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The Impact of Corruption on Economic Growth in Low-Income Countries: An Empirical Analysis Using the Kuznets Hypothesis

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ABSTRACT

***Purpose**: This study explores the impact of corruption on economic growth in low-income countries (LICs) by applying the Kuznets hypothesis as a novel methodological approach to examine this relationship.*

***Design/methodology/approach**: Using panel data for 29 LICs from 1996 to 2018, the study employs multiple econometric techniques including panel unit root tests, Granger causality tests, panel EGLS with fixed effects, and an adaptation of the Kuznets curve hypothesis. This comprehensive approach allows for analysis of both short-term and long-term effects, as well as the potential non-linear relationship between corruption and growth.*

***Findings**: The results reveal that corruption has a significant negative impact on economic growth in LICs. Specifically, a one-unit increase in corruption is associated with a 0.98% decrease in economic growth after an 8-year lag. Moreover, the study finds evidence of an inverted U-shaped relationship between corruption and economic growth, consistent with the Kuznets hypothesis. Corruption exhibits diminishing returns, increasing initially with economic growth until a threshold of approximately 10% growth is reached, after which it begins to decrease.*

***Implications**: These findings suggest that anti-corruption efforts in LICs may not yield immediate results, but are crucial for long-term economic development. The non-linear relationship implies that as LICs develop, they may experience an initial increase in corruption before seeing improvements. This underscores the need for sustained anti-corruption efforts throughout the development process.*

***Originality/value**: This paper contributes to the literature by focusing specifically on LICs, utilizing a long-term panel dataset, and introducing the Kuznets hypothesis as a new methodological framework to examine the dynamic relationship between corruption and economic growth over time.*

KEYWORDS

Corruption, Kuznets Hypothesis, Governance, Long-Run Analysis, Econometric Analysis, VAR, Panel EGLS, Granger Causality.

1. INTRODUCTION

Corruption is defined as the misallocation of capital by a citizen for personal returns through the application of legal and illegal standards. Moreover, Akindele (1990) illustrated corruption as a behavior in which a person deviates from legal to illegal actions using his/her position of power. Corruption has no clear-cut definition or channels; it can be done in all the country's sectors. In the public sector, Shleifer and Vishny (1993), Kaufmann (1997), Rose-Ackerman (1999), and Cuervo-Cazurra (2008) added that corruption is the abuse of public officials' power for personal financial gains, which becomes a burden on business that increases the costs of production as well as acts as a disincentive to invest. For example, citizens pay bribes to public officers to avoid bureaucratic rules or penalties for illegal actions (Khan et al. 2021, Mahmood 2021, Qureshi et al. 2021)[1]. The concept of bribes is like taxes, in which citizens pay for a service done to improve their well-being. However, the only difference is that governments do not collect bribes (Shleifer and Vishny 1993).

The study will focus on public sector corruption, which is the misallocation of capital by public officers for personal gains. According to the World Economic Forum (Fleming 2019), corruption costs developing countries $1.26 trillion per year. That is enough to lift the 1.4 billion people who live on less than $1.25 a day and keep them there for at least six years. As well, the African Union forecasted the loss of Africa to corruption to be 25% of the countries' GDP annually (Podobnik 2008, Qureshi et al. 2021). Besides, The World Bank hypothesized that world countries are losing 1 trillion US dollars annually due to corruption, which accounts for 5% of the world's GDP (Labelle 2006).

Corruption has a deeply damaging effect on economic growth. Research shows that when corruption increases by just 1% (as measured by the Corruption Perception Index), GDP per capita can drop by a staggering 17% (Gründler & Potrafke, 2019). In low-income countries (LICs), the impact is even more severe, with corruption-related losses estimated to consume up to 25% of annual GDP (Podobnik, 2008; Qureshi et al., 2021). Despite these alarming figures, most studies on corruption and economic growth focus on wealthier nations (e.g., Bakare, 2011; Nageri et al., 2013; Malanski & Póvoa, 2021; Song et al., 2021) or developing countries (e.g., Mohammed et al., 2021; Song et al., 2021). This leaves a significant gap in understanding how corruption uniquely affects LICs, where economies are often more vulnerable.

This study aims to bridge that gap by exploring the specific ways in which corruption hinders economic growth in low-income countries. By shedding light on this issue, the research hopes to provide valuable insights that can inform policy solutions and drive meaningful change. This will be an important contribution on both academic and practical levels. From an academic perspective, although many authors have investigated the relationship between corruption and economic growth, few or none have specifically focused their analysis on LICs. This paper closes this gap by exclusively focusing on LICs, with a wide window of time, from 1996 to 2018, allowing observation of long-term tendencies. Moreover, we introduce the novel approach to the use of the Kuznets hypothesis, which allows us to look at the dynamics of corruption and growth relationship, not assuming the latter to be static.

From the practical perspective, our findings are relevant for policymakers and developmental institutions who work in LICs. In which, policy makers have a greater opportunity to craft more effective strategies that could incorporate corruption effects. The use of the Kuznets hypothesis provides a deeper understanding of whether corruption's effects change over time, allowing for more adaptive and corrective policies. Furthermore, the extended timeframe enables us to identify long-term patterns, which can guide sustainable policy solutions aimed at reducing corruption's negative economic impact. Ultimately, this research will add to the academic knowledge pool and provide practical insights into real economic development.

[1] See also Rahman et al. (2000), Jain (2001), Svensson (2005), Anoruo & Braha (2005), Podobnik (2008), Bakare (2011), Tavanti and Stachowicz-Stanusch (2013), Carmeci et al. (2021).

Research findings indicate that corruption has a negative impact on economic growth. In which corruption did not facilitate doing business and overcome bureaucracy, however, it helped deepen inequality in opportunities offered to citizens (Mauro 1995; Bakare 2011; Nageri et al. 2013; Malanski and Póvoa 2021; Mohammed et al. 2021; Song et al. 2021). Moreover, corruption exhibits diminishing returns, which increase at the beginning of growth and development until our calculated threshold, which is approximately an economic growth of 10%, and then starts to decrease. Corruption in LICs has an inverted U-shaped curve.

The subsequent sections of the study are structured as follows: an overview of both theoretical and empirical literature is outlined in section 2. Section 3 describes the methodology data and findings. Lastly, section 3 outlines the concluding remarks.

2. LITERATURE REVIEW

"*It has been noted that where corruption exists, even a highly endowed nation in terms of natural and human resources may fail to develop in a beneficial way to a great majority of the citizens*". Bakare (2011)

The limitation of economic development has been cited as corruption. According to Bakare (2011), even a rich endowment with natural and human resources will find it difficult in bringing all-pervading prosperity if the benefits are highly infected with corruption. For centuries, the debate on corruption and economic growth has changed over time. Perspectives in decades have changed regarding this question. Key debates on corruption from the 1960s to the 1990s were mentioned by Mauro (1995). This is an example of how economic thought has shifted in different years.

Some economists saw corruption to increase economic growth during the 1960s. Two basic ideas supported this notion. First, corruption was used as a form of grease money: it facilitated the process of getting around bureaucratic holdups and allowed businesses to speed up their investments. Second, it was considered that corruption could heighten government officials' productivity in handling administrative procedures. In the 1970s, talks changed toward issues of how to control corruption, even though some were still considering it to be good for the economy. The debate changed in the 1980s, however, when economists began to consider corruption an impediment rather than a greasing agent to development. Researchers started to indicate its dampening effects on the level of investment and pinpointed inefficient and bureaucratic governance as a leading contributor to corruption. This perspective flowed from the earlier approach of the 1990s, which placed emphasis on how corruption diverted talented and capable government officials into rent-seeking activities and further aggravated economic inefficiencies.

