 with an ARDL specification of the form:

$$
\begin{aligned}
GDP_t = \gamma_0 &+ \sum_{i=1}^{r} \gamma_1 \Delta GDP_{t-1} + \sum_{i=1}^{r} \gamma_2 \Delta CORR_{t-1} + \sum_{i=1}^{r} \gamma_3 \Delta TRADE_{t-1} + \sum_{i=1}^{r} \gamma_4 \Delta CAP_{t-1} \\
&+ \sum_{i=1}^{r} \gamma_5 \Delta INF_{t-1} + \sum_{i=1}^{r} \gamma_6 \Delta GSIZE_{t-1} + \beta_1 GDP_{t-1} + \beta_2 CORR_{t-1} + \beta_3 TRADE_{t-1} \\
&+ \beta_4 CAP_{t-1} + \beta_5 INF_{t-1} + \beta_6 GSIZE_{t-1} + \mu_t
\end{aligned}
$$

$$(5)$$

where definition of variables remains the same as previously stated, $\gamma_0$ denotes the drift component, and $\mu$ is the error term. The next step in the ARDL bounds test procedure is to test for the existence of cointegration among the variables using an F(W)-statistic. Upon a determination of the existence of cointegration, an error correction model (ECM) is estimated to determine the short-run dynamics in the model as well as the speed of adjustment towards equilibrium. The selection of the lag values m, n, o, p, q, and r in Equation 5 was based on AIC, SIC, Hannan-Quinn information criteria. The short-run multipliers of the variables were described by adopting the ECM, with a representation specified as follows:

$$
\begin{aligned}
GDP_t = \gamma_0 &+ \sum_{i=1}^{r} \gamma_1 \Delta GDP_{t-1} + \sum_{i=1}^{r} \gamma_2 \Delta CORR_{t-1} + \sum_{i=1}^{r} \gamma_3 \Delta TRADE_{t-1} + \sum_{i=1}^{r} \gamma_4 \Delta CAP_{t-1} \\
&+ \sum_{i=1}^{r} \gamma_5 \Delta INF_{t-1} + \sum_{i=1}^{r} \gamma_6 \Delta GSIZE_{t-1} + \beta_1 GDP_{t-1} + \beta_2 CORR_{t-1} + \beta_3 TRADE_{t-1} \\
&+ \beta_4 CAP_{t-1} + \beta_5 INF_{t-1} + \beta_6 GSIZE_{t-1} \lambda ECT_{t-1} + \mu_t
\end{aligned}
$$

$$(6)$$

The coefficient of the error correction term, λ in Equation 6 represents the speed of adjustment of a parameter, depicting how quickly the series can bounce back to its long-run equilibrium. The sign of the adjustment coefficient must be negative and significant. Diagnostic tests, which include serial correlation, heteroscedasticity, normality tests were performed to ensure the suitability of the model. Further, we used graphs to illustrate the cumulative sum (CUSUM), the cumulative sum of squares (CUSUMQ), to assess the stability of the elasticities.

## 4. EMPIRICAL RESULTS AND DISCUSSION

### 4.1. Descriptive Statistics

Table 2 presents the descriptive statistics for the variables, which includes the total number of observations, the mean, the standard deviation, the variance, minimum and maximum values, as well as skewness and kurtosis values.

From Table 2, the average economic growth, proxied by GDP per capita, is 2.666 with a standard deviation of 2.235. The average growth is characterized by a maximum of 11.279, and a minimum value of -.1195. The mean of corruption was about 2.48 with a standard deviation of 0.67, a maximum of 4 and a minimum of 1.5.

