Fiscal Deficit, Corruption and Gross Capital Accumulation in Ghana: a structural VAR Approach

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Abstract

This study investigates the dynamic interrelationships among fiscal deficits, corruption, and private capital accumulation in Ghana using structural vector autoregression (SVAR) methodology over the period 1990-2022. Ghana's persistent fiscal imbalances and endemic corruption represent critical impediments to sustainable development, yet their complex interactions with private investment behavior remain underexplored in existing literature. Employing impulse response functions and variance decomposition analysis, we examine both short-run dynamics and causal relationships among these variables while accounting for their endogenous interactions. The empirical results reveal no long-run cointegrating relationship among the variables, indicating that interactions are primarily characterized by short-run dynamics completing within three periods. Impulse response analysis demonstrates bidirectional causality between corruption and fiscal deficits, with corruption systematically worsening fiscal performance while fiscal stress creates conditions conducive to corrupt behavior. Notably, corruption innovations generate positive short-run effects on private capital accumulation, suggesting adaptive rent-seeking strategies by private actors in weak institutional environments. Variance decomposition reveals that corruption contributes 11% to fiscal balance variation - the strongest cross-variable relationship in the system - while private capital formation exhibits the greatest sensitivity to both fiscal and corruption shocks. The findings support integrated policy approaches addressing governance and fiscal dimensions simultaneously. Key recommendations include procurement system modernization, strengthened institutional oversight mechanisms, and coordinated anti-corruption and fiscal consolidation strategies. The three-period adjustment horizon suggests that well-designed reforms could generate relatively rapid improvements in macroeconomic and institutional outcomes, providing optimistic prospects for Ghana's development under appropriate policy frameworks.

Keywords: *Fiscal deficit, corruption, private capital accumulation, structural VAR, governance*

1.0 INTRODUCTION

Ghana's persistent fiscal imbalances and endemic corruption represent critical impediments to sustainable economic development, with far-reaching consequences for capital accumulation and long-term growth prospects (Dithebe et al. 2019; Fagbemi & Olatunde 2019). The country's chronic fiscal deficits, which have over the years been characterized by systematic excess of government expenditures over revenues have necessitated extensive reliance on debt financing, thereby compromising macroeconomic stability and public investment (Yonk & Bobek 2020). This fiscal deterioration reflects deeper structural vulnerabilities in Ghana's public financial management system, such as inadequately diversified revenue base and persistent challenges in expenditure

control (Aryeetey & Kanbur 2017). The resulting macroeconomic distortions have become manifest through elevated debt-to-GDP ratios, inflationary pressures, and diminished fiscal space for critical investments in human capital development and infrastructure (IMF 2023, 2021). These fiscal challenges have been further compounded by pervasive corruption, which not only erodes public resources but also undermines the efficiency of government expenditure and as well distorts investment allocation decisions (Osei & Ogunkola, 2022). The confluence of these factors creates a complex web of interactions that potentially constrains Ghana's capacity for sustained capital formation and economic transformation, necessitating a comprehensive empirical investigation of their dynamic relationships and transmission mechanisms.

The institutional foundations underlying these fiscal challenges deserve critical examination. It is very critical to point out weak accountability mechanisms that have systematically enabled rent-seeking behaviors in further exacerbating the problem of fiscal imbalances (Riyadi 2020). This institutional decay manifests most prominently through pervasive corruption, which we operationally define as the abuse of entrusted public power for private gain through bribery, embezzlement, and fraudulent procurement practices. Such practices have become deeply embedded within Ghana's political economy, paradoxically coexisting with the country's democratic credentials and regional leadership aspirations (Andoh Rıchard 2021).

The empirical magnitude of this governance crisis is striking. Conservative estimates indicate that Ghana lost approximately USD 3.0 billion to corrupt practices in 2018 alone, representing 4.2% of national GDP (Rahman 2018; Duho et al. 2021). More recent assessments by the United Nations Office on Drugs and Crime revealed that bribery payments to public officials reached 5.0 billion Ghana cedis in 2021—equivalent to nearly one-third of the national budget (UNODC 2022). These extraordinary resource leakages directly reduce funds available for productive public investment. Beyond direct losses, corruption creates systematic distortions in capital allocation decisions and undermines government expenditure efficiency (Daswani 2020). The cumulative effect erodes the social contract between citizens and the state, generating a vicious cycle of diminished public trust, which further weakens fiscal accountability mechanisms.

This institutional degradation reveals a more complex theoretical puzzle (Andoh Rıchard 2021). Thus, the relationship between corruption and fiscal deficits transcends simple unidirectional causality to encompass intricate bidirectional feedback mechanisms that amplify macroeconomic instability. Rather than merely resulting from weak fiscal oversight, corruption actively perpetuates and magnifies fiscal imbalances through distinct yet interconnected transmission channels. Systematic resource leakages, deliberately inflated procurement costs, and unauthorized off-budget expenditures not only compromise allocative efficiency but also erode the tax base by undermining revenue mobilization efforts and discouraging voluntary compliance. These mechanisms generate a self-reinforcing dynamics whereby fiscal stress systematically weakens institutional oversight capacity, creating expanded opportunities for rent extraction and ultimately leading to further deterioration in public financial management.

