THE EFFECT OF CORRUPTION ON PUBLIC DEBT SUSTAINABILITY: EVIDENCE FROM THE EUROPEAN UNION'S COUNTRIES

Hassan Alamro [*]

* Department of Economics, Business and Finance, Mutah University, Al-Karak, Jordan
Contact details: Department of Economics, Business and Finance, Mutah University, Al-Karak 61710, Jordan

Abstract

Corruption has significant implications for economic development and stability. It distorts market mechanisms, undermines public trust, and hampers investment and economic growth. Understanding the impact of corruption on the economy helps policymakers design effective anti-corruption measures and promote good governance. The dearth of studies examining the influence of corruption on the relationship between public debt and economic growth is the research challenge that the study addresses. Numerous studies have investigated the association between economic growth and public debt, but few have explored the impact of corruption on these variables. Our research aims to fill this gap by examining the impact of corruption on the connection between economic growth and public debt. To achieve this, we employed a dynamic panel generalized method of moments models (Arelleno & Bover, 1995) and fixed effects models using data from 28 countries spanning from 2012 to 2019. The empirical results show that there is a statistically significant interaction term between debt sustainability and corruption. This supports the idea that the impact of public debt on economic growth is a function of corruption, with a negative sign for the marginal effect. Therefore, public debt hinders economic growth in corrupt nations.

Keywords: Debt Sustainability, Economic Growth, Corruption, Generalized Method of Moments Models

Authors' individual contribution: The Author is responsible for all the contributions to the paper according to CRediT (Contributor Roles Taxonomy) standards.

Declaration of conflicting interests: The Author declares that there is no conflict of interest.

1. INTRODUCTION

The debt problem is regarded as one of the most critical economic issues in the world, having progressed from being primarily a problem of developing countries or poor countries to one that affects many of the world's major industrial countries. The public debt of many countries has reached critical levels due to massive growth in public spending, despite these countries having a weak real financial ability to service their debts in the long term. This has sparked a debate about these countries' future financial conditions and the importance of controlling the government sector and public spending.

Governments' excessive public spending, currently causing public debt growth, will be a burden on the state's public finances in the future. Future generations will bear the majority of the burdens, negatively impacting their welfare levels because they did not participate in making their own decisions. When the entire benefit of these debts goes to the current generation, they may not benefit at all. As a result, ensuring the sustainability

of public debt and public finances has become the primary goal for governments.

A country's public debt is considered sustainable if the government can fulfil all its current and future payment obligations without requiring extraordinary financial assistance or defaulting. Analysts assess whether debt stabilization policies are feasible and consistent with the country's growth potential or development progress. As a result, when countries borrow from financial markets, the risks associated with refinancing are significant (Baldacci & Kumar, 2010).

This means that sustainable public debt is the kind of debt that a state can service relatively easily and without the risk of defaulting on debt service. This requires that the funds derived from the debt are invested in a manner that generates income equal to or greater than the growth in debt service. To be considered sustainable, public debt must contribute to achieving a real growth rate in economic growth that is greater than the interest rate on debt.

Numerous studies have been conducted to investigate the relationship between public debt and economic growth (Abbas & Christensen, 2010; Fincke & Greiner, 2013; Woo & Kumar, 2015; Laina, 2011; Ogunmuyiwa, 2011). While most research shows that public debt has a negative influence on economic growth, some research indicates that the connection between public debt and economic growth depends on various factors, the most important of which is corruption (Kim & Kim, 2017; Benfratello et al., 2018; Ibrahim, 2021). Despite the abundance of literature, only a few researchers have focused on the role of corruption in the relationship between public debt and economic growth, particularly in the context of the European Union (EU). Hence, the current study aims to address this gap by investigating the impact of corruption on the sustainability of public debt in the context of European.

This was achieved by analysing panel data of 28 European nations published in the reports of euro area statistics. Econometrics methodology was adopted in the current study, namely: generalised method of moment (GMM) and fixed effect (FE).

The main question of this paper is whether corruption plays a moderating role in the association between public debt and economic growth. As far as we know, this is the first study to demonstrate that corruption has a moderating effect on debt sustainability. More specifically, the attempt to empirically assess whether the marginal impact of public debt on economic growth is a function of corruption distinguishes this paper. Furthermore, the study aims to provide in-depth and comprehensive assessments of public debt sustainability from which valuable policy implications can be extracted.

The structure of this paper is as follows. Section 2 reviews the relevant literature that investigates the relationship between corruption and economic growth. Section 3 presents the methodology that has been used to conduct empirical research and data description; furthermore, this section discusses the Model Specification. Section 4 discusses the results of the panel GMM and FE estimations. Section 5 addresses the discussion of the results. Section 6 concludes the paper.

