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The impact of controlling corruption on government effectiveness in GCC countries

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ABSTRACT

This research examines how controlling corruption impacts government effectiveness in GCC countries while also considering independent variables like political stability, industry, gross national expenditure, regulatory quality, and rule of law. The study uses panel data from 2003 to 2022 for six emerging GCC countries: Saudi Arabia, the United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman. Data for this analysis was sourced from the World Bank database, 2023. The study applied the ordinary least squares (OLS) method and accounted for the effects of COVID-19 and the 2008 recession on government effectiveness. Diagnostic tests for autocorrelation, multicollinearity, heteroscedasticity, and normality were conducted to ensure the reliability of the regression results, revealing no issues with multicollinearity or normality. The findings show that control of corruption and other variables significantly affect government effectiveness in GCC countries, with an adjusted R^2 of 87.4%. The model proposed could be recommended as a tool for assessing government effectiveness in any country.

1. Introduction

In recent decades, there has been increasing interest in understanding the impact of corruption on various aspects of society, particularly its effects on economic development, stability, and governance. A substantial body of research has emerged investigating the consequences of corruption on economies worldwide (Mauro, 1996; Mendonça and Fonseca, 2012; Rose–Ackerman, 2008; Shleifer and Vishny, 1993; Tanzi and Davoodi, 2012). According to their findings, there are four main ways that corruption affects economic growth and human development. Firstly, it slows down business and trade due to inefficiencies and undermines allocation effectiveness in both the public and private sectors. Secondly, it deteriorates public health and education programs. Thirdly, higher levels of corruption are linked to higher inflation. Lastly, high levels of corruption increase income inequality and poverty. According to Mauro (1996), corruption lowers the effectiveness of government spending. This is a result of authorities and politicians embezzling funds intended for public services and infrastructure instead of allowing them to reach their intended use. Because resources are diverted from improving people's lives to paying bribes, corruption results in a misallocation of government expenditures, which makes governments ineffective at enacting policies and providing public goods and services. While the body of empirical research on the impact of corruption on the economy is rising, it is still very small in certain areas. The majority of empirical research focuses on how corruption affects a select set of variables, like investment, inflation, and economic growth. However, limited research has specifically focused on the GCC countries, which comprise Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. These countries have experienced significant economic growth and development in recent decades, and they share unique contexts due to their distinct political, economic, and cultural characteristics, making it crucial to investigate the relationship between control of corruption and government effectiveness within this regional context.

This study aims to contribute to this growing body of knowledge by examining the impact of controlling corruption on government effectiveness in Gulf Cooperation Council (GCC) countries. Moreover, the analysis also considers the effects of political stability, gross national expenditure,

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industry, regularity quality, and rule of law, along with the impact of COVID-19 and the 2008 recession on government effectiveness. This study utilizes a dataset composed of the six GCC countries from the World Bank database to perform multiple linear regression analysis to examine the relationship between control of corruption and government effectiveness. We seek to answer the following question: What is the impact of controlling corruption on the government effectiveness of GCC countries? Our main hypothesis is that control of corruption impacts government effectiveness positively. By exploring the impact of controlling corruption on government effectiveness in the GCC countries, this research seeks to provide valuable insights for policymakers, scholars, and stakeholders invested in enhancing governance outcomes in these nations. Understanding the intricate relationship between corruption control and government effectiveness can inform evidence-based policy decisions that promote transparency, accountability, and good governance practices. Moreover, as the GCC countries play a significant role in global economics and geopolitics, the findings of this study have broader implications for regional stability, economic growth, and international relations.

2. Literature review

Corruption is a pervasive issue that poses significant challenges to governments. It seriously jeopardizes a country's social and economic advancement. It refers to the abuse of entrusted power for personal gain, often leading to the misallocation of resources, weakened public institutions, and diminished public trust. According to Dutta et al. (2023), corruption always causes harm, even in non-crisis situations. Its negative consequences are mitigated during times of crisis. The biggest barrier to a country's economic progress and expansion is corruption (Saeed et al., 2023). The control of corruption, on the other hand, involves implementing measures and policies aimed at preventing, detecting, and punishing corrupt practices (Graycar and Sidebottom, 2012). Effective control of corruption is crucial for enhancing government effectiveness as it leads to more efficient resource allocation, improved service delivery, and increased public confidence in the government's ability to address societal needs (Apaza, 2009).

Government effectiveness is a crucial factor in determining the overall development and stability of a nation. Enhancing the effectiveness of governance in developing countries is a matter of great significance; nonetheless, there is a shortage of empirically based research on the matter (Boyne et al., 2009; Fernández-Gutiérrez and Van de Walle, 2019). The six pillars of good governance are performance, equity, rights, accountability, transparency, and legitimacy, where everyone can actively contribute to development, including the commercial sector, non-governmental organizations (NGOs), and the general public (Langbein and Knack, 2010). This will subsequently foster the expansion of public and business trust. According to Kaufmann et al. (2011), the Worldwide Governance Indicator showed that government effectiveness, control of corruption, regulatory quality, the rule of law, voice accountability, and political stability are the main dimensions of good governance. Government effectiveness is defined as the standard of public services, civil service and the extent of its autonomy from political influences, the standard of policy creation and execution, and the legitimacy of the government's commitment to these policies (Lee and Whitford, 2009) whereas, control of corruption refers to the degree to which elites and special interests use public authority for their benefit. This includes both small-scale and large-scale corruption, as well as the "capture" of the state (Cieślik and Goczek, 2018). Other key elements include regulatory quality, which refers to the ability of the government to develop and implement reasonable laws and regulations that promote and support private sector growth. The rule of law involves the extent to which individuals trust and adhere to social norms, the judicial system, and the likelihood of criminal activities or violent events. Voice and accountability describe the extent to which citizens can participate in selecting their government and enjoy freedoms such as those of the press, association, and expression (Apaza, 2009). Finally, political stability and the absence of violence refer to opinions about the possibility that unlawful or violent methods, such as terrorism and political violence, may be used to topple the government or destabilize it.