**Table-2.** Descriptive statistics.

| Statistic | GDP | CORR | TRADE | CAP | INF | GSIZE |
|---|---|---|---|---|---|---|
| N | 33 | 33 | 33 | 33 | 33 | 33 |
| Mean | 2.6663 | 2.479697 | 68.3008 | 19.3378 | 21.822 | 10.593 |
| Std.Dev | 2.2346 | .6669 | 24.2246 | 6.6490 | 12.2591 | 1.9885 |
| Variance | 4.9932 | .4448 | 586.831 | 44.2085 | 150.285 | 3.9541 |
| Minimum | -.1195 | 1.5 | 18.8146 | 6.8768 | 7.1264 | 7.0695 |
| Maximum | 11.2793 | 4 | 116.0484 | 29.8143 | 59.4616 | 15.3082 |
| Skewness | 2.0590 | .3696 | -.0362 | -.0810 | 1.1959 | .4228 |
| Kurtosis | 8.0021 | 2.6198 | 2.3623 | 1.8340 | 4.0866 | 2.8184 |

The average trade over the study duration was 68.3, standard deviation of 24.2, maximum of 116.05 and minimum of 18.8. the mean stock of capital was 19.3, characterized by a standard deviation of 6.65, maximum of 29.8 and minimum of 6.9. Inflation and government size recorded mean values of 21.822 and 10.593 respectively, and were associated with a standard deviation of 12.2591 and 1.9885 respectively. For a normal distribution, skewness and kurtosis values have to be zero (0) and 3 respectively. Apart from trade and stock of capital that were negatively skewed, economic growth, corruption, inflation and government size were all positively skewed. In terms of kurtosis, economic growth and inflation recorded values greater than 3, which means they were long-tailed, or leptokurtic. However, the rest (corruption, trade, capital and government size) recorded kurtosis values less than 3, which implies they were short-tailed or platykurtic.

### 4.2. Results of Unit Root Tests

To check for stationarity of the data series, augmented dicker fuller (ADF) unit root tests were performed. The results of the ADF test are shown in Table 3. The ADF unit root test was also performed with the null hypothesis that unit root exists against the alternative hypothesis that unit root does not exist. The ADF unit root test indicates that some of the variables (INF and GSIZE) are stationary at level and at first difference, implying that they are integrated of zero order, denoted as I(0). Other variables (GDP, CORR, TRADE and CAP) are not stationary at level but stationary at first difference, implying that they are integrated at first order, denoted as I(1).

**Table-3.** Results of augmented dicker fuller (ADF) unit root test.

| Variable | | Constant | Constant and Trend | Conclusion |
|---|---|---|---|---|
| lnGDP | Level | -0.52155** | -0.81562 | I(1) |
| | First Difference | -1.63576*** | -1.58589** | |
| lnCORR | Level | -0.29941** | -0.32297 | I(1) |
| | First Difference | -0.99097*** | -0.99178** | |
| lnTRADE | Level | -0.22850*** | -0.24509 | I(1) |
| | First Difference | -1.16713*** | -1.39030*** | |
| lnCAP | Level | -0.21452** | -0.27797 | I(1) |
| | First Difference | -1.19592*** | -1.21793*** | |
| lnINF | Level | -0.48827*** | -0.88206** | I(0) |
| | First Difference | -1.35610*** | -1.35535*** | |
| lnGSIZE | Level | -0.65064*** | -.66759* | I(0) |
| | First Difference | -1.37843*** | -1.39466*** | |

**Note:** (***), (**) and (*) denote 1%, 5% and 10% levels of significance respectively; I (1) = first order integration. For those series, the existence of a unit root cannot be rejected at 5% level of significance indicating that those series are integrated at first order, I(1).

### 4.3. Results of ARDL Cointegration Test

The outcome of the bounds test provides ample evidence to suggest the existence of a long-term association between economic growth and the explanatory variables shown in Equation 4. Table 4 shows the results obtained from the bounds test approach to cointegration performed.

As exhibited in Table 5 the null hypothesis of no cointegration among the variables is rejected at both 5% and 1% levels as computed test statistic is greater than the upper bounds at all levels. This indicates the existence of a long-run relationship.