Ghana's contemporary macroeconomic experience provides compelling empirical evidence of this pernicious interaction. The country's fiscal deficit has persistently exceeded 7.0% of GDP since 2020, which coincided with marked deterioration in governance quality as reflected in the declining rankings of Transparency International's Corruption Perceptions Index and Afrobarometer surveys (Kibet 2013; Asomah 2021). This temporal synchronization suggests deep structural interdependencies that demand sophisticated econometric investigation. However, despite

mounting empirical evidence of these concurrent trends, existing scholarship has failed to adequately model their dynamic interrelationships. The prevailing literature treats Ghana's fiscal challenges in analytical isolation, examining determinants and consequences through largely monocausal frameworks while systematically overlooking corruption as an endogenous mediating variable (Musah 2023; Adjei 2018; Adom et al. 2018; Adom et al. 2015). More critically, this analytical blind spot extends to the nexus between governance failures and private capital accumulation. Private capital accumulation becomes critical in this relationship because it is the cornerstone for sustained economic transformation to escape poverty (Dasuki et al. 2025; Desire & Patrick 2020).

The study's contributions extend across multiple dimensions of scholarly and policy discourses. Theoretically, we advance understanding of how institutional weaknesses manifest through fiscal channels to constrain private sector development, thereby enriching the literature on governance-growth nexus in resource-constrained economies. Empirically, our findings provide the first rigorous econometric evidence of bidirectional causality between corruption and fiscal performance in Ghana, while simultaneously quantifying their joint impact on capital formation dynamics. From a policy perspective, the analysis offers actionable insights for designing integrated reform strategies that address the reinforcing nature of fiscal and governance challenges, moving beyond piecemeal interventions toward comprehensive institutional transformation. These insights carry a particular relevance for Ghana's ongoing fiscal consolidation efforts and broader anti-corruption initiatives. It also contributes valuable lessons for similarly positioned developing economies grappling with the dual challenges of fiscal sustainability and governance reform.

2.0 THEORETICAL FOUNDATIONS

This study's analytical framework is anchored on the complementary insights of Keynesian macroeconomic theory and Public Choice Theory (PCT), which together provide a comprehensive lens for understanding the complex interactions between fiscal policy, institutional quality, and capital formation in developing economies.

2.1 Keynesian framework and fiscal policy transmission

The Keynesian theoretical foundation establishes the macroeconomic rationale for fiscal intervention as a stabilization mechanism during economic downturns. According to this paradigm, aggregate demand shocks can precipitate recessionary conditions that require countercyclical fiscal policy to restore full employment equilibrium (Jahan et al. 2014). Keynesian theory posits that government expenditure generates positive multiplier effects through increased aggregate demand, potentially stimulating private investment through enhanced business confidence and improved economic fundamentals (Palley et al. 2020). This theoretical position justifies deficit financing as a legitimate policy tool for economic stabilization, particularly when the economy operates below potential output.

However, the Keynesian framework also acknowledges potential transmission mechanisms that may attenuate the effectiveness of fiscal stimulus. The crowding-out hypothesis suggests that government borrowing to finance deficits may increase interest rates, thereby dampening private investment incentives (Barro 1990). This creates a theoretical tension between the intended stimulative effects of fiscal expansion and its potential adverse consequences for private capital formation. Contemporary empirical evidence presents mixed findings on this relationship, with outcomes largely dependent on institutional quality, financial market development, and the efficiency of government expenditure (Hamburger & Zwick 1981).

2.2 Public choice theory and institutional degradation

Previous studies on the effects of deficit spending on economic growth primarily focused on their crowding-out effects on private capital (Marimuthu et al. 2021; Chinyere 2021). However, in recent times, some studies are adding another dimension to effects of the deficit phenomenon, where it is being linked to weakening fiscal institutions through corruption (Abanikanda et al. 2023; Acemoglu & Verdier 2000). The Public Choice Theory (PCT) provides crucial insights into how institutional weaknesses can distort fiscal policy implementation and effectiveness. PCT fundamentally challenges the benevolent social planner assumption underlying traditional fiscal theory by recognizing that policymakers and bureaucrats are rational agents who maximize their own utility functions rather than social welfare (Gürkan 2021). This behavioral foundation suggests that fiscal decisions may be systematically biased toward outcomes that generate private benefits of decision-makers, even when such outcomes conflict with broader economic objectives.

Within PCT framework, corruption emerges as a rational choice when the expected benefits of rent-seeking behavior exceed the anticipated costs, including detection probability and associated penalties (de Graaf 2007). This cost-benefit calculus is fundamentally influenced by the quality of institutional arrangements, which North (1994) defined as the formal and informal rules governing political and economic interactions. Weak institutional environments characterized by limited transparency, inadequate oversight mechanisms, and poor enforcement capacity systematically reduce the costs of corrupt behavior while potentially increasing its benefits.