Empirical studies have investigated how corruption affects investment, especially in transitional economies. Some scholars believe that corruption can be viewed as an engine grease, which allows businesses to operate in the absence of effective laws and regulations, thus encouraging investment (Rahman et al., 2000; Jain, 2001; Cuervo-Cazurra, 2008). These studies conclude that, in countries where regulatory frameworks are weak, higher levels of corruption might paradoxically lead to increased investment. However, Podobnik (2008) shows empirical evidence contravening such an effect and contradicts the argued view. Instead, he maintains that reducing corruption levels attracts more direct foreign investment; hence, which increases business formation. His conclusions further indicate the fact that corruption increases operating costs for newer ventures and gulps down profit margins in future. Younger investors tend therefore to seek relatively less corrupt countries as they enjoy higher profit margins following reduced costs of operation. Anoruo and Braha (2005) explained the growth-corruption nexus as two broad categories. The first category implies the positive effect corruption has on economic growth, relying on the fact of high bureaucracy in some societies, in which corruption acts as oil that facilitates the engine of growth. As a result, the efficiency of the economy will be higher, and growth will continue. On the other hand, the second category implies the negative effect corruption has on economic growth, relying on the fact that corruption adds more uncertainty to business, which is equivalent to higher risk levels. As a result, this will hinder economic growth.

According to Cuervo-Cazurra (2008), corruption has both positive and negative effects on economic growth. The effect of corruption is identified by the stage of development of the country. If the country is in a transitional stage of development and does not have well-established market institutions, corruption becomes the oil for such an economy. The reason for the positive effect of corruption is that it helps businesses avoid additional operating costs caused by a poor regulatory business environment. On the other hand, corruption has a negative effect on economic growth because it increases operating costs for businesses and adds uncertainty as well (Rahman et al. 2000, Cuervo-Cazurra 2008).

2.1. Theoretical Foundation

Corruption is a phenomenon that has been very pervasive across the world, undermining economic growth and weakening institutions to break the trust of the general public. International organizations like the World Bank, the International Monetary Fund, and the United Nations defined corruption as an act of abuse of entrusted power for private gain. Corruption appears as a form of bribery, embezzlement, fraud, nepotism, and state capture. According to Transparency International, corruption has been classified as grand corruption, petty corruption, and political corruption. Corruption is typically measured using various indices: Transparency International's Corruption Perceptions Index (CPI), World Bank's Control of Corruption Index, and the Global Corruption Barometer. The indices provide a perspective of corruption prevalence across countries: it shines on differences in the intensity of corruption and the effectiveness of anti-corruption policies. Empirical works show that a heightened level of corruption is associated with implications such as lower levels of governance, lower direct foreign investment, and economic performance.

Various social theories have, over time, been used to show the theoretical basis of corruption. One of the most influential frameworks and commonly used in discussing and analyzing corruption is principal-agent theory (Shleifer & Vishny 1993; Klitgaard 1988; Forgues-Puccio, 2013). Ugur & Dasgupta, 2011, in their meta-analysis of 115 economic studies on corruption, verified that the principal-agent theory is the dominant theory when analyzing corruption. Under this theory, agents are public officers, while principals are governments, supervisors, parliaments, and/or the public. It is assumed that agents should act in the best interests of the principal. However, corruption arises when agents pursue their own interests instead, often because asymmetric information favors them over the principals (Shleifer & Vishny 1993; Klitgaard 2000; Forgues-Puccio 2013; Tavanti & Stachowicz-Stanusch 2013; Marquette & Peiffer 2015; and Walton & Jones, 2017).

Klitgaard (2000) hypothesizes that corruption should be dealt with as a structured process to understand its nature and dynamics effectively. He outlines three stages: first, corruption should be identified, and awareness of its negative impacts should be raised. Second, anti-corruption measures should be implemented to limit its negative effects. Third, corruption should be eradicated from its roots. At this second stage, Klitgaard (2000) analogizes the building of the immune system of the body to that of resisting diseases through changes in lifestyle. In this second stage, principal-agent theory assumes importance through the provision of anti-corruption strategies including higher transparency, accountability, incentives, and oversight as a way of aligning principal and agent interests (Klitgaard, 2000; Marquette & Peiffer, 2015; Walton & Jones, 2017). This theoretical framework finds widespread acceptance among international organizations including the World Bank, IMF, and UN, among others (Marquette & Peiffer, 2015; Walton & Jones, 2017).

Despite its wide applicability, principal-agent theory has not produced fully satisfactory results in the fight against corruption. Economists and policymakers expected positive effects from the implementation of the theory, but the results were disappointing. Zaum et al. (2013) concluded that there was no significant effect of applying principal-agent theory in reducing corruption in public goods provision. Persson et al. (2013) also argue that the theory does not work due to the assumption of a principal agent who closely monitors the process.

As such, collective action theory has emerged as an alternative and widely accepted framework for understanding corruption (Persson et al., 2013; Marquette & Peiffer, 2015; Walton & Jones, 2017). The importance of group members acting for the collective good was first conceptualized by Mancur Olson (1965), who stated that "self-seeking" actions by some may be detrimental to others regarding the group's overall well-being. According to Olson, the free riders are those who benefit from the collective goods without contributing to their maintenance. Hardin (1968) labeled this fact as the "tragedy of the commons."

In a way, corruption is a variant of the free-rider problem-people acting for self-benefit, which causes the poverty of resources and government weakness (Marquette & Peiffer, 2015; Walton & Jones, 2017). Ostrom (1998, 2010) shows that collective action varies according to the degree of the following variables: group size, heterogeneity, trust, repeated interaction, norms, monitoring, and transparency. According to Marquette & Peiffer (2015), this adds up to causal relations among those above variables as defining collective action against corruption.

Collective action theory postulates that corruption cannot be addressed by one stakeholder but calls for intersectoral cooperation. Since the private sector is usually the source of a bribe, and the public sector is the recipient, addressing corruption effectively requires collaboration of both (World Bank 2016). Collective action approaches to anti-corruption as stated by the World Bank (2016) include integrity pacts, compliance pacts, and long-term initiatives. Integrity pacts, introduced by Transparency International in the 1990s, secure fair bidding in public procurement through third-party monitoring. Compliance pacts enforce industry-wide anti-corruption agreements, including the World Economic Forum's Partnering Against Corruption Initiative (PACI). Long-term initiatives help to build an overall anti-corruption culture at a national level by holding business roundtables, best practice sharing, anti-corruption training, and cooperation with regulatory bodies.

Corruption has deep economic effects, especially in low-income countries. Empirical evidence indicates that corruption can distort economic incentives, undermine public confidence in institutions, and retard economic growth. First, corruption decreases investment due to increased uncertainty and risk. Several studies prove that corruption discourages FDI, since businesses bear higher transaction costs and legal uncertainty. High levels of corruption discourage investors and result in capital flight, hence lower economic expansion. Also, corrupt practices distort market competition in favor of inefficient firms that can afford to spend resources on bribery against the more productive enterprises. Corruption drains money that would otherwise be utilized in welfare services, including health, education, and infrastructure, thus reducing the public sector's efficiency. In LICs, corruption means the misallocation of resources, hence low-quality public service, hence limiting economic opportunities to the population. Klitgaard (2000) and Marquette & Peiffer (2015) hold that corruption raises income inequality because it only benefits the elites at the expense of the marginalized, slowing economic development further.