**Table-4.** Critical value bounds for F- and W-statistics.

| K | 95% Level | | 99% Level | | F(W)-statistics |
|---|---|---|---|---|---|
| | **Lower bound** | **Upper bound** | **Lower bound** | **Upper bound** | |
| 5 | 2.62 | 3.79 | 3.41 | 4.68 | 14.587 |
| 5 | (−2.86) | (−4.19) | (−3.43) | (−4.79) | (−8.060) |
| F(W)$_{lnGDP}$[lnGDP| lnCORR, lnTRADE, lnCAP, lnINF] | | | | | |

**Note:** K refers to the number of regressors with W-statistic and its critical values shown in parentheses. A statistic in between the lower and upper bounds, indicates that the test outcome is inconclusive. If the statistic is greater than the upper bound, the null hypothesis of no cointegration is rejected. If it is below the lower bound, the null hypothesis of no cointegration is not rejected.

After establishing the existence of cointegration, we estimate the long-run elasticities in the ARDL model with the appropriate lag length selected. Using AIC, SIC, and Hannan-Quinn information criteria, ARDL (1, 0, 1, 1, 0, 0) was arrived as the most suitable model for the series. The long-run estimates from the ARDL (1, 0, 1, 1, 0, 0) specification are shown in Table 5.

**Table-5.** Long-run estimates based on ARDL (1,0,1,1,0,0) approach.

**Dependent Variable: lnGDP**

| Regressors | Coefficient | Std. Error | T-statistic | Probability |
|---|---|---|---|---|
| Constant | .635496 | 1.518308 | 0.42 | 0.680 |
| lnCORR | −.608852** | .260338 | −2.34 | 0.029 |
| lnTRADE | 1.309715*** | .288288 | 4.54 | 0.000 |
| lnCAP | −1.818812*** | .361472 | −5.03 | 0.000 |
| lnINF | −.342603** | .131357 | −2.61 | 0.016 |
| lnGSIZE | .692670 | .415638 | 1.67 | 0.110 |
| R-Square | 80.88% | | | |
| Adj. R-Square | 73.59% | | | |

Four of the five independent variables included in the model were statistically significant in influencing economic growth in the long term. The coefficient of corruption was -0.6089 and statistically significant at 5 percent level. With respective coefficients of 1.3097 and -1.8188, trade and the stock of physical capital were statistically significant at 1 percent level. With elasticity coefficient of -0.3426, inflation was statistically significant at 5 percent level. While government size recorded a positive coefficient of 0.6927, it was statistically insignificant.

After estimating of the long-run elasticities, we model the short-run dynamics to ascertain the speed of convergence towards equilibrium in case of a shock in the system. Table 6 shows the results of the error correction model (ECM).

As expected, the error correction coefficient was negative and significant at 1 percent level, an evidence of the existence of cointegration among the variables in the model. The elasticity of the error correction term (-0.35053) implies that the correction of short-run disequilibrium in the long-run equilibrium is at 35 percent. The adjustment coefficient value indicates that a 35 percent of adjustment would be effected in the first year and it would require 2.85 years (2 years and 10 months) to get back to its long-run equilibrium.

**Table-6.** Short-run results based on ARDL (1,0,1,1,0,0).

**Dependent Variable: ΔlnGDP**

| Regressors | Coefficient | Std. Error | T-statistic | Probability |
|---|---|---|---|---|
| ECT(-) | –1.35053*** | .16755 | –8.06 | 0.000 |
| Δ lnCORR | -.82227** | .36016 | -2.28 | 0.033 |
| Δ lnTRADE | 2.39525*** | .58563 | 4.09 | 0.001 |
| Δ lnCAP | -2.01027*** | .49061 | -4.10 | 0.001 |
| Δ lnINF | -.46270** | .20314 | -2.28 | 0.033 |
| Δ lnGSIZE | .93547 | .54855 | 1.71 | 0.103 |
| Constant | .63550 | 1.51831 | 0.42 | 0.680 |
| R-Square | 73.46% | | | |
| Adj. R-Square | 63.35% | | | |
| F (8,21) | 7.27 | | | |
| Prob. | 0.0001 | | | |

Beyond these years, the series would be at long-run equilibrium. Table 6 also shows a negative and statistically significant relationship between corruption and economic growth. While trade had a statistically significant positive effect on growth, stock of physical capital and inflation had statistically significant negative influence on growth. Government size was showed a positive effect on growth except that the effect was not statistically significant. Notably, the signs of the short-run parameters were consistent with the long-run coefficients at the same levels of significance.