2. LITERATURE REVIEW

First, corruption has the potential to influence both economic performance and public finance variables such as government expenditure, taxation, public debt, and investment. This study focuses on the role of corruption as a moderating factor in the relationship between debt and economic growth. Corruption may influence the relationship between debt and growth through various mechanisms. For example, in the most corrupt countries, money is spent on less productive projects rather than more productive ones (Lambsdorff, 2003; Mauro, 1998). As a result, if a corrupt country's public debt is used for inefficient spending, taking on more debt could be detrimental to the economy.

Second, tax evasion and the shadow economy, both of which are forms of corruption, can reduce debt sustainability by raising the budget deficit. This occurs when debt is used to fund the government's deficit rather than to stimulate economic growth (Schneider et al., 2010). Third, as Brunetti et al. (1997) argue, corruption may diminish investment. Furthermore, Mauro (1998) showed that corruption reduces education and health expenditure.

Several previous studies have investigated the association between public debt and corruption (Apergis & Apergis, 2019; Owusu-Nantwi & Owusu-Nantwi, 2021; González-Fernández & González-Velasco, 2014). Other research indicates that corruption harms economic performance and growth (Mauro, 1995/1998; Tanzi & Davoodi, 2000; Ibrahim, 2021; Olamide & Maredza, 2023). However, another viewpoint contends that corruption promotes economic progress by eliminating bureaucracy (Leff, 1964).

Kim and Kim (2017) found a statistically significant connection between corruption and public debt in their empirical investigation. This provides evidence for the hypothesis that corruption has a significant influence on the impact of public debt on economic growth. According to the findings, in corrupt countries, the marginal effect is negative, implying that public debt hinders economic growth. In contrast, public debt may boost economic growth in non-corrupt and transparent governments. However, the literature that is more explicitly related to public debt is that which investigates the influence of corruption on debt. Corruption, according to González-Fernandez and González-Velasco (2014), has a large and favourable influence on government debt in Spain's autonomous communities. Cooray et al. (2017) also discovered that corruption contributes to an increase in government debt and that this effect is exacerbated by the presence of a shadow economy, high government expenditure, and military spending.

According to Jalles (2011), countries with lower levels of corruption countries can better manage and utilise their debt. Therefore, the amount of debt at which the effect of debt on growth turns negative (threshold of debt) is larger in lower corruption countries. On the other hand, Njangang (2018) found that corruption has a positive effect on public debt in Sub-Saharan African countries. Therefore, these countries must intensify their anti-corruption efforts to improve the efficiency of their public expenditures and, more importantly, to decrease their sovereign debt. González-Fernández and González-Velasco (2014) contend that the volume of

the shadow economy has a significant and positive impact on regional public debt. Corruption has a clear and significant relationship with public debt in autonomous communities, while its influence is smaller than that of the shadow economy.

Many studies have confirmed that corruption has several adverse effects on economic activity. Cooray et al. (2017) found that corruption reduces economic growth, deters investment (Mauro, 1995; Brunetti et al., 1997), and limits foreign direct investment (Lambsdorff, 2003). Furthermore, highly corrupt countries experience increased inflation (Al-Marhubi, 2000), a higher shadow economy (Friedman et al., 2000; Schneider et al., 2010), and lower spending on education and health (Mauro, 1998).

Gupta et al. (2001) indicate that corruption is connected to a higher percentage of military spending as a percentage of gross domestic product (GDP), as well as overall government spending. Similar findings are advanced by Delavallade (2006). Furthermore, evidence suggests that corruption encourages the growth of the shadow economy. Friedman et al. (2000) argue that corruption is associated with an increase in unofficial activity, which lowers revenue from taxes. Johnson et al. (1998) present a similar argument, contending that a government's capacity to provide public goods to the official sector is diminished by tax evasion by the informal sector.

Empirical evidence from Benfratello et al. (2018) confirms that corruption increases public debt. According to Ketkar et al. (2005), a one-point increase in Corruption Perception Index (CPI) generates an extra foreign direct investment of 0.5% of GDP. Moreover, a three-point increase in CPI would increase corporation tax by more than double. Owusu-Nantwi and Owusu-Nantwi (2021) showed a statistically significant and positive correlation between governmental debt and corruption. The analysis also reveals that the shadow economy has a positive and statistically significant impact on public debt. In addition, there is a short-term, unidirectional causal relationship between public debt, the shadow economy, and corruption. The direction of causation is from public debt to corruption.