Thirdly, corruption reduces tax revenues and weakens state capacity. Tax evasion and illicit financial flows take away vital revenues that governments need for development projects. In addition, therefore, LICs are bound to be afflicted with budget deficits, especially if they minimize investments in leading economic growth drivers. Studies have also found that corruption is associated with weak governance indicators, such as regulatory inefficiencies, poor contract enforcement, and weak property rights.

In conclusion, corruption is a deeply entrenched problem with drastic economic effects, especially in LICs. Theoretical approaches toward it are provided by principal-agent and collective action theories on the mechanism and its possible solutions. Principal-agent theory makes calls for transparency and accountability, while collective action theory reasons upon cooperation and institutional frameworks. Empirical evidence suggests that corruption negatively influences economic growth by discouraging investment, misallocating resources, and reducing government revenues. Anti-corruption requires effective multi-stakeholder cooperation and comprehensive policy measures to root out the causes of corruption.

2.2. Empirical Literature

Empirical studies provide ambiguous and mixed results on the effect of corruption on economic growth. Empirical findings are divided into three main spectra. The first spectrum supports the negative relationship that corruption has on economic growth. Malanski and Póvoa (2021) study the impact of economic freedom on the relationship between corruption and economic growth. The sample consists of emerging markets in both Latin America and Pacific Asia from 2000 to 2017, using the GMM model for panel data approach. The regression equation analysis of each continent separately in order to obtain accurate and representable results. The GMM equation is as follows:

$$In(Y_{it}) = \alpha_0 + \alpha_1 In(Y_{it-1}) + \alpha_2 CPI_{it} + \alpha_3 CPI_{it-k} + \alpha_4 EF_{it} + \alpha_5 (CPI * EF)_{it} + \alpha_6 D + \alpha_7 Development + \alpha_n \delta_{it} + \varepsilon_{it} (1.3.1.2.)$$

Where ln (Yi, t) is the natural logarithm of the GDP per capita of country i in period t and period t-1, CPIi, t, k is the Corruption Perception Index (CPI) of country i in period t (with k representing the lag length), EFi, t is the economic freedom index of country i in period t, D is the dummy variable for whether country i is tropical, Development is a dummy variable for the level of development of country i in period t, and δi, t is a control variable vector. The study's findings proved that economic freedom boosts economic growth in both continents. Furthermore, when freedom is high, corruption has a negative effect on economic growth, and when freedom is low, corruption has a positive effect on growth in Latin America. On the other hand, in Asian countries, corruption has a negative effect on growth regardless of the level of freedom of the country. The reason behind the differences in results between the two continents is that Latin American countries are at earlier stages of development than Asian countries.

Mohammed et al. (2021) study the effects of crime rates and corruption on economic growth for 11 African countries, they are Benin, Burkina Faso, Cape Verde, Cote Devoir, Ghana, Guinea, The Gambia, Mali, Nigeria, Senegal, and Sierra Leone, hereafter the Economic Community of West African States (ECOWAS). Data for the dissertation was obtained from Transparency International from 2000 to 2019, applying a panel data approach. The dissertation used fixed effects models (FEM), feasible generalized least square (FGLS), and pooled ordinary least square (OLS), in order to fulfil the dissertation objective of finding the relationship between growth and corruption. The findings illustrated that corruption and economic growth have strong negative relationships with coefficients of 0.394%, 1.06%, 2.88%, and 2.67%, which differ according to the used model. Moreover, panel granger causality showed that there is a bidirectional causality between corruption and economic growth in ECOWAS economies.

Moreover, Mauro (1995) illustrated that corruption has a strong and significant negative relationship with private investment levels, in which for every 1-unit improvement in corruption, the level of investment as a percentage of GDP increases by 2.9 units using both OLS and 2SLS econometric models. Moreover, Mauro (1995) added that, when analyzing the effect of bureaucracy level on corruption, the results showed that despite the level of bureaucracy, it has a negative effect on levels of investment as a percentage of GDP.

In analyzing the effect of corruption on the growth and development of Nigeria, Nageri et al. (2013) stated that corruption has been hindering Nigeria from developing despite the abundance of natural resources such as gold and oil. Although the Nigerian economy strives to alleviate corruption through the establishment of various anti-graft institutions such as the Independent Corrupt Practices and Other Related Offences Commission (ICPC) in 2000, the Financial Action Task Force on Money Laundering (FATF) in 2002, and the Economic and Financial Crimes Commission (EFCC) in 2003, corruption continues to weaken the institutions and hinder development. Through OLS, Nageri et al. (2013) examined the dynamics of corruption in Nigeria, and the results show the negative effect corruption has on the growth of GDP in Nigeria.

Moreover, Bakare (2011) examined the crowding out effect of corruption on economic growth in the Nigerian economy from 1986 to 2009, a time series of 23 years. The paper adapted the ADF stationarity test, co-integration test, and regression analysis through OLS and ECM techniques. In testing the crowding out effect, economists used the Barol equation as follows:

$$Y = AK^{(1-a)}Pg_{ia} \text{ (2.3.1.2.)}$$

Where Y = National Income, A = Technological Parameter, K = the private capital per worker, Pgi = the flow of public. However, the paper adapted the linear version of Baroll model as follows:

$$NGDP_t = \beta_0 + \beta_1 CPI_t + \beta_2 MS_t + \beta_3 UNE_t + \beta_4 CAPF_t + \beta_5 PINV_t + \beta_6 EXTD_t + \mu_t \text{(3.3.1.2.)}$$

Where CPI = Corruption Perception Index, GDP = Gross Domestic, Product, CAPF = Capital formation, MS = Money Supply, UNEMP =Unemployment rate, PINV= Public Domestic Investment, EXTD=External Debt, T is the time trend and μ = Error Term.

The results showed that when corruption increases by 1-unit, GDP, on the other hand, decreases by 0.25279 units in the long-run. The negative relationship is supported by the depressed nature of the Nigerian economy as a low-income country, the abandonment of capital projects, and the crowding out effect of corruption, due to the divergent of projects from developmental to private or personal gains. Thus, levels of capital flight to illegal depositary institutions abroad increased tremendously, which crowded out public domestic investments and worsened economic growth. The results found by Bakare (2011) were in line with Akindele (2005), where he found a negative effect of corruption on economic growth as well as the deep effect of corruption in retarding developmental projects and crowding domestic investments.

Moreover, Song et al. (2021) examined the relationship between economic growth, financial development, and corruption. The sample consists of 142 countries, 124 developing countries, and 18 developed countries from 2002 to 2016. The paper divided the sample into three sub-samples: developing, developed, and a joint sample of both. A panel data approach was used with FMOLS, VECM, and panel causality econometric techniques. The results showed that financial development is positively affected by GDP and negatively affected by corruption. So, financial development increases by 45% while it decreases by 2.65% when economic growth and corruption increase respectively. Moreover, the findings support the long-term co-integration between growth, financial development, and corruption. As for the causality results, developing countries showed that there is unidirectional causality that runs from economic growth and corruption towards financial development at a 5% level of significance. However, developed countries failed to support any running causality between the three studied variables.