### 4.4. Model Diagnostic Tests

The ARDL estimates were very robust as evidenced by the results of the diagnostic tests performed as shown in Table 7. The model has good fit and passed all diagnostic tests as shown in the table. It has also passed parameter stability test as exhibited by graphs of the recursive residuals shown in Figures 5 and 6.

**Table-7.** Diagnostic tests for ARDL Regression.

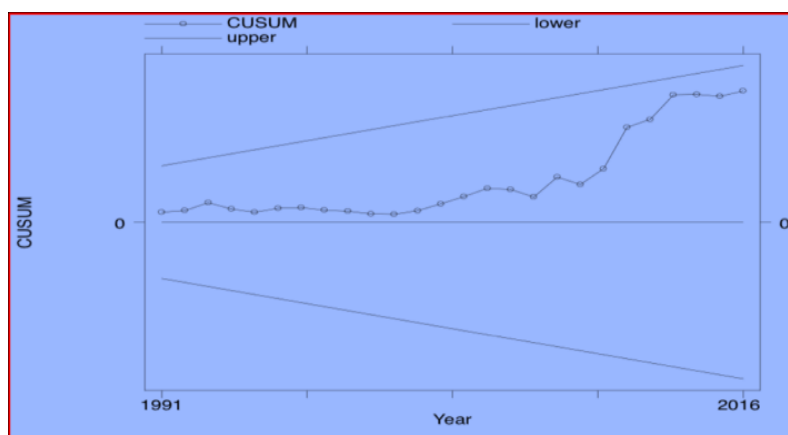| Test Statistic | F-statistic | Probability |
|---|---|---|
| Breusch-Godfrey Serial Correlation LM Test | 1.523071 | 0.0841 |
| Breusch-Pagan-Godfrey Heteroskedasticity Test | 2.56 | 0.1207 |
| Jarque-Bera Normality Test | 0.9006 | 0.6374 |
| Ramsey RESET Test | 1.40 | 0.2748 |



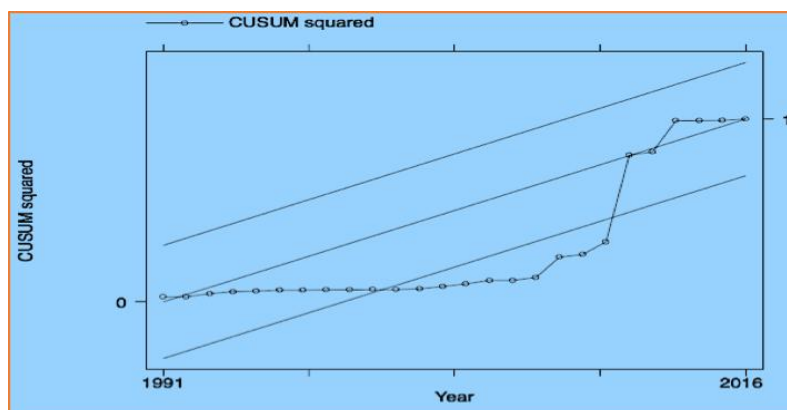**Figure-5.** Cumulative sum of recursive residual.

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**Figure-6.** Cumulative sum of squared recursive residual.