Furthermore, the empirical findings of Apergis and Apergis (2019) indicate that the relationship between corruption and debt is non-linear with a substantial threshold impact. The study reveals that public debt responds faster to a high-corruption regime than to a low-corruption regime, whereas increases in the size of the shadow economy, government spending, inflation, debt interest payments, and military spending all increased the debt-to-GDP ratio. According to Ibrahim (2021), high levels of corruption hinder long-term economic growth and exacerbate the negative impact of public debt on economic growth in emerging nations.

According to research conducted by Rivi et al. (2020), there is a negative relationship between corruption and debt sustainability in Nigeria, suggesting that high levels of corruption lead to unsustainable debt in the public sector. The same result was previously confirmed by Ogbaro et al. (2022), who argued that public debt in Nigeria promotes economic growth when corruption is kept to a minimum. Based on Van et al. (2020), reducing corruption mitigates the harmful consequences of budget deficits and public debt on the viability of long-term economic growth in developing countries. According to research conducted by Eğrican et al. (2022), Turkey may achieve debt sustainability and eliminate corruption by strengthening tax and procurement laws.

3. RESEARCH METHODOLOGY

Several studies used pooled time series-cross section analysis to assess the impact of corruption on public debt, as this method is considered one of the best estimation methods, allowing the performance of several statistical tests and treatments by adding it to individual and/or time influences in the model formulation. This method is also known as random effects and fixed effects.

In this study, we employed the GMM developed by Arelleno and Bover (1995) to obtain accurate results. This method was used to improve the quality of cross-sectional data assessment because of its high capacity to handle problems of bias caused by neglecting some independent variables, as well as address the endogeneity problem and prevent the impacts of the unit root. We used a dynamic panel data model in accordance with the theoretical framework of the economic model to investigate the impact of corruption on the sustainability of public debt.

3.1. Model specification

There is widespread consensus that a quick and persistent increase in the percentage of public debt to GDP does not result in fiscal policy sustainability. When a fiscal deficit occurs, it is financed by borrowing (raising governmental debt), which raises interest payments. Here, a simple model will be built to measure public debt sustainability.

The relationship in the t period can be expressed as follows (Contessi, 2012):

$$D_t = (1 + i_t)D_{t-1} + PD_t \qquad (1)$$

where, D_t represents government debt at the end of period t, PD_t represents the primary deficit during the t period, and i_t represents the nominal interest rate on government debt.

Divided the equation 1 by nominal GDP (P_tY_t):

$$D_t/P_tY_t = ((1 + i_t)D_{t-1})/ P_tY_t + PD_t/P_tY_t \qquad (2)$$

where, P_tY_t represents the product of $(1 + \pi_t)$ and $(1 + g_t)$ multiplied by $P_{t-1}Y_{t-1}$, with Y_t denoting real GDP, P_t — the implicit deflator in GDP, π_t — the inflation rate, g_t — the growth rate to real GDP.

$$D_t/P_tY_t = ((1 + i_t))/((1 + \pi_t)(1 + g_t))(D_{t-1}/ \atop (P_{t-1}Y_{t-1}) + PD_t/P_tY_t \qquad (3)$$

$$d_t = ((1 + i_t))/((1 + \pi_t)(1 + g_t))d_{t-1} + pd_t \qquad (4)$$

As the nominal interest rate consists of the real interest rate and the inflation rate where, $(1 + i_t) = (1 + \pi_t)(1 + r_t)$, r_t — the real interest rate on government debt, d_t — the ratio of public debt to nominal GDP.

$$d_t = ((1 + \pi_t)(1 + r_t))/((1 + \pi_t)(1 + g_t)) \, d_{t-1} + pd_t \tag{5}$$

$$d_t = ((1 + r_t))/((1 + g_t)) \, d_{t-1} + pd_t \tag{6}$$

$$d_t - d_{t-1} = \{((1 + r_t))/((1 + g_t)) - 1\} \, d_{t-1} + pd_t \tag{7}$$

$$\Delta d_t = ((r_t - g_t))/((1 + g_t)) \, d_{t-1} + pd_t \tag{8}$$

Assuming the small size of g, $((r_t - g_t)/(1 + g_t))$ is close to $(r_t - g_t)$, we get:

$$\Delta d_t = (r_t - g_t) \, d_{t-1} + pd_t \tag{9}$$

where Δd_t represents the changes in the ratio of government debt to the nominal GDP, and pd_t refers to the ratio of primary deficit to nominal GDP.