While the second spectrum supports the positive relationship that corruption has on economic growth, the effect of corruption on the economic growth of Saudi Arabia has been examined with in-cooperating oil prices and governance. Using the time series approach, the sample consists of 24 years from 1996 to 2019. The study applies ARDL and F-statistic as econometric techniques for the analysis. Findings prove empirically that controlling corruption in Saudi Arabia does not affect the economic growth of the country. However, good governance policies assure a positive and long-term effect on growth. As for the oil prices, it proves their positive effect on economic growth as well as good governance. In the long-run, when governance increases by 1-point, economic growth increases by 0.25 points with a 5% level of significance, while it shows insignificance in the short-run. The corruption coefficient shows a negative relationship with economic growth, with 0.2123 and 0.0998 in both the long and short-run, respectively. However, it is insignificant. Moreover, the oil price coefficient in the long-run was 0.0744 and 0.0350 in the short-run, both at 5% significance (Mahmood 2021).

Anoruo and Braha (2005) analyze the growth-corruption nexus through regression analysis using the FMOLS model for 18 African countries, among which are Angola, Burkina Faso, Cameroon, Democratic Republic of Congo, Republic of Congo, Cote d'Ivoire, Ghana, Guinea-Bissau, Kenya, Madagascar, Malawi, Mali, Niger, Mozambique,

Sierra Leone, Togo, Uganda, and Zambia from 1984 to 2000. The paper used a set of equations to assess the previously mentioned nexus as follows:

$$EG = \alpha_0 + \beta_1 COR + \beta_2 Y \epsilon_t \text{(4.3.1.2.)}$$
$$EG = \alpha_0 + \beta_1 COR + \beta_2 K + \beta_3 Y + \epsilon_t \text{(5.3.1.2.)}$$
$$EG = \alpha_0 + \beta_1 COR + \beta_2 PG + \beta_3 Y + \epsilon_t \text{(6.3.1.2.)}$$
$$EG = \alpha_0 + \beta_1 COR + \beta_2 K + \beta_3 PG + \beta_4 Y + \epsilon_t \text{(7.3.1.2.)}$$

Where corruption index (COR), economic growth (EG), capital (K), population growth (PG), and initial output (proxies by lagged value of GPD per capita) (Y). The equations have been run separately to assess the rule of transmission channels on corruption.

The results revealed that when corruption increases by 1%, economic growth decreases by 0.961%. Moreover, the relationship between growth and corruption is strengthened by including transmission channels in the regression analysis. Furthermore, when population growth is used as a transmission channel, the corruption coefficient hits its maximum of 1.7%, at which point growth decreases by 1.7% when corruption increases by 1-unit. Thus, corruption has direct and indirect effects on economic growth. In direct effect, corruption affects growth by reducing the productivity of capital and increasing misallocation. While indirect effects affect corruption by reducing investments in both human and physical capital (Anoruo and Braha 2005).

However, the third spectrum supports the mixed relationship that corruption has on economic growth. The majority of studies highlight the negative impact of corruption on economic growth. However, many East-and-Southeast-Asian countries are achieving high economic growth rates along with high corruption rates, the so-called East-Asian-Paradox. Saha and Sen (2021) were interested in revisiting this paradox and testing whether it still holds or not. They have observed that countries with high levels of growth and corruption are autocracies. Thus, the relationship between corruption and growth will be re-examined in light of the type of political regime. The study uses panel data from over 100 countries for the period 1984–2016 and incorporates OLS as an econometric technique. The regression equation is based on the Solow growth model and is as follows:

$$log(GDP_{it}) = \alpha_0 + \alpha_1 CORR_{it} + \alpha_2 DEMO_{it} + \alpha_3 CORR_{it} * DEMO_{it} + \alpha_4 \log(\frac{CAP}{POP})_{it} + \alpha_5 EDU_{it} + \alpha_6 RND_{it} + \alpha_7 OPEN_{it} + \alpha_8 M2GDP_{it} + \varepsilon_{it} \text{(8.3.1.2.)}$$

Where, Log (GDP) is log of real per capita gross domestic product as a measure of economic growth, CORR is corruption, DEMO is democracy indices, CAP is capital per capita, RND is research and development, EDU is educational attainment, OPEN (EF) is trade openness (economic freedom), M2 GDP is money supply to GDP ratio, and ε is error term. Subscripts i is country and t are for time. The study findings showed that corruption has a negative effect on economic growth with a 0.891 coefficient at 1% level of significance. However, when re-running the regression analysis with a 5-year moving average and fixed effects, the findings showed that corruption has a positive effect on economic growth with a 0.144 at 5% level of significance. The results are mixed between positive and negative relationships between growth and corruption, which means that the paradox still holds. As for economic freedom, the findings support the notion that autocratic countries tend to have higher economic growth as well as corruption levels.

Recently, Qureshi et al. (2021) studied the dynamic nexus between economic growth, corruption, and foreign direct investment (FDI). The originality of the study lies in two econometric privileges. First, the sample of the study is divided into annual and quarterly observations, in which the regression has been run twice to assure the accuracy of the results. Second, the study uses the GMM model as a robustness test as well as the panel vector autoregressive (PVAR) as the main model. The sample was gathered from 1996 till 2018 for 28 developing economies and 26 developed countries. Moreover, the regression equations are as follows:

$$CCI_{it} = \alpha_1 + \sum_{i=1}^{n} \beta_1 CCI_{i,t-1} + \sum_{i=1}^{n} \beta_2 GDP_{i,t-1} + \sum_{i=1}^{n} \gamma_1 FDI_{i,t-1} + \varepsilon_{1i,t} \text{(9.3.1.2.)}$$

$$GDP_{it} = \alpha_1 + \sum_{i=1}^{n} \beta_3 CCI_{i,t-1} + \sum_{i=1}^{n} \beta_4 GDP_{i,t-1} + \sum_{i=1}^{n} \gamma_2 FDI_{i,t-1} + \varepsilon_{1i,t} \text{(10.3.1.2.)}$$

$$FDI_{it} = \alpha_1 + \sum_{i=1}^{n} \beta_5 CCI_{i,t-1} + \sum_{i=1}^{n} \beta_6 GDP_{i,t-1} + \sum_{i=1}^{n} \gamma_3 FDI_{i,t-1} + \varepsilon_{1i,t} \text{(11.3.1.2.)}$$

Where CCI is the control of corruption perception index at the end of year t for a country i, and GDP stands for gross domestic product growth rate at the end of year t for a country i. FDI refers to foreign direct investment (as a percentage of GDP). The findings illustrate that, for developing countries, corruption has a negative impact on economic growth with a 0.382 coefficient at a 10% level of significance using annual data. While using quarterly data, the negative effect increases to a 0.419 coefficient, also at a 10% level of significance. However, FDI has a positive impact on growth with 4.516 and 5.565 coefficients at 1% significance using annual and quartar data, respectively. In addition, corruption has a negative impact on FDI with 0.134 and 0.144 coefficients at a 10% level of significance for annual and quartar data, respectively.

Surprisingly, the findings showed different patterns and trends in the developed economies. First of all, corruption has a positive impact on economic growth with a 4.09 for the annual data model and a 4.24 for the quarter data model. Both models have a 5% level of significance. In other words, when corruption increases by 1% in year t-1, economic growth increases by approximately 4% in year t, which has a huge effect on the growth of the developed economies from illegal economic variables like corruption and despite the sound governance these economies have. FDI has a huge positive impact on growth with 7.323 at 5% significance and 9.193 at 1% significance. These results go in line with the positive effect corruption has on FDI in developed countries. Illustratively, when corruption increases by 1% annually in year t-1, FDI increases by 4.474% in year t at 5% significance, as well as when corruption increases by 1% quarterly in year t-1, FDI increases by 2.563% in year t at 10% significance (Qureshi et al. 2021).