### 4.5. Discussion of Results

The results of this study reveal a significant negative relationship between the corruption and economic growth in both the short-run and the long-run. This confirms the hypothesis of Myrdal (1968); Kurer (1993); Rose-Ackerman (1997); Mauro (1998) that corruption "sands the wheels" of growth. The results also affirm the studies by Gyimah-Brempong. (2002); Amin et al. (2013); Forson et al. (2017) which reveal that an increase in corruption corresponds to a decrease in the growth of countries. As shown in Table 5, the coefficient of -.608852 implies that a change in corruption results in a corresponding negative change of 60 percent in growth in the long-term. In the short-term, a change in corruption results in a corresponding negative change of 82 percent in growth (as shown by a coefficient of -.82227 in Table 6). Thus, bribes, palm-greasing offers made by private sector agents (firms and households) to some bureaucrats and public officials appear to hamper growth of the economy. While the proponents of the need to reevaluate the effect of corruption on growth favour the notion that firms may shape rules of engagement through corrupt payments to bureaucrats, the practice is considered exceedingly detrimental to the larger economy. This situation is more pronounced in jurisdictions where such state capture is carried out by the bureaucrats and politicians instead of the private sector (Gyimah-Brempong, 2002).

Again, the results point out capital formation and inflation show significant negative effects on economic growth over the study period in both the short-run and long-run. Capital formation shows coefficients of -1.818812 and -2.01027 respectively in the long-term and the short-term. Inflation also shows coefficients of -.342603 and -.46270 respectively in the long-run and the short-run. The effect of inflation obtained is in consonance with the widely held view that inflation hampers growth. In addition, trade openness has a positive and significant effect on economic growth. This is a confirmation of the conventional expectation that trade openness stimulates economic growth. While government size has a positive effect on growth, that effect is not significant as shown by coefficients of .692670 (in Table 5) and .63550 (in Table 6). The coefficient of government size being positive confirms the traditional prediction that government size measured by government spending, enhances growth. On the basis of our data set, there is a strong support for the hypothesis that corruption reduces growth. The results of our study are also found to be robust and thus, appropriate policy actions are expected to deal with the decreasing growth effect of corruption.

## 5. CONCLUSION AND POLICY IMPLICATIONS

This review paper examines whether there is a long-run relationship between corruption and economic growth in Ghana using data from 1984 to 2016. Data on control of corruption according to the Transparency International was used to determine the predictive power of corruption. Five predictor variables of economic growth were employed for the study: corruption, trade openness, inflation, capital formation and government size. The study used the ARDL bounds test in the analysis. Upon obtaining evidence that the variables were cointegrated, both long-run and short-run parameters were estimated, which showed the existence of a negative relationship between

corruption and economic growth in both the long-run and the short-run horizons. Our initial econometric models, supported by robustness checks, predict a negative effect of corruption on economic growth of Ghana. We also find that capital and inflation show a negative effect on economic growth. Economic growth is, however, influenced positively by trade openness as well as government size which effect was insignificant. Generally, our findings support the "sand the wheels" hypothesis (Achim, 2017; Forson et al., 2017; Mauro, 1995) documenting a negative effect that relationship between corruption and economic growth in Ghana. The findings of this study can have political implications for government machinery as best policies and practices are required to enhance the economic performance of the country. The government should effectively combat the devastating occurrence of corrupt practices and find the appropriate mechanisms to enhance institutional quality and to adopt relevant regulatory measures. To serve as good example, the government should clamp down corruption cases involving public officials, who usually take advantage of their positions to engage in illegal activities. For governments of developing countries to benefit from the expanding growth effect of reduced corruption, more efforts should be targeted at key institutional reforms, as the foundation of lasting economic performance. Various flagship policies and policies of government should be underpinned with zero tolerance of corruption in order to realize their intended outcomes. The government should also strive hard to further enhance transparency of governmental functions by involving the citizens in governance, making policies understandable and minimizing the discretion at the disposal of bureaucrats. Our study has some limitations. We have only investigated the long-run relationship between corruption and economic growth in Ghana. In spite of the fact that the outcome of our estimation points out that the corruption data can explain, on average, 67 percent of the variation in corruption, we submit that future research consider an extended period of time. Caution should also be made when designing policies on control of corruption as there are varied measurements and proxies for corruption. In order to validate our findings for future studies, we intend to overcome these drawbacks in future endeavours. A future empirical study may consider a corruption measure different from what we used in this study. A promising future research direction should focus on the explanatory power of corruption in the growth-environment nexus as well as the growth-energy-environment nexus.

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