2.3 Theoretical integration and empirical implications

The integration of Keynesian and PCT perspectives generates several testable propositions regarding the fiscal deficit-corruption-capital accumulation nexus. First, while Keynesian theory suggests that fiscal expansion should stimulate private investment through demand-side effects, PCT implies that the quality of fiscal institutions mediates this relationship (Afonso et al. 2022; Căpraru et al. 2022). Specifically, high levels of corruption may undermine effectiveness of fiscal policy by reducing productivity of government expenditure, distorting resource allocation, and creating uncertainty that discourages private investment (Chen and Neshkova 2020). Second, the theoretical synthesis suggests bi-directional causality between fiscal deficits and corruption. That is, fiscal stress may weaken institutional oversight capacity, creating opportunities for rent-seeking, while corruption simultaneously exacerbates fiscal imbalances through resource leakages and inefficient expenditure patterns (Lavallée & Roubaud 2018). This creates a reinforcing dynamic that PCT helps explain through its emphasis on the endogenous nature of institutional quality.

2.4 Fiscal deficit-corruption nexus

The empirical literature demonstrates substantial convergence regarding corruption's role as a significant determinant of fiscal deterioration across diverse country contexts. Multiple studies provide compelling evidence that elevated corruption levels systematically contribute to fiscal deficit expansion through various transmission mechanisms (Nguyen et al. 2020; Del Monte & Pennacchio 2020; Sonmez & Yaraşir 2020; Wolf & Mueller 2020; Oto-Peralías et al. 2013). These findings establish a clear empirical foundation for anti-corruption initiatives as integral components of fiscal consolidation strategies. The mechanisms underlying this relationship have received detailed empirical scrutiny, particularly in the context of public procurement systems. Anja Baum et al. (2017) demonstrated that corrupt procurement practices systematically inflate project costs

through substandard material substitution, deliberate over-charging, and kickback arrangements, directly contributing to expenditure escalation and deficit growth. This micro-level evidence aligns with broader regional studies, such as Lavallée and Roubaud (2018) analysis of West African economies, which establishes that corruption undermines supply chain governance efficiency and constrains competitiveness-driven economic growth.

On the flipside however, empirical literature also reveals emerging evidence of reverse causality, suggesting that fiscal stress may itself create conditions conducive to corrupt behavior. This bidirectional relationship reflects the theoretical insights from PCT, where fiscal constraints may weaken institutional oversight capacity while simultaneously creating incentives for rent-seeking behavior among public officials (Sonmez & Yaraşir 2020; Lavallée & Roubaud 2018). Such findings underscore the importance of employing econometric methodologies capable of addressing endogeneity concerns in modeling these relationships.

2.5 Corruption-private capital formation dynamics

The relationship between corruption and private capital accumulation presents a more nuanced empirical landscape, with outcomes largely contingent on institutional context and the specific channels through which corruption manifests. Recent evidence suggests that corruption serves as a mechanism for private wealth accumulation among political elites and senior bureaucrats, particularly in environments characterized by weak oversight mechanisms (Zacarés 2020; Forgues-Puccio & Lauw 2021). Infrastructure investment emerges as a particularly vulnerable sector, with Fazekas & Tóth (2018) documenting systematic corruption in high-risk countries through deliberate project design distortions and cost inflation schemes that benefit both public officials and their private sector collaborators. These practices not only divert public resources but also distort private sector incentives by creating rents for well-connected firms while potentially crowding out legitimate competitors.

Large-scale empirical analysis by Tawiah et al. (2023), covering 83 countries over the period 2000-2017, established that corruption significantly facilitates private wealth accumulation, though this relationship was mediated by institutional quality. Countries with stronger institutions demonstrate greater capacity to constrain corruption-driven wealth transfers, suggesting that institutional development serves as a crucial policy lever. Complementing this finding, Sedgo & Omgba (2023) provided evidence that corruption systematically reduced productive capital expenditure, including infrastructure and long-term development projects, thereby constraining economy-wide productivity growth. Despite these important contributions, the existing literature has not adequately addressed how fiscal policy conditions mediate the corruption-private capital relationship, representing a significant analytical gap.

2.6 Fiscal deficits and private investment: the crowding-out debate

The empirical literature on fiscal deficit-private investment relationships reflects the broader theoretical divide between classical and Keynesian perspectives, with country-specific evidence providing mixed support for competing hypotheses. The crowding-out mechanism, which predicts that government borrowing increases interest rates and reduces private investment, receives empirical support in several contexts but with important qualifications. The analysis of the Nigerian economy by Kasali (2019) provided strong evidence for significant crowding-out effects, aligning with earlier studies in the same context that document systematic displacement of private investment

through fiscal expansion. This finding reflects the classical theoretical prediction and suggests that financial market constraints may limit the economy's capacity to simultaneously accommodate public and private borrowing demands.

Conversely, Abdulkarima & Saidatulakmala (2021) employed Autoregressive Distributed Lag (ARDL) methodology to demonstrate that expanded public capital expenditure positively influences private investment growth in Nigeria. This lends support to the Keynesian view that government investment can complement rather than substitute for private capital formation. This contradictory finding within the same country context underscores the importance of disaggregating fiscal variables and accounting for different types of government expenditure.