For public debt to be sustainable, it must be able to generate a real GDP growth rate that is higher than the real interest rate on borrowed funds. This means that economic decision-makers must avoid resorting to large public budget deficits, as this can increase borrowing rates and risk an interest rate hike that could negatively impact private investment and economic growth, ultimately leading to fiscal policy unsustainability (Belhocine & Dell'Eraba, 2013).

If the interest rate (r) is higher than the growth rate of real GDP (g), then the debt-to-GDP ratio will continue to climb, especially if the balance sheets are in deficit. This implies that fiscal policy and public debt are unsustainable. However, if the interest rate is lower than the rate of real growth, the economy can always run a public-balance deficit, and both public debt and fiscal policy are sustainable (Belhocine & Dell'Eraba, 2013).

The main argument of this study is that public debt may not be a huge issue itself, but when linked to corruption, it becomes more of a concern. Additionally, the influence of public debt on economic growth is not the same across all countries. To estimate the impact of corruption on debt sustainability, we utilise a standard panel growth regression model. The fundamental model is as follows:

$$DTS_{it} = f(CUR_{it}, GE_{it}, INF_{it}, POP_{it}) \tag{10}$$

where, i and t denote the countries included in the analysis and the time periods considered, respectively (where $i = 1, \ldots, 28$ and $t = 2012, \ldots, 2019$), DTS represents debt sustainability, while CUR refers to the corruption index, GE is the government expenditure percentage of GDP, INF is the inflation rate, and POP is population growth.

3.2. Data description

For this study, we used a sample of 28 member states of the EU over the period 2012–2019. This period was selected based on the availability of data. The debt sustainability index (DTS) is the dependent variable in our research, measured using equation nine. The data was obtained from the euro area statistics.

Our main independent variable is *corruption*. We used the CPI developed by Transparency International (2022). The CPI is a composite index based on a combination of surveys and assessments of corruption from 13 different sources. It scores and ranks countries based on their perceived level of corruption in the public sector, with a score of 0 indicating a very high level of corruption and a score of 100 indicating a highly clean country.

The CPI includes sources that offer a score for a group of countries or territories that measure perceptions of corruption in the public sector. To be included in the ranking, a country or territory must appear in at least three of the CPI data sources. Transparency International publishes the CPI.

The control variables, although not identical, were selected in accordance with the previous literature (Benfratello et al., 2018; Kim & Kim, 2017). Among these control variables, we have government expenditure as a percentage of GDP, population growth, and inflation rate. Descriptive statistics and different data sources are presented in Table 1.

Table 1. Descriptive statistics

Variable	Mean	Maximum	Minimum	Standard Deviation	Observations	Sources
DTS	11.62	34.5	0.9	5.3872	224	euro area statistics
CUR	64.29	92	36	14.628	224	euro area statistics
GE	44.75	62.4	24.8	6.8828	224	euro area statistics
INF	1.24	5.7	-1.6	1.2555	224	euro area statistics
POP	0.24	3.75	-1.60	0.8254	224	euro area statistics

Table 1 provides descriptive statistics for the 28 countries included in our analysis. The CPI scores, which measure corruption, range from 36 to 92. A higher score indicates lower corruption in the country. The average CPI score is 64.29. Regarding debt sustainability, the average is 11.62, with a notable variation between the minimum score of 0.9 and the maximum score of 34.5.

4. RESULTS

The current paper examines the hypothesis that posits a negative impact of corruption on the relationship between public debt and economic growth. Accordingly, this study estimated the econometric model using panel fixed effects and the system GMM. Equation (11) expresses the dynamic panel data model as follows:

$$y_{i,t} = X_{i,t} \, \beta + \varpi_i + \eta_t + \mu_{i,t} \tag{11}$$

where, $y_{i,t}$ represents the debt sustainability for country i in period t; $X_{i,t}$ is a vector that includes all independent variables, including the corruption index and control variables; ϖ_i captures the country-specific effect, and η_t considers the relevant time effect; μ_{it} is a random error term that captures the effect of all omitted variables. Equation (11) is calculated using the first difference GMM (Arelleno & Bover, 1995).

Table 2. Estimation results

Variable	FE (1)	GMM (2)	Orthogonal GMM (3)
DTS (-1)	-	0.489204*** (0.000)	0.365774*** (0.000)
CPI	0.271067** (0.035)	1.230161*** (0.000)	0.287238** (0.028)
GE	-0.712522*** (0.000)	-1.005176*** (0.000)	-0.85112*** (0.000)
INF	1.556161*** (0.000)	2.905241*** (0.000)	2.685011*** (0.000)
POP	0.346786 (0.751)	-8.069892*** (0.004)	-1.31597** (0.020)
Constant	24.06385 (0.019)	-	-
Observations	224	168	168
Number of Countries	28	28	28
R-Squared	0.424982	-	-
AR (1)	-	-2.863042 (0.0042)	-
AR (2)	-	-0.538091 (0.5905)	-

Note: Robust standard errors are reported in parenthesis. ***, **, and * denotes significance level at 1%, 5%, and 10%, respectively.