The analysis of the effects of corruption is extended from analyzing its relationship with economic growth to in-cooperating with other macroeconomic, social, and environmental variables. Haseeb and Azam (2021) analyze the dynamic relationship between corruption, democracy, tourism, and environmental degradation for low-, middle-, and high-income countries. The dissertation chose the top five countries in CO2 emissions in each category of income from 1995 to 2015, compiled in panel data form. As for econometric techniques, the dissertation employed the Fully Modified Ordinary Least Squares (FMOLS) method of panel and Dumitrescu-Hurlin Panel Causality Tests. The equation is as follows:

$$CO_{2it} = \alpha_0 + \alpha_1 TUR_{it} + \alpha_2 DEMO_{it} + \alpha_3 COR_{it} + \varepsilon_{it} \text{(12.3.1.2.)}$$

Where CO2 is carbon dioxide emissions, TUR is international tourist arrival, DEMO is democracy index, COR is corruption index, i is country, and ε is a white noise error term. The findings suggest that corruption and tourism are key factors in affecting CO2 emissions. Moreover, when democracy increases in high-income countries, CO2 emissions start to decrease. In addition, Granger causality results showed bidirectional causality between democracy and tourism variables and between corruption and CO2 emissions. As well as revealing a unidirectional causality running from tourism to CO2 emissions and from tourism to corruption.

In analysing the effect of corruption on the development of Ukraine's financial sector, Ziernhold and Ivannikova (2021) used a sample consisting of 24 observations from 1996 to 2019. The dissertation aim was to identify both the long-term and short-term effects of corruption on financial development. The Dissertation used ARDL-based error correction econometric models in order to fulfil the dissertation aim. Moreover, the ARDL long-run equation is as follows:

$$\Delta BM_t = \alpha_0 + \sum_{i=1}^{n} b_1 \Delta BM_{t-i} + \sum_{i=1}^{n} b_2 \Delta LnGDP_{t-i} + \sum_{i=1}^{n} b_3 \Delta CCI_{t-i} + \varphi_1 BM_{t-i} + \varphi_2 LnGDP_{t-i} + \varphi_3 CCI_{t-i} + \varepsilon_t \text{(13.3.1.2.)}$$

Where BM is broad money that is used as an indicator for financial development, ln GDP is an indicator for economic growth and CCI is corruption control index.

While, ARDL short-run equation based on error correction is as follows:

$$\Delta BM_t = \alpha_0 + \sum_{i=1}^{n} b_1 \Delta BM_{t-i} + \sum_{i=1}^{n} b_2 \Delta LnGDP_{t-i} + \sum_{i=1}^{n} b_3 \Delta CCI_{t-i} + \omega ECT_{t-1} + \varepsilon_t \quad (14.3.1.2.)$$

The results showed that when corruption increases by 1%, financial development, on the other hand, decreases by 16.39% in both the short and long term, indicating the strong negative relationship that both indicators have with each other.

In conclusion, the empirical results of the effect of corruption on economic growth in literature consist of three main spectrums. The first spectrum stated that corruption has a negative effect on the economic growth of the country due to the ambiguously added cost of production. The second spectrum highlights the empirically positive effect that corruption has on economic growth as it acts as an oil for growth engines in countries. while the last spectrum identifies that the empirical results are mixed between both negative and positive (summerized in Table. 1)

Table 1: Corruption Empirical Literature Review

Author	Sample/Data	Model	Equation	Results
Negative Relationship				
Mauro (1995)		OLS and 2SLS		Corruption has a strong and significant negative relationship with private investment levels, in which for every 1-unit improvement in corruption, the level of investment as a percentage of GDP increases by 2.9 units. When analyzing the effect of bureaucracy level on corruption, the results showed that despite the level of bureaucracy, it has a negative effect on levels of investment as a percentage of GDP.
Bakare (2011)	Nigeria from 1986 to 2009	ADF stationarity test, co-integration test, and regression analysis through OLS and ECM	$NGDP_t = \beta_0 + \beta_1 CPI_t + \beta_2 MS_t + \beta_3 UNE_t + \beta_4 CAPF_t + \beta_5 PINV_t + \beta_6 EXTD_t + \mu_t$	The results showed that when corruption increases by 1-unit, GDP, on the other hand, decreases by 0.25279 units in the long-run. The negative relationship is supported by the depressed nature of the Nigerian economy as a low-income country, the abandonment of capital projects, and the crowding out effect of corruption, due to the divergent of projects from developmental to private or personal gains. Thus, levels of capital flight to illegal depositary institutions abroad increased tremendously, which crowded out public domestic investments and worsened economic growth. The results found by Bakare (2011) were in line with Akindele (2005), where he found a negative effect of corruption on economic growth as well as the deep effect of corruption in retarding developmental projects and crowding domestic investments.
Nageri et al. (2013)	Nigeria	OLS		Corruption has been hindering Nigeria from developing despite the abundance of natural resources such as gold and oil.
Malanski and Póvoa (2021)	Emerging markets in both Latin America and Pacific Asia from 2000 to 2017	GMM	$In(Y_{it}) = \alpha_0 + \alpha_1 In(Y_{it-1}) + \alpha_2 CPI_{it} + \alpha_3 CPI_{it-k} + \alpha_4 EF_{it} + \alpha_5 (CPI * EF)_{it} + \alpha_6 D + \alpha_7 Development + \alpha_n \delta_{it} + \varepsilon_{it}$	The study's findings proved that economic freedom boosts economic growth in both continents. Furthermore, when freedom is high, corruption has a negative effect on economic growth, and when freedom is low, corruption has a positive effect on growth in Latin America. On the other hand, in Asian countries, corruption has a negative effect on growth regardless of the level of freedom of the country. The reason behind the differences in results between the two continents is that Latin American countries are at earlier stages of development than Asian countries.
Mohammed et al. (2021)	11 African countries (ECOWAS) from 2000 to 2019	Fixed effects models (FEM), feasible generalized least square (FGLS), and pooled ordinary least square (OLS),		The findings illustrated that corruption and economic growth have strong negative relationships with coefficients of 0.394%, 1.06%, 2.88%, and 2.67%, which differ according to the used model. Moreover, panel granger causality showed that there is a bidirectional causality between corruption and economic growth in ECOWAS economies.