Evidence from the United States also provides additional complexity, with Kia (2020) documenting that while expanded public capital expenditure negatively affects private investment, fiscal deficits per se generate crowding-out effects through financial market channels. These mixed findings suggest that the fiscal deficit-private investment relationship may be contingent on country-specific factors including financial market development, institutional quality, and the composition of government expenditure. These factors have not been adequately integrated into existing empirical studies but require considerable attention.

3.0 METHODOLOGY

The methodology was motivated by the work of Mohanty & Panda (2020), which provided an empirical investigation into the effect of public debt on India's economy. The methodology used was adept and straightforward, and it suited the modeling requirements of this study.

3.1 Source of data and definition of variables

Annual data were used for the study ranging from 1990 to 2022. The data were obtained from the African Information Highway portal of the African Development Bank. The study variables were fiscal deficit (proxied by the fiscal balance), corruption and private capital accumulation. Fiscal deficit is indicative of a negative fiscal balance, which measures excess government expenditure over revenue, expressed as a percentage of GDP. Corruption was measured by the Corruption Perception Index (CPI) by Transparency International. CPI is based on a study that ranks 180 countries by their perceived levels of public sector corruption (Domashova & Politova 2021). The Index used a rank scale of 0 – 100 to assess the performance of the countries with regard to their citizens' perceptions on public corruption in a given year. The index measure of zero indicates highly corrupt public sector system whilst 100 measures a very clean system. Gross capital accumulation on the other hand measures gains in capital assets, inventories and profits through the production processes and transactions (Mbaku 2008).

3.2 Model

The three variables for the study were assumed to be endogenous and conceptually related. For instance, high level of public sector corruption may increase government procurement expenditure, which may inflate overall government expenditure, thus creating fiscal deficit. Fiscal deficit and high public sector corruption also affect the profit levels of firms as well as asset accumulation, leading to expanded private capital accumulation. As a result of these, the study adopted a Vector Autoregressive (VAR) framework, which is able to address the problem of endogeneity practically well (Warsono et al. 2019). The concept is based on the fact that current levels of the variables

were partly explained by their own past realizations as well as past realizations of other variables in the model. The VAR could thus explain multiple relationships among many variables at the same time and it is able to predict unidirectional and bidirectional relationships more flexibly. There are three components of the VAR model that make its analytical strengths very appealing, that is, the impulse response function, variance decomposition and Grangar causality properties (Akkaya 2021). The impulse response analysis reflects unplanned shocks on the endogenous variables in the model while the variance decomposition measures a change in one of the variables and how this change transmits shocks through the others. The Grangar causality test on the other hand, is used to measure the direction of causality among variables in the presence of delayed effect in some other existing variables.

The standard VAR is the basic form of the VAR family and it comes in the form of unrestricted nature. It is presented as follows:

$$Y_t = \alpha + \beta Y_{t-1} + \mu_t$$

Where Y_t=f (fiscal deficit,corruption and private capital accumulation), α is a vector of intercept parameters whilst is a matrix of reponse coefficients to be estimated by the model. The μ_t is a vector of random shocks.

As a result of some limitations of the standard VAR, we decided to employ structural VAR (SVAR) to analyse the empirical relationship among the variables. For instance, the standard VAR has been criticized as lacking strong theoretical underpinnings and thus makes interpretation of results output very difficult (Adenomon & Oyejola 2019). However, the SVAR is more efficient, easy to interpret and more responsive to economic policy implications because of its flexibility of handling contemporaneous effects of the variables in a dynamic economic relationship.

The relationship among the study variables of fiscal deficit, corruption and gross capital accumulation was examined within the framework of SVAR as:

$$Y_t = f(u_t^{Fdef}, u_t^{Corr}, u_t^{Pcap})$$

Where u_t^{Fdef},u_t^{Corr},u_t^{Pcap} are unobeservable structural shocks of fiscal deficit, corruption and gross capital accululation in that order. Since the shocks are unobservable, it suffices to impose some restrictions to establish the underlying structural shocks in the model. The SVAR framework dwells on applying a non-recursive orthgonalization of the shock parameters for impulse response analysis.

Given the three variables, fiscal deficit (Fdel), corruption (Corr) and gross capital accumulation (Gcap), the SVAR model is constructed as:

$$B_0 Y_t = a + B(L) Y_{t-p} + u_t$$

Where Y_t is a 3x1 vector of study variables, a is 3x1 vector of intercepts, u_t is 3x1 vector of structural disturbance terms, which is assumed to be serially and mutually uncorrelated, while L is the lag operator. B_0 is a matrix that describes the restrictions imposed on the model and it is defined by

$$B_0 = [1\ B_{12}\ B_{13}\ B_{21}\ 1\ B_{23}\ B_{31}\ B_{32}\ 1\ ]$$

where the off-diagonals measure contemporaneous effects in the model. Since, B_0 is assumed to be