The outcomes of our analysis are presented in Table 2. Column 1 presents the results of the fixed effects[1] estimation, and Columns 2 and 3 summarise the GMM dynamic panel regression estimation results.

The results indicate that the coefficients of the CPI are positive and statistically significant at the 1% and 5% levels. This implies that as the CPI score increases (i.e., corruption decreases), debt sustainability increases. Thus, the fixed effect results in Column 1 demonstrate that a 1-unit decrease in corruption leads to an increase in debt sustainability of 0.27 units. The GMM results in Column 2 exhibit a similar relationship, where a 1-unit decrease in corruption leads to an increase in debt sustainability of 0.29 units.

These findings suggest that a rise in corruption leads to debt leakage into areas that do not stimulate economic growth, thus reducing debt sustainability. This aligns with the conclusion reached by Kim and Kim (2017) that the relationship between public debt and economic growth is affected by corruption. Furthermore, all control factors are found to be statistically significant. For example, the results in Columns 1, 2, and 3 indicate that government expenditure as a proportion of GDP has a negative influence on debt sustainability. A one-unit rise in government expenditure as a percentage of GDP is estimated to decrease debt sustainability by 0.71, 1.00, and 0.85 units, respectively.

Furthermore, the results in Columns 1, 2, and 3 indicate that inflation has a positive effect on debt sustainability. A one-unit rise in the inflation rate results in a decrease in debt sustainability at rates of 1.55, 2.90, and 2.68 units, respectively. In terms of population growth rate, Columns 2 and 3 demonstrated a negative influence on debt sustainability. A one-unit increase in population growth results in a one-unit decrease in debt sustainability at rates of 8.06 and 1.31 units, respectively.

Given these findings, it is possible to conclude that corruption may have an indirect impact on economic growth through the debt channel. Corruption, in particular, may lead to resource misallocation and inefficient use of borrowed funds, resulting in larger levels of external debt. This, in turn, may hamper economic growth owing to the weight of debt repayment and lower investment in the economy's productive sectors.

Corruption may also weaken institutions and governance systems, making effective debt management techniques and debt servicing harder to implement. Furthermore, corruption may hinder foreign investment and slow economic growth, exacerbating debt sustainability issues. Therefore, addressing corruption is crucial for maintaining debt sustainability and ensuring that borrowed funds are used efficiently and effectively for the benefit of the economy.
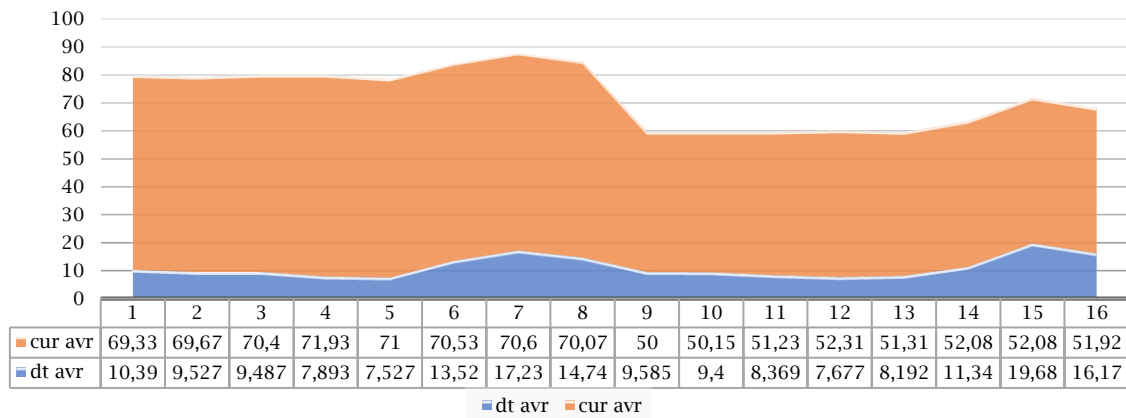
Models *AR (1)* and *AR (2)* were used in a diagnostic test. According to Table 2, the *p-value* for *AR (1)* was less than 5%. The result clearly demonstrates that first-order autoregressive was appropriate and occurred in this study as a result of the impact of period *t-1* on period in *t*. *AR (2)* is an abbreviation for second-order autoregressive. However, *AR (2)* is of greater importance in GMM than *AR (1)* since *AR (2)* emphasises the errors in *AR (1)*. Table 2 indicates that the *p-values* for both *AR (2)* models were more than 10%, indicating that the models had no autocorrelation.