Song et al. (2021)	142 countries, 124 developing countries, and 18 developed countries from 2002 to 2016	FMOLS, VECM, and panel causality econometric techniques		The results showed that financial development is positively affected by GDP and negatively affected by corruption. So, financial development increases by 45% while it decreases by 2.65% when economic growth and corruption increase respectively. Moreover, the findings support the long-term co-integration between growth, financial development, and corruption. As for the causality results, developing countries showed that there is unidirectional causality that runs from economic growth and corruption towards financial development at a 5% level of significance. However, developed countries failed to support any running causality between the three studied variables.
Positive Relationship				
Anoruo and Braha (2005)	18 African countries from 1984 to 2000.	FMOLS	$EG = \alpha_0 + \beta_1 COR + \beta_2 Y \epsilon_t$ $EG = \alpha_0 + \beta_1 COR + \beta_2 K + \beta_3 Y + \epsilon_t$ $EG = \alpha_0 + \beta_1 COR + \beta_2 PG + \beta_3 Y + \epsilon_t$ $EG = \alpha_0 + \beta_1 COR + \beta_2 K + \beta_3 PG + \beta_4 Y + \epsilon_t$	The results revealed that when corruption increases by 1%, economic growth decreases by 0.961%. Moreover, the relationship between growth and corruption is strengthened by including transmission channels in the regression analysis. Furthermore, when population growth is used as a transmission channel, the corruption coefficient hits its maximum of 1.7%, at which point growth decreases by 1.7% when corruption increases by 1-unit. Thus, corruption has direct and indirect effects on economic growth. In direct effect, corruption affects growth by reducing the productivity of capital and increasing misallocation. While indirect effects affect corruption by reducing investments in both human and physical capital (Anoruo and Braha 2005).
Mahmood (2021)	Saudi Arabia from 1996 to 2019	ARDL and F-statistic		Findings prove empirically that controlling corruption in Saudi Arabia does not affect the economic growth of the country. However, good governance policies assure a positive and long-term effect on growth. As for the oil prices, it proves their positive effect on economic growth as well as good governance. In the long-run, when governance increases by 1-point, economic growth increases by 0.25 points with a 5% level of significance, while it shows insignificance in the short-run. The corruption coefficient shows a negative relationship with economic growth, with 0.2123 and 0.0998 in both the long and short-run, respectively. However, it is insignificant. Moreover, the oil price coefficient in the long-run was 0.0744 and 0.0350 in the short-run, both at 5% significance
Mixed Results "East-Asian-Paradox"				
Saha and Sen (2021)	100 countries for the period 1984–2016	OLS	$log(GDP_{it}) = \alpha_0 + \alpha_1 CORR_{it} + \alpha_2 DEMO_{it} + \alpha_3 CORR_{it} * DEMO_{it} + \alpha_4 \log(\frac{CAP}{POP})_{it} + \alpha_5 EDU_{it} + \alpha_6 RND_{it} + \alpha_7 OPEN_{it} + \alpha_8 M2GDP_{it} + \varepsilon_{it}$	The study findings showed that corruption has a negative effect on economic growth with a 0.891 coefficient at 1% level of significance. However, when re-running the regression analysis with a 5-year moving average and fixed effects, the findings showed that corruption has a positive effect on economic growth with a 0.144 at 5% level of significance. The results are mixed between positive and negative relationships between growth and corruption, which means that the paradox still holds. As for economic freedom, the findings support the notion that autocratic countries tend to have higher economic growth as well as corruption levels.

Qureshi et al. (2021)	The sample was gathered from 1996 till 2018 for 28 developing economies and 26 developed countries	GMM model as a robustness test as well as the panel vector autoregressive (PVAR) as the main model	$CCI_{it} = \alpha_1 + \sum_{i=1}^{n} \beta_1 CCI_{i,t-1} + \sum_{i=1}^{n} \beta_2 GDP_{i,t-1} + \sum_{i=1}^{n} \gamma_1 FDI_{i,t-1} + \varepsilon_{1i,t}$ $GDP_{it} = \alpha_1 + \sum_{i=1}^{n} \beta_3 CCI_{i,t-1} + \sum_{i=1}^{n} \beta_4 GDP_{i,t-1} + \sum_{i=1}^{n} \gamma_2 FDI_{i,t-1} + \varepsilon_{1i,t}$ $FDI_{it} = \alpha_1 + \sum_{i=1}^{n} \beta_5 CCI_{i,t-1} + \sum_{i=1}^{n} \beta_6 GDP_{i,t-1} + \sum_{i=1}^{n} \gamma_3 FDI_{i,t-1} + \varepsilon_{1i,t}$	The findings illustrate that, for developing countries, corruption has a negative impact on economic growth with a 0.382 coefficient at a 10% level of significance using annual data. While using quarterly data, the negative effect increases to a 0.419 coefficient, also at a 10% level of significance. However, FDI has a positive impact on growth with 4.516 and 5.565 coefficients at 1% significance using annual and quartar data, respectively. In addition, corruption has a negative impact on FDI with 0.134 and 0.144 coefficients at a 10% level of significance for annual and quartar data, respectively. When corruption increases by 1% in year t-1, economic growth increases by approximately 4% in year t, which has a huge effect on the growth of the developed economies from illegal economic variables like corruption and despite the sound governance these economies have. FDI has a huge positive impact on growth with 7.323 at 5% significance and 9.193 at 1% significance. These results go in line with the positive effect corruption has on FDI in developed countries. Illustratively, when corruption increases by 1% annually in year t-1, FDI increases by 4.474% in year t at 5% significance, as well as when corruption increases by 1% quarterly in year t-1, FDI increases by 2.563% in year t at 10% significance
Haseeb and Azam (2021)	low-, middle-, and high-income countries 1995 to 2015	Fully Modified Ordinary Least Squares (FMOLS) and Dumitrescu-Hurlin Panel Causality Tests.	$CO_{2it} = \alpha_0 + \alpha_1 TUR_{it} + \alpha_2 DEMO_{it} + \alpha_3 COR_{it} + \varepsilon_{it}$	The findings suggest that corruption and tourism are key factors in affecting CO_2 emissions. Moreover, when democracy increases in high-income countries, CO_2 emissions start to decrease. In addition, Granger causality results showed bidirectional causality between democracy and tourism variables and between corruption and CO_2 emissions. As well as revealing a unidirectional causality running from tourism to CO2 emissions and from tourism to corruption.
Ziernhold and Ivannikova (2021)	Ukraine from 1996 to 2019	ARDL-based error correction econometric models	$\Delta BM_t = \alpha_0 + \sum_{i=1}^{n} b_1 \Delta BM_{t-i} + \sum_{i=1}^{n} b_2 \Delta LnGDP_{t-i} + \sum_{i=1}^{n} b_3 \Delta CCI_{t-i} + \varphi_1 BM_{t-i} + \varphi_2 LnGDP_{t-i} + \varphi_3 CCI_{t-i} + \varepsilon_t$ $\Delta BM_t = \alpha_0 + \sum_{i=1}^{n} b_1 \Delta BM_{t-i} + \sum_{i=1}^{n} b_2 \Delta LnGDP_{t-i} + \sum_{i=1}^{n} b_3 \Delta CCI_{t-i} + \omega ECT_{t-1} + \varepsilon_t$	The results showed that when corruption increases by 1%, financial development, on the other hand, decreases by 16.39% in both the short and long term, indicating the strong negative relationship that both indicators have with each other.

3. DATA, SAMPLE, AND METHODOLOGY

Throughout the years, developed countries and international institutions have been fighting corruption. Tremendous efforts were exerted to overcome this issue, as it is a main reason for hindering economic growth, especially in LICs. Therefore, the study's main aim is to explore the relationship between economic growth and corruption in LICs. In the first hypothesis, we conjecture that with collective efforts to fight corruption, it should have a changing trend over time. According to the empirical literature findings in Table 1, we hypothesize that corruption has a negative impact on economic growth as well as a bidirectional relationship. As for the fourth hypothesis, according to Rahman et al. (2000), Jain (2001), and Cuervo-Cazurra (2008), transitional economies tend to have higher corruption rates to facilitate the investment environment. Since LICs are moving towards higher growth and development, corruption is expected to have a positive association with growth until a threshold is reached, after which the impact tends to be negative. In other words, corruption tends to be a diminishing feature.

What is the relationship between corruption and economic growth in LICs?

H2.1: Corruption has changing trends over time.

H2.2: Corruption has negative impact on economic growth.

H2.3: Bidirectional causality between corruption and economic growth.

H2.4: Corruption exhibits diminishing returns.