symmetric and orthogonal, it can pre-multiply both sides of the model by B_0^{-1}, which yields

$$A(L)Y_t = c + \varepsilon_t$$

where $c=B_0^{-1}\,a$ and $\varepsilon_t=B_0^{-1}\,u_t$. The quantity is a vector of errors from the reduced VAR models, that is, $\varepsilon_t=B_0^{-1}\,u_t$. It follows that the structural disturbance term u_t is related with the the reduced form error ε_t as in $u_t=B_0\,\varepsilon_t$. $A(L)=B_0^{-1}\,B(L)=A_1\,L - A_2\,L^2 ---- A_p\,L^p$. The impulse response function will be given by $A(L)^{-1}\,B_0^{-1}$ and to make B_0 invertible, at least $\frac{n(n-1)}{2}$ restrictions should be imposed for the model to be identified.

The restrictions should have strong grounding in economic theory and would guide the ordering of the variables to meet requirement of the study's theoretical framework. Guided by the Cholesky ordering principle, it is practical to order the variables in such a way that the most exogenous variable serves as the trigger for the shock transmission through the model (Lee et al. 2021; Dinh 2020). We therefore assumed that corruption is the model's most exogenous variable, since it is purely a policy variable based on perceptions of people on the workings of the public sector. Also it is assumed that fiscal deficit is affected by dual shocks from its lagged effect as well as corruption through weak public procurement processes. That is, when people take undue advantage of the public procurement system through corrupt practices, it leads to increased government expenditure that escalates the fiscal deficit situation and as well past fiscal deficit shocks have effects on current experiences of the deficit phenomenon. Further to this, private capital accumulation is assumed to be affected by its own shocks as well as shocks in fiscal deficit and corruption. The private sector is largely a beneficiary of a corrupted public procurement system, which generally affects movements in fiscal deficits and its proceeds are assumed to affect accumulation of private capital.

$$e_t^{Corr} = \beta_{11} u_t^{Corr}$$

$$e_t^{Fdef} = \beta_{21} u_t^{Corr} + \beta_{22} u_t^{Fdef}$$

$$e_t^{Gcap} = \beta_{31} u_t^{Corr} + \beta_{32} u_t^{Fdef} + \beta_{33} u_t^{Gcap}$$

Thus

$$\left[e_t^{Corr}\; e_t^{Fdef}\; e_t^{Gcap}\right] = [1\;0\;0 * 1\;0 * * 1]\left[u_t^{Corr}\; u_t^{Fdef}\; u_t^{Gcap}\right]$$

4.0 RESULTS AND DISCUSSION

4.1 Unit root analysis and stationarity properties

We employed the Augmented Dickey-Fuller (ADF) test to assess the stationarity properties of each variable to determine the appropriate VAR specification and integration framework. The unit root test revealed heterogeneous integration properties across the study variables, with important implications for the subsequent econometric analysis. From Table 1, both corruption and fiscal deficit exhibit unit root behavior at levels, failing to reject the null hypothesis of non-stationarity at conventional significance levels. However, these variables achieve stationarity after first differencing, confirming their classification as integrated of order one [I(1)] processes. This

finding is consistent with the theoretical expectation that governance and fiscal variables tend to exhibit reasonable persistence, reflecting a gradual evolution of institutional quality and structural fiscal imbalances (Asomah 2021). In contrast, private capital accumulation demonstrates stationary behavior at level, rejecting the unit root null hypothesis. This I(0) property suggests that private investment exhibits mean-reverting behavior around a stable long-run trend, possibly reflecting the influence of business cycle fluctuations and adjustment costs that prevent sustained deviations from equilibrium investment.

Table 1: Augmented Dickey-Fuller unit root test results

Variable	Level	First Difference
Corruption	-1.7301	-6.4311**
Fiscal Deficit	-3.0160	-5.8362**
Private Capital Accumulation	-3.2133**	-

Note: ** denotes rejection of null hypothesis at 5% significance level.

4.2 Cointegration analysis: ARDL bounds testing

Given the mixed integration properties identified in the unit root analysis, there was the need to examine long run relationships among the variables to satisfy integration pre-conditions. The Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001) was used to examine potential long-run equilibrium relationships among the variables. The ARDL bounds test was particularly well-suited for this analysis as it could accommodate variables with different orders of integration regardless of whether they were mutually cointegrated. This flexibility is crucial given our finding that private capital accumulation was I(0) while corruption and fiscal deficit were I(1).

The bounds testing procedure tests the null hypothesis of no cointegration against on a basis of a computed F-statistic at critical value bounds. If the F-statistic exceeded the upper critical bound, we reject the null hypothesis and conclude that cointegration exists. If the F-statistic falls below the lower critical bound, we fail to reject the null hypothesis. Values between the bounds yield inconclusive results requiring additional testing procedures.