5. DISCUSSION

The results of the econometric analysis can be supported and confirmed through the Figure 1, which presents the relationship between the CPI and public debt sustainability in the EU from 2012 to 2019.

---

[1] Both fixed and random effects models were estimated. However, based on the results of the Hausman test, the fixed effects model was found to be relatively more reliable. Therefore, the paper reports results only for panel fixed effect estimation. However, the unreported results will be available upon request.

Figure 1. The relationship between the CPI and public debt sustainability

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
■ cur avr	69,33	69,67	70,4	71,93	71	70,53	70,6	70,07	50	50,15	51,23	52,31	51,31	52,08	52,08	51,92
■ dt avr	10,39	9,527	9,487	7,893	7,527	13,52	17,23	14,74	9,585	9,4	8,369	7,677	8,192	11,34	19,68	16,17

■ dt avr   ■ cur avr

The CPI ranks countries based on how corrupt their public sector is perceived to be, with a score of 0 indicating a highly corrupt country and 100 indicating a very clean country. Figure 1 indicates an inverse relationship between corruption and debt sustainability, suggesting that the negative impact of corruption on economic growth can be transmitted through the public debt channel. This relationship can be further understood through the following channels:

• Corruption leads to misallocation of resources, diversion of funds, and inefficient public spending, resulting in higher levels of public debt and reduced capacity to service the debt.

• Corrupt practices such as embezzlement, bribery, and favouritism can lead to inflated project costs, lower-quality infrastructure, and reduced returns on public investments, further exacerbating the debt burden.

• Corruption erodes public trust and weakens institutions, making it difficult to implement effective fiscal policies and reforms necessary for debt sustainability.

• The negative effect of corruption on debt sustainability highlights the importance of addressing corruption through institutional reforms and transparency measures to ensure efficient use of public resources and maintain sustainable levels of debt.

Ibrahim (2020) emphasized the negative impact of corruption on public debt spending, which can result in funds being directed towards less productive enterprises in more corrupt countries, ultimately slowing economic growth. Additionally, Apergis and Apergis (2019), as well as González-Fernández and González-Velasco (2014), found that corruption can negatively affect government revenues through tax evasion and the shadow economy. This reduction in public revenues can increase the public budget deficit, leading to increased borrowing from abroad and ultimately contributing to increased indebtedness, which, in turn, can harm economic growth.

6. CONCLUSION

After reviewing previous studies, it became clear that some focused on the relationship between public debt and economic growth, while others examined the relationship between public debt and corruption. However, none explored the impact of corruption on debt sustainability.

Thus, we collected data from 28 countries over the period of 2013 and 2019 and utilised dynamic panel GMM models (Arellano & Bond, 1991) and fixed effects models to analyse the relationship between debt sustainability and corruption. The empirical findings indicate that there is a statistically significant interaction term between debt sustainability and corruption. This supports the hypothesis that corruption determines how public debt affects economic growth, with a negative sign for the marginal effect. As a result, public debt discourages economic growth in corrupt societies.

To maintain the sustainability of public debt, policymakers must ensure that revenues generated by public debt are invested in productive firms that provide higher returns than debt payments. These findings highlight the need for all governments to estimate their debt threshold, monitor its sustainability, and be mindful of how corruption in all its forms can jeopardize the sustainability of public debt.

This paper highlights the importance of considering corruption as a factor when studying the relationship between public debt and economic growth, suggesting that future research should continue to explore this relationship from a different perspective or with better data.

Furthermore, the article adds to the continuing debate about the impact of public debt on economic performance by shedding light on the detrimental impact of public debt in corrupt nations and the good impact in highly transparent countries.

Furthermore, the findings highlight the importance of effective anti-corruption institutions, revisiting whistleblower policies, and promoting transparency in financial transactions to mitigate the detrimental effects of corruption on debt sustainability and economic development.

However, one of the study's limitations was its investigation of a dataset encompassing 22 countries from 2012 to 2019, which might have limited how extensively the findings could be generalised to other countries or time periods.

Future research may consider a larger time span and (or) different countries sample. Further, advance econometrics approach such as threshold could be used as well as panel ARDL to address any non-linearity both short-term and long-term impact.