To examine our four hypotheses, the study will apply a set of econometric techniques. In examining the first hypothesis, the study will apply the panel stationarity test to be able to identify corruption as well as economic growth trends over time in LICs. To test the second hypothesis, the study will apply VAR lag length criteria to determine the suitable lag length for the data, followed by the OLS econometric technique to identify the relationship between corruption and growth along with the Kuznets hypothesis. In investigating the third hypothesis, the study will apply panel-granger causality.

Control of corruption estimates from world governance indicators by the World Bank are used as a measure for corruption, as well as GDP growth rates from world development indicators by the World Bank are used as a measure for economic growth. The data set is retrieved from 1996 to 2018 annually. The countries' control of corruption index ranges from -2.5 to 2.5, at which countries whose control of corruption index approaches -2.5 are the countries that suffer the most from corruption in the economy, while on the other hand, countries that approach 2.5 index values are the clean economies.

According to Figure 1, LICs are arranged according to their corresponding control of corruption index values. Somalia's control of corruption index approaches -2, in which it has the most corrupt economy in the low-income category. However, Rwanda's control of corruption is approximately 0.5, in which it has the least corrupt economy in the low-income category. Despite the fact that 0.5 as a value for control of corruption in Rwanda is still a low index value.

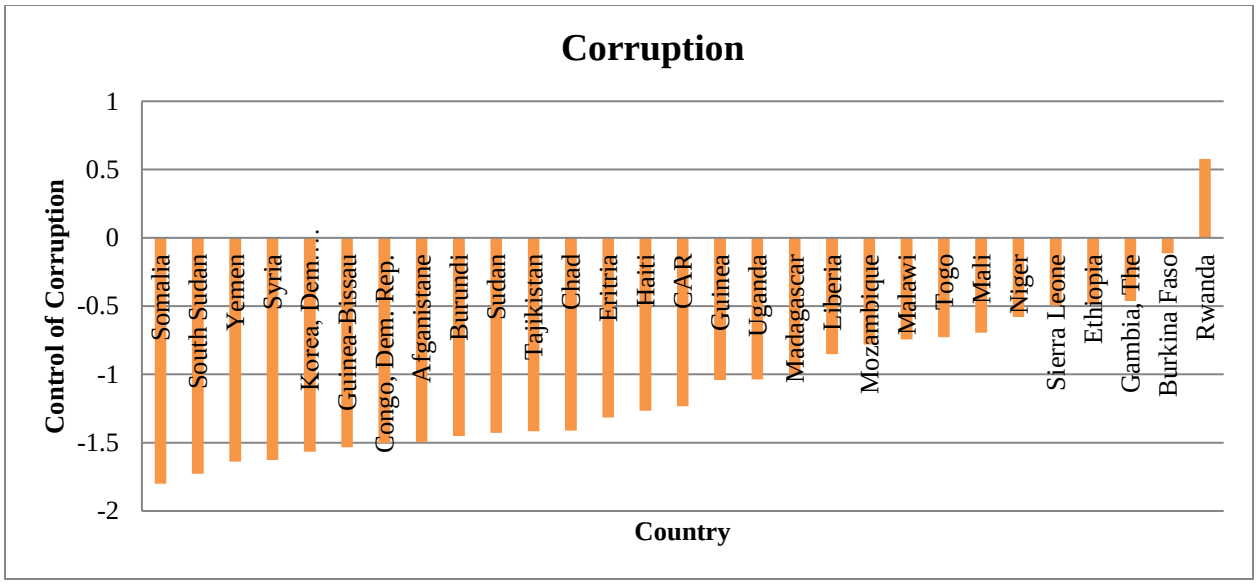

Figure 1: Control of Corruption Index Values Arrangements

Source: Author

The Pasimouns regression equation used in this study was adapted from Nageri et al. (2013). Where GDP is gross domestic product gross rates, are the constant values, β_1 are the coefficients of change, and corruption is the control of corruption index:

$$GDP_{i,t} = \alpha_1 + \beta_1 Corruption_{i,t}$$

4. EMPIRICAL RESULTS

Panel unit root test findings show that both economic growth and corruption are stationary at levels with a 1% significance level according to table 2. This gives an intuition about the performance of both corruption and growth over time in LICs. The stationarity behavior of economic growth and corruption over the period of 1996 to 2018 indicates that the tremendous efforts spent by developed countries and international organizations on boosting economic growth and combating corruption in LICs did not pay off. Thus, H2.1 is rejected, economic growth and corruption has on average constant mean and variance overtime.

Table 2: Panel Stationarity Test Results

Variable	Method	Statistic	Probability
Corruption	Levin, Lin & Chu t	-4.20396	0.0000
	Im, Pesaran and Shin W-stat	-2.44138	0.0073
	ADF - Fisher Chi-square	95.8313	0.0013
	PP - Fisher Chi-square	98.7447	0.0007
GDP Growth	Levin, Lin & Chu t	-25.9996	0.0000
	Im, Pesaran and Shin W-stat	-24.1501	0.0000
	ADF - Fisher Chi-square	623.840	0.0000
	PP - Fisher Chi-square	640.456	0.0000

4.1. Panel Granger Causality

Results show that there is a bidirectional causality running between economic growth and corruption levels in LICs at a 1% level of significance (table 3). Thus, H2.2 is supported.

Table 3: Panel Causality Test Results

Hypothesis	Probability
Corruption does not Granger Cause Economic Growth	0.0468
Economic Growth does not Granger Cause Corruption	0.0030

4.2. Panel Ordinary Least Squares

The study uses VAR lag order specifications to identify the optimal lag length in testing the relationship between economic growth and corruption. According to the Akaike information criterion, the optimal lag length is 8 (table 4). After specifying the optimal lag length, the dissertation used the Hausman test to identify which effect fits the model specification the most. According to table 5, Hausman test results are significant at 5%, which means that a fixed effect is more suitable for the model specification.

Table 4: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-540.0804	NA	2.176208	6.453338	6.490528	6.468431
1	-109.0417	846.6831	0.013485	1.369544	1.481115	1.414825
2	-102.2722	13.13615	0.013048	1.336574	1.522524	1.412041
3	-100.0616	4.236875	0.013329	1.357877	1.618207	1.463531
4	-95.28095	9.049157	0.013208	1.348583	1.683293	1.484424
5	-91.61210	6.857248	0.013262	1.352525	1.761616	1.518554
6	-47.55022	81.30467	0.008234	0.875598	1.359068*	1.071814
7	-43.68073	7.048001	0.008249	0.877151	1.435002	1.103554
8	-32.99918	19.20134*	0.007622*	0.797609*	1.429840	1.054199*
9	-29.99255	5.333201	0.007717	0.809435	1.516046	1.096212
10	-26.41984	6.252243	0.007761	0.814522	1.595513	1.131486

Table 5: Correlated Random Effects - Hausman Test

Test Summary	Probability
Cross-section random	0.0154

In testing the relationship between growth and corruption, the dissertation uses panel EGLS with fixed effects. The results demonstrate that corruption affects economic growth negatively after 8 lags at a 5% level of significance. When corruption increases by 1-unit, economic growth decreases by 1.194 units. See table 6. However, the dissertation will re-run panel EGLS with fixed effects to adjust it to an 8-lag period and remove all the statistically insignificant results. The adjusted results show that corruption decreases economic growth by nearly 100% after 8 years in LICs at a 5% level of significance and 82% R-squared (see table 7). Thus, H2.4 is supported.