Table 2: ARDL bounds test for cointegration

Test Statistic	Value	Sig	I(0) Bound	I(1) Bound
F-statistic	3.368	10%	3.38	4.02
k = 2		5%	3.88	4.61
		2.5%	4.37	5.16
		1%	4.99	5.85

Note: k represents the number of forcing variables in the ARDL model

The computed F-statistic of 3.368 falls below the lower critical bound at all conventional significance levels, providing clear evidence against the existence of a long-run cointegrating relationship among the variables. Specifically, the F-statistic is substantially below the I(0) lower bound of 3.38 at the 10% significance level, eliminating any ambiguity in the test conclusion. From a methodological perspective, the absence of cointegration indicates that the variables do not share a common stochastic trend and do not exhibit a stable long-run equilibrium relationship. The absence of long-

run cointegration suggests that these variables, while potentially related in the short run, do not converge to a stable long-term equilibrium.

That is, the absence of cointegration may indicate relationships among these variables are predominantly driven by short-run shocks and adjustments rather than fundamental long-run structural linkages. This interpretation aligns with the observation that Ghana's fiscal and governance indicators have experienced significant volatility over the sample period. This potentially reflects frequent policy regime changes, external shocks, and political transitions that prevent the establishment of stable long-run relationships (Richard 2021; Brierley 2020). Also, the phenomenon might reflect the effectiveness of policy interventions and institutional reforms in preventing the entrenchment of vicious cycles between corruption and fiscal deterioration. If successful reforms periodically disrupt emerging negative feedback loops, this could prevent the formation of persistent long-run equilibrium relationships while maintaining short-run interactions.

4.3 Impulse response function analysis

The impulse response functions (IRFs) provided crucial insights into the dynamic transmission mechanisms linking fiscal deficits, corruption, and private capital accumulation over a ten-period horizon. These functions trace the time path of each endogenous variable following one-standard-deviation structural innovations, revealing both the magnitude and persistence of shock transmission (Kirchner 2022). The IRF analysis is particularly valuable given our finding of no long-run cointegration, as it focuses attention on the short- to medium-run adjustment processes that characterize the relationships among these variables.

4.4 Response to corruption innovations

Figure 1 presents the dynamic responses of all endogenous variables to a one-standard-deviation positive innovation in corruption, revealing complex transmission patterns that evolve significantly over time. The corruption variable itself exhibits initial persistence followed by oscillatory behavior, with the positive innovation generating a sustained positive effect that peaks in the first period before gradually declining. This pattern suggests that corruption shocks have moderately persistent effects on institutional quality, consistent with theoretical predictions about the self-reinforcing nature of corrupt practices (Abanikanda et al. 2023).

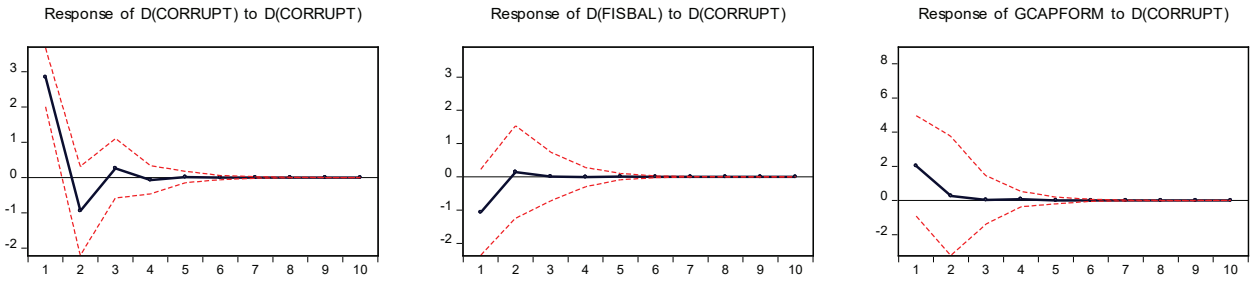

Figure 1: response to corruption innovations

The response of fiscal balance to corruption innovations demonstrates the theoretically predicted negative relationship, with corruption shocks systematically worsening fiscal performance over a two-period horizon. The magnitude of this effect peaks in the second period, indicating a delayed transmission mechanism where corruption's fiscal impact materializes with a lag, possibly reflecting the time required for corrupt practices to manifest in observable fiscal outcomes. This delayed

response pattern aligns with the institutional channel emphasized in PCT, where corrupt behavior initially operates through informal networks before affecting formal fiscal aggregates (Kogelmann 2022; Chen & Neshkova 2020).

Particularly noteworthy is the positive response of private capital accumulation to corruption innovations, which persists for approximately two periods before converging to zero. This seemingly counterintuitive finding requires careful interpretation within Ghana's institutional context. The positive correlation may reflect several mechanisms: first, corruption might facilitate certain types of private investment through expedited licensing and regulatory approvals, creating short-run investment incentives despite long-run efficiency losses (Forgues-Puccio & Lauw 2021; Fazekas & Tóth 2018). Second, corrupt practices may generate private wealth accumulation among connected elites, consistent with (Tawiah et al. 2023). Third, the relationship might reflect the endogenous nature of corruption in environments where private investors adapt strategies to institutional weaknesses as established by (Sedgo & Omgba 2023).