REFERENCES

Abbas, S. A., & Christensen, J. E. (2010). The role of domestic debt markets in economic growth: An empirical investigation for low-income countries and emerging markets. *IMF Staff Papers, 57*(1), 209–255. https://doi.org/10.1057/imfsp.2009.24

Al-Marhubi, F. A. (2000). Corruption and inflation. *Economics Letters, 66*(2), 199–202. https://doi.org/10.1016/S0165-1765(99)00230-X

Apergis, E., & Apergis, N. (2019). New evidence on corruption and government debt from a global country panel: A non-linear panel long-run approach. *Journal of Economic Studies, 46*(5), 1009–1027. https://doi.org/10.1108/JES-03-2018-0088

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277–297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another Look at instrumental variable estimation of error component models. *Journal of Econometrics, 68*(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Baldacci, E., & Kumar, M. (2010). *Fiscal deficits, public debt & sovereign bond yields* (Working Paper No. 2010/184). International Monetary Fund. https://doi.org/10.2139/ssrn.1669865

Banzhaf, H. S., & Oates, W. E. (2013). On fiscal illusion in local public finance: Re-examining Ricardian equivalence and the renter effect. *National Tax Journal, 66*(3), 511–540. https://doi.org/10.17310/ntj.2013.3.01

Belhocine, N., & Dell'Erba, M. S. (2013). *The impact of debt sustainability and the level of debt on emerging markets spreads* (Working Paper No. 2013/093). International Monetary Fund. https://doi.org/10.5089/9781484382769.001

Benfratello, L., Del Monte, A., & Pennacchio, L. (2018). Corruption and public debt: A cross-country analysis. *Applied Economics Letters, 25*(5), 340–344. https://doi.org/10.1080/13504851.2017.1321831

Brunetti, A. (1997). Political variables in cross-country growth analysis. *Journal of Economic Surveys, 11*(2), 163–190. https://doi.org/10.1111/1467-6419.00029

Contessi, S. (2012). An application of conventional sovereign debt sustainability analysis to the current debt crises. *Federal Reserve Bank of St. Louis, 94*(3), 197–220. https://doi.org/10.20955/r.94.197-220

Cooray, A., Dzhumashev, R., & Schneider, F. (2017). How does corruption affect public debt? An empirical analysis. *World Development, 90*, 115–127. https://doi.org/10.1016/j.worlddev.2016.08.020

Delavallade, C. (2006). Corruption and distribution of public spending in developing countries. *Journal of Economics and Finance, 30*(2), 222–239. https://doi.org/10.1007/BF02761488

Eğrican, A. T., Caner, S., & Togan, S. (2022). Reforming public debt governance in Turkey to reach debt sustainability. *Journal of Policy Modeling, 44*(5), 1057–1076. https://doi.org/10.1016/j.jpolmod.2022.07.004

Fincke, B., & Greiner, A. (2013). *On the relation between public debt and economic growth: An empirical investigation* (Working Paper in Economic and Management No. 24–2013). Bielefeld University. https://d-nb.info/1150851724/34

Friedman, E., Johnson, S., Kaufmann, D., & Zoido-Lobaton, P. (2000). Dodging the grabbing hand: The determinants of unofficial activity in 69 countries. *Journal of Public Economics, 76*(3), 459–493. https://doi.org/10.1016/S0047-2727(99)00093-6

González-Fernández, M., & González-Velasco, C. (2014). Shadow economy, corruption and public debt in Spain. *Journal of Policy Modelling, 36*(6), 1101–1117. https://doi.org/10.1016/j.jpolmod.2014.10.001

Grosu, A. C., Pintilescu, C., & Zugravu, B. (2022). Trends in public debt sustainability in Central and Eastern EU countries. *Post-Communist Economies, 34*(2), 173–195. https://doi.org/10.1080/14631377.2020.1867431

Gupta, S., de Mello, L., & Sharan, R. (2001). Corruption and military spending. *European Journal of Political Economy, 17*(4), 749–777. https://doi.org/10.1016/S0176-2680(01)00054-4

Ibrahim, C. (2021). Corruption, public debt and economic growth — Evidence from developing countries. *International Journal of Development Issues, 20*(1), 24–37. https://doi.org/10.1108/IJDI-12-2019-0208

Jalles, J. T. (2011). The impact of democracy and corruption on the debt-growth relationship in developing countries. *Journal of Economic Development, 36*(4), 41–72. https://doi.org/10.35866/caujed.2011.36.4.003