Table 6: Panel EGLS (Cross-section weights)

Dependent Variable	Independent Variable	Coefficient	R-Squared
Economic Growth	Corruption	-0.484960	0.859554
	Corruption (-1)	-0.245132	
	Corruption (-2)	0.025442	
	Corruption (-3)	0.243577	
	Corruption (-4)	-0.221529	
	Corruption (-5)	-0.114653	
	Corruption (-6)	-0.573219	
	Corruption (-7)	0.023202	
	Corruption (-8)	(-1.194109) **	
	Constant	(1.783029) ***	

Table 7: Panel EGLS (Cross-section weights) - 8th lag

Dependent Variable	Independent Variable	Coefficient	R-Squared
Economic Growth	Corruption (-8)	(-0.976670) **	0.822144
	Constant	(3.569183) ***	

Moving to the country-specific effect corruption has on economic growth of each country from low-income category calculated from the fixed effect is explained following. According to table 8, corruption decreases economic growth in Afghanistan by 0.85, Burkina Faso by 3.04, Congo, Dem. Rep. by 1.9, Eretria by 0.496, Ethiopia by 6.387, Gambia, The by 0.72995, Guinea by 3.12, Guinea-Bissau by 0.28, Malawi by 1.35, Mali by 1.39, Mozambique by 2.6, Niger by 2.197, Rwanda by 4.777, Sierra Leone by 0.88, Tajikistan by 3.32, Togo by 1.599, and Uganda by 2.34. On the other hand, corruption exhibits a positive effect on economic growth in Burundi by 1.36, CAR by 2.23, Chad by 0.65, Haiti by 2.2, Liberia by 0.18661, Sudan by 0.746279, and Yemen by 6.659856.

Table 8: Fixed Effects

	Country	Effect	Net Coefficient
1	Afghanistan	-0.127891	-0.848779
2	Burkina Faso	2.071170	-3.04784
3	Burundi	-2.337788	1.361118
4	CAR	-3.209265	2.232595
5	Chad	-1.626730	0.65006
6	Congo, Dem. Rep.	0.942536	-1.919206
7	Eretria	-0.480756	-0.495914
8	Ethiopia	5.410406	-6.387076
9	Gambia, The	-0.246724	-0.72995
10	Guinea	2.147815	-3.124485
11	Guinea-Bissau	-0.694021	-0.282649
12	Haiti	-3.177724	2.201054
13	Liberia	-1.095331	0.118661
14	Madagascar	-0.194031	-0.782639
15	Malawi	0.374305	-1.350975
16	Mali	0.416076	-1.392746
17	Mozambique	1.644030	-2.6207
18	Niger	1.220819	-2.197486
19	Rwanda	3.800553	-4.777223

20	Sierra Leone	-0.094746	-0.881924
21	Sudan	-1.722949	0.746279
22	Tajikistan	2.347326	-3.323996
23	Togo	0.623225	-1.599895
24	Uganda	1.365779	-2.342449
25	Yemen	-7.636526	6.659856

4.3. Corruption Kuznets Curve (CKC)

The relationship between economic growth and corruption is negative, according to (Mauro 1995, Bakare 2011, Nageri et al. 2013, Malanski and Póvoa 2021, Mohammed et al. 2021, Song et al. 2021). Hence, the diminishing feature of the relationship over years has not been studied. Thus, the study integrates Kuznets curve hypothesis for inequality to examine the diminishing feature of corruption in LICs. The results illustrate that corruption exhibits a diminishing feature over time with regard to economic growth. In other words, corruption started to increase at the beginning of the years of development with increasing economic growth. With higher levels of development, corruption tends to decrease and economic growth continues to increase.

According to table 9, the diminishing feature proven for corruption is concluded from the significant negative relationship found between corruption and GDP_g^2 with a 0.0022 coefficient at 1% level of significance. Moreover, the positive relationship found between corruption and GDP_g means that when GDP_g increases by 1%, corruption rises by 0.0434%. The established relationship between corruption and economic growth results in an inverted U curve. Thus, H2.3 is supported. The point at which corruption starts to decrease is at 9.775% economic growth and a -7.95 level of corruption. The threshold point at which corruption starts to decrease is calculated according to Pao and Tsai (2010):

- $Corruption = -1.007368 + 0.043432GDP_g - 0.002221GDP_g^2$
- $\frac{d.Corruption}{d.GDP_g} = 0.043432 - 0.004442GDP_g = 0$
- $0.043432 = 0.004442GDP_g$
- $GDP_g = 9.7775\%$
- $Corruption = -7.95$

Table 9: Panel EGLS -Period Random Effects-

Dependent Variable	Independent Variable	Coefficient	R-Squared
Corruption	GDPg	(0.043432) ***	0.079245
	GDPg-Squared	(-0.002221) ***	
	Constant	(-1.007368) ***	

5. CONCLUSION

This study has explored the intricate relationship between corruption and economic growth in Low-Income Countries (LICs), employing a novel methodological approach through the application of the Kuznets hypothesis. Utilizing a dataset spanning from 1996 to 2018 for 29 LICs, our analysis reveals several crucial findings that contribute to the existing literature on corruption and economic development.

The results of our corruption analysis demonstrate a significant negative impact on economic growth in LICs. Specifically, we found that a one-unit increase in corruption is associated with a 0.98% decrease in economic growth after an 8-year lag. This finding aligns with previous studies by Mauro (1995), Bakare (2011), and Malanski and Póvoa (2021), reinforcing the detrimental effects of corruption on economic development. Moreover, our application of the Kuznets hypothesis unveiled an inverted U-shaped relationship between corruption and economic growth. This suggests that corruption exhibits diminishing returns, initially increasing with economic growth until a threshold of approximately 10% growth is reached, after which it begins to decrease.

These findings have important implications for policymakers in LICs. The lag effect observed in our study indicates that anti-corruption efforts may not yield immediate results, but are crucial for long-term economic development. The non-linear relationship implied by the Kuznets curve suggests that as LICs develop, they may experience an initial increase in corruption before seeing improvements. This underscores the need for sustained and comprehensive anti-corruption efforts throughout the development process.

Based on these findings, we propose the following policy recommendations: LIC governments should establish independent anti-corruption agencies with robust investigative and prosecutorial powers. Clear anti-corruption legislation should be developed and widely disseminated, accompanied by user-friendly guides and anonymous reporting systems. Enhancing transparency through e-governance systems, public disclosure of government budgets and contracts, and mandatory asset declarations for officials is essential. Strengthening the judiciary through specialized training and the establishment of anti-corruption courts is crucial. Public awareness campaigns and the integration of anti-corruption education into school curricula can help build a culture of integrity. The business environment can be improved by simplifying registration procedures, implementing robust whistleblower protection, and encouraging corporate compliance programs. Active participation in international anti-corruption initiatives and cooperation on cross-border investigations is also vital. Regular monitoring and evaluation of these efforts, including independent audits and annual progress reports, will help ensure their effectiveness.

While this study contributes significantly to our understanding of corruption in LICs, several avenues for future research remain. Further studies could explore the impact of other governance variables such as voice and accountability, political stability, government effectiveness, regulatory quality, and the rule of law on the corruption-growth nexus in LICs. Additionally, comparative analyses of countries that have successfully combated corruption could provide valuable insights into effective strategies and best practices. Such research would offer a more comprehensive roadmap for LICs in developing effective anti-corruption frameworks.

In conclusion, this study highlights the complex and dynamic nature of the relationship between corruption and economic growth in LICs. By shedding light on this critical issue, we hope to inform policy solutions and drive meaningful change. The fight against corruption in LICs is a long-term endeavor that requires sustained effort, but it is crucial for unlocking the full economic potential of these nations and improving the lives of their citizens.

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