4.5 *Response to fiscal balance innovations*

Figure 2 illustrates the dynamic effects of fiscal balance innovations on the system variables, providing evidence of bidirectional causality between fiscal conditions and corruption levels. A positive fiscal balance shock (fiscal improvement) generates an initial negative effect on corruption that persists through the second period, suggesting that fiscal consolidation efforts may create conditions less conducive to corrupt behavior. This finding supports the institutional channel where improved fiscal discipline strengthens oversight mechanisms and reduces opportunities for rent extraction consistent with (Wolf & Mueller 2020; Del Monte & Pennacchio 2020).

The fiscal balance variable exhibits typical mean-reversion following its own innovations, with the positive shock creating sustained improvement through the second period before gradually diminishing. This pattern reflects the standard macroeconomic expectation that fiscal improvements, while beneficial, tend to erode over time without accompanying structural reforms (Seidu & Vasilev 2024).

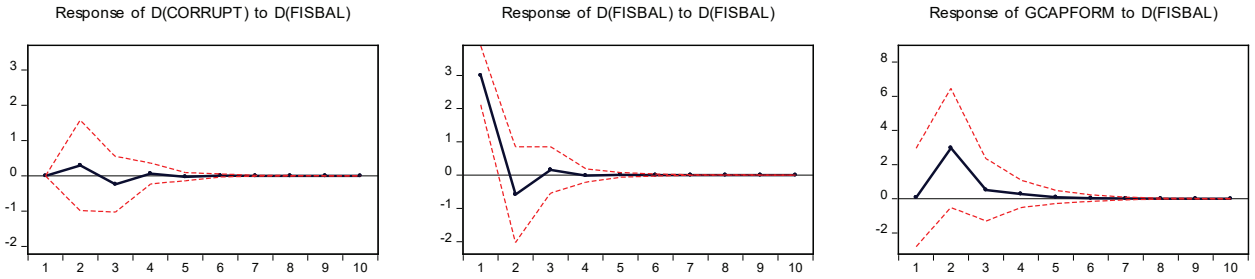

Figure 2: response to fiscal balance innovations

The interaction between fiscal balance and corruption innovations reveals synchronized oscillatory patterns, providing empirical evidence of the reinforcing dynamics predicted by theory. When corruption increases, fiscal balance deteriorates with a lag, and conversely, when fiscal conditions improve, corruption levels tend to decline as documented by (Căpraru et al. 2022). This bidirectional relationship supports the theoretical framework emphasizing feedback loops between governance quality and fiscal performance.

4.6 Response to private capital accumulation innovations

Figure 3 presents the system's response to private capital accumulation shocks, revealing the feedback effects through which investment dynamics influence governance and fiscal outcomes. A positive innovation in private capital accumulation generates a modest negative effect on corruption levels that persist through the third period. This suggests that increased legitimate private sector activity may crowd out corrupt practices or strengthen institutional oversight through enhanced economic transparency consistent with (Zacarés 2020).

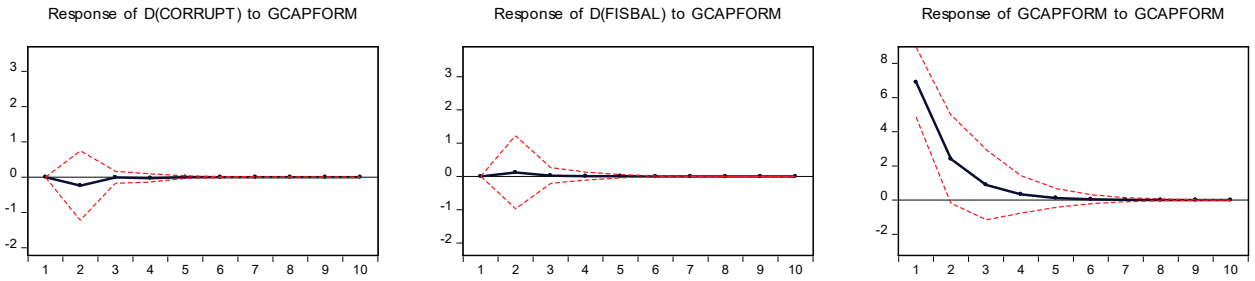

Figure 3: response to private capital accumulation innovations

The response of fiscal balance to private investment shocks is consistently positive through the third period, reflecting the standard macroeconomic channel where increased private sector activity generates higher tax revenues and reduces fiscal pressures. This finding provides empirical support for the growth-enhancing effects of private investment on public sector finances, consistent with endogenous growth theory predictions.

4.7 Forecast error variance decomposition analysis

Variance decomposition analysis provides complementary insights into the impulse response functions by quantifying the relative contribution of each structural shock to the forecast error variance of all endogenous variables at different time horizons. This analysis reveals the relative importance of each variable in explaining fluctuations in the others, thereby identifying the dominant sources of variation in the system and informing policy priorities for macroeconomic stabilization efforts.