Johnson, S., Kaufmann, D., & Zoido-Lobaton, P. (1998). Regulatory discretion and the unofficial economy. *The American Economic Review, 88*(2), 387–392. https://www.jstor.org/stable/116953

Ketkar, K. W., Murtuza, A., & Ketkar, S. L. (2005). Impact of corruption on foreign direct investment and tax revenues. *Journal of Public Budgeting, Accounting & Financial Management, 17*(3), 313–341. https://doi.org/10.1108/JPBAFM-17-03-2005-B004

Kim, E., Ha, Y., & Kim, S. (2017). Public debt, corruption and sustainable economic growth. *Sustainability, 9*(3), Article 433. https://doi.org/10.3390/su9030433

Laina, P. (2011). *Dynamic effects of total debt and GDP: A time-series analysis of the United States.* [Master's thesis, Aalto University]. https://core.ac.uk/download/pdf/80701286.pdf

Lambsdorff, J. G. (2003). How corruption affects productivity. *Kyklos, 56*(4), 457–474. https://doi.org/10.1046/j.0023-5962.2003.00233.x

Leff, N. H. (1964). Economic development through bureaucratic corruption. *American Behavioral Scientist, 8*(3), 8-14. https://doi.org/10.1177/000276426400800303

Mauro, P. (1995). Corruption and growth. *The Quarterly Journal of Economics, 110*(3), 681–712. https://doi.org/10.2307/2946696

Mauro, P. (1998). Corruption and the composition of government expenditure. *Journal of Public Economics, 69*(2), 263–279. https://doi.org/10.1016/S0047-2727(98)00025-5

Njangang, N. H. (2018). Impact of corruption on public debt: Evidence from Sub-Saharan African countries. *American Journal of Economics, 8*(1), 14–17. https://doi.org/10.5923/j.economics.20180801.03

Ogbaro, E. O., Young, A. O., & Bank-Ola, R. F. (2022). Revisiting the threshold effect of corruption in the link between public debt and economic growth in Nigeria. *Economic Journal of Emerging Markets, 14*(2), 151–161. https://doi.org/10.20885/ejem.vol14.iss2.art1

Ogunmuyiwa, M. S. (2011). Does external debt promote economic growth in Nigeria? *Current Research Journal of Economic Theory, 3*(1), 29–35. https://maxwellsci.com/print/crjet/v3-29-35.pdf

Olamide, E. G., & Maredza, A. (2023). Pre-COVID-19 evaluation of external debt, corruption and economic growth in South Africa. *Review of Economics and Political Science*, 8(1), 19–36 https://doi.org/10.1108/REPS-03-2021-0019

Owusu-Nantwi, V., & Owusu-Nantwi, G. (2021). Public debt, corruption and shadow economy in Africa: An empirical analysis. *Journal of Economic and Administrative Sciences*, 39(1), 184–202, https://doi.org/10.1108/JEAS-08-2020-0150

Rivi, M. T., Ogboru, I., & Rivi, D. J. (2020). An analysis of the long-run relationship between corruption and debt sustainability in Nigeria. *RAIS Journal for Social Sciences, 4*(2), 71–88. https://journal.rais.education/index.php/raiss/article/download/135/104

Schneider, F., Buehn, A., & Montenegro, C. E. (2010). Shadow economies all over the world: New estimates for 162 countries from 1999 to 2007. In F. Schneider (Ed.), *Handbook on the shadow economy* (Chapter 1). Edward Elgar Publishing. https://doi.org/10.4337/9780857930880.00007

Shittu, W. O., Hassan, S., & Nawaz, M. A. (2018). The nexus between external debt, corruption and economic growth: Evidence from five SSA countries. *African Journal of Economic and Management Studies, 9*(3), 319–334. https://doi.org/10.1108/AJEMS-07-2017-0171

Tanzi, V., & Davoodi, H. (2000). *Corruption, growth, and public finances* (Working Paper No. 2000/182). International Monetary Fund. https://doi.org/10.5089/9781451859256.001

Transparency International. (2022). *Corruption perceptions index 2022.* https://www.transparency.org/en/cpi/2022

Van, V. T. T., Ha, N. T. T., Quyen, P. G., Anh, L. T. H., & Loi, D. T. (2020). The relationship between public debt, budget deficit, and sustainable economic development in developing countries: The role of corruption control. *Journal Ekonomi & Studi Pembangunan, 21*(1), 84–104. https://doi.org/10.18196/jesp.21.1.5033

Woo, J., & Kumar, M. S. (2015). Public debt and growth. *Economica, 82*(328), 705–739. https://doi.org/10.1111/ecca.12138