The variance decomposition results demonstrate a consistent pattern across all variables: own-variable innovations account for the overwhelming majority of forecast error variance, suggesting that the system exhibits relatively weak cross-variable linkages despite the presence of statistically significant impulse responses. This finding has important implications for understanding the transmission mechanisms operating in Ghana's macroeconomic environment and the relative effectiveness of different policy intervention strategies.

4.8 Corruption variance decomposition

Table 3 reveals that corruption exhibits the highest degree of autonomous variation among the three variables, with own-shocks explaining approximately 97.8% of forecast error variance by the twelfth period. This dominance of own-variable effects suggests that corruption levels in Ghana are primarily driven by path-dependent institutional factors and historical legacies rather than contemporaneous macroeconomic conditions.

Table 3: Variance decomposition of corruption

Period	S.E.	D(Corr)	D(Fisbal)	Gcapform
1	2.842	100.00	0.00	0.00
2	3.018	98.42	0.96	0.62
3	3.038	97.82	1.57	0.62
6	3.040	97.76	1.62	0.62
12	3.040	97.76	1.62	0.62

The modest contribution of fiscal balance shocks (1.6%) and private capital formation shocks (0.6%) to corruption variance suggests that while fiscal and investment conditions may influence corruption through the channels identified in the IRF analysis, these effects are quantitatively small relative to the persistence inherent in institutional quality measures. This finding aligns with the institutional economics literature emphasizing the deep-rooted nature of governance problems and the difficulty of achieving rapid improvements through purely economic interventions.

4.9 Fiscal balance variance decomposition

The variance decomposition of fiscal balance (Table 4) reveals a more complex pattern, with own-variable shocks explaining 88.8% of forecast error variance while corruption innovations contribute a notable 11.0%. This represents the strongest cross-variable relationship identified in the analysis, providing quantitative support for the theoretical emphasis on corruption as a key determinant of fiscal performance.

Table 4: Variance decomposition of fiscal balance

Period	S.E.	D(Corr)	D(Fisbal)	Gcapform
1	3.183	11.26	88.74	0.00
2	3.242	11.05	88.82	0.13
6	3.246	11.03	88.83	0.14
12	3.246	11.03	88.83	0.14

The 11% contribution of corruption shocks to fiscal balance variation represents an economically significant relationship that validates the theoretical framework's emphasis on governance-fiscal linkages. This finding suggests that anti-corruption initiatives could generate measurable improvements in fiscal performance, though the dominant role of own-variable effects indicates that fiscal outcomes depend primarily on direct fiscal policy measures rather than indirect governance improvements.

The minimal contribution of private capital formation shocks (0.14%) to fiscal variance suggests that revenue effects from private investment fluctuations play a limited role in explaining fiscal balance movements over the sample period. This may reflect the relatively small size of formal private sector tax contributions in Ghana's economy or the limited responsiveness of fiscal policy to private sector performance.

4.10 Private capital formation variance decomposition

The variance decomposition of private capital accumulation (Table 5) reveals the most balanced cross-variable relationships, with own-shocks accounting for 80.3% of forecast error variance while fiscal balance and corruption contribute 13.5% and 6.2%, respectively. This pattern suggests that

private investment decisions are more responsive to macroeconomic and institutional conditions than either corruption or fiscal balance variables.

Table 5: Variance decomposition of private capital formation

Period	S.E.	D(Corr)	D(Fisbal)	Gcapform
1	7.196	7.90	0.01	92.08
2	8.149	6.28	13.27	80.46
6	8.229	6.16	13.55	80.29
12	8.229	6.16	13.55	80.29

The substantial contribution of fiscal balance shocks (13.5%) to private capital formation variance provides empirical evidence for fiscal policy transmission to private investment. This view supports both crowding-out and crowding-in theoretical perspectives depending on the nature of fiscal shocks. The moderate contribution of corruption shocks (6.2%) suggests that governance quality influences private investment decisions, though the effect is smaller than fiscal policy impacts.

5.0 CONCLUSIONS

This study demonstrated that the relationships among fiscal deficit, corruption, and private capital accumulation in Ghana are characterized by complex short-run dynamics rather than stable long-run equilibria. The empirical evidence supports integrated policy approaches that simultaneously address governance, fiscal, and investment dimensions while recognizing the distinct characteristics of each variable. The finding that most adjustments complete within three periods suggests that well-designed reform initiatives could generate relatively rapid improvements in macroeconomic and institutional outcomes, providing grounds for optimism about Ghana's development prospects under appropriate policy frameworks.

Limitations and future research directions

While this study provides valuable insights, several limitations suggest directions for future research. The analysis relies on aggregate, country-level data that may mask important sectoral or regional variations in the relationships examined. The perception-based corruption measure, while widely used, may not capture all dimensions of institutional quality relevant for fiscal and investment outcomes. Future research could incorporate alternative governance indicators or construct composite measures that better reflect the multidimensional nature of institutional quality. The study's focus on Ghana limits generalizability to other developing economies with different institutional histories and economic structures. Comparative studies across West African countries or broader developing economy samples could test whether the identified relationships reflect Ghana-specific factors or broader patterns in institutional-fiscal dynamics.

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