According to Suong (2021) and Holmberg and Rothstein (2012), governance reflects the institutional underpinnings of national governance. Public administration aims to respond to societal demands and provide services in line with them. This impacts societal cohesiveness, long-term economic prosperity, and individual well-being (Bsoul-Kopowska et al., 2022; Sidak et al., 2021). Pimonenko et al. (2021) stated that governance shapes public core values and affects citizens' trust. Marišová et al. (2021) demonstrated that the governing bodies' operations in joint governance and inside the networks have not improved enough. Analyzing the causes of these inconsistent changes is challenging since systemic evaluations of reform outcomes are sometimes too limited in scope (Andronie et al., 2021; Lăzăroiu et al., 2020). There is also a dearth of comparative studies on reform experiences and achievements across governments, policy domains, and administrative structures. According to agency theory, an agency relationship is a contract in which the principal, the owner, appoints another person as an agent to carry out various tasks on their behalf, including giving the agent the authority to make decisions regarding the business's day-to-day operations. The owner and the agent will both seek to maximize their own utilities, which may lead to situations in which the agent acts more in the owner's personal interests than the

owner's best interests. Compared to the people, the government, acting as the country's manager, is more informed about the status and future possibilities of the nation (Shapiro, 2005). The government's role as an agent acting for the principal's benefit to ensure that the government acts in the best interests of the people is another example of an agency connection between the government and the population it serves. Therefore, the owner—in this example, the people who act as owners of capital resources—must exercise control and oversight over the governance actions taken by the government to make it effective.

Many developing countries have taken a range of actions since the 1980s to address challenging issues related to governance, such as corruption, ineffectiveness, the politicization of the civil service, lack of responsiveness, breakdowns in law and order, inadequate regulatory frameworks, and a lack of accountability and transparency (Haque and Pathrannarakul, 2013). According to Aidt (2011), Aidt et al. (2008), and Méndez and Sepúlveda (2006), socioeconomic and political variables, among other contextual factors, seem to have a significant influence on government performance. Research demonstrates that the political and socioeconomic landscape, which is undergoing fast change, shapes public sector innovations, changes, dynamism, and reforms (Brewer et al., 2007; Samaratunge and Alam, 2021). This influences government performance. Brewer et al. (2007) demonstrated that contextual factors seem to have a higher impact on government effectiveness than various forms of governance reforms. Political stability plays a vital role in controlling corruption and affecting government effectiveness. A stable political system allows for the establishment of strong institutions, including an independent judiciary and law enforcement agencies, which are crucial for effectively combating corruption. Political stability has a major influence on government effectiveness. Numerous theories exist to explain political stability. As the Anglo-Saxons say, it represents stability and consistency in public affairs for certain specialists (Battles, 2023; Halleröd et al., 2013; Holmberg and Rothstein, 2012). Many see the problem as the serenity of living in a state free from war, revolution, and violent street fights. According to Kaufmann et al. (2013), there is another group of experts who believe that a country is stable when its head of state, whether it be the president or another head of state, retires quietly and effectively, without causing problems for the people or the government's system.

External factors, such as the 2008 recession and COVID-19, may have an influence on government effectiveness. The 2008 recession, also known as the global financial crisis, was a severe economic downturn that originated in the United States and spread to other parts of the world. It was triggered by the collapse of the housing market and the subsequent financial crisis that followed. The repercussions of the recession were felt across various economic sectors and profoundly impacted government effectiveness, including the control of corruption (Bellido et al., 2021). The impact of the recession on government effectiveness varied across countries. In some cases, the crisis exposed weaknesses in governance structures and regulatory frameworks, leading to a deterioration in control of corruption. On the other hand, The COVID-19 pandemic has profoundly impacted government effectiveness and control of corruption worldwide. Governments have been challenged to respond swiftly and effectively to the crisis, with varying degrees of success. The pandemic exposed weaknesses in governance systems, such as public procurement transparency and resource allocation accountability (WBG, 2020). Additionally, the urgency to address the crisis created opportunities for corruption, necessitating robust anti-corruption measures to safeguard public resources and maintain trust in government actions.

In the context of Gulf Cooperation Council (GCC) countries, understanding the impact of controlling corruption on government effectiveness is particularly important. Corruption has been identified as a significant challenge in many GCC countries. GCC countries have similar political structures, economic dependencies, and cultural factors (Belloumi and Alshehry, 2021). These countries often experience corruption-related challenges and potential impacts on government effectiveness. For instance, due to their reliance on oil exports, there can be concerns about corruption in allocating and managing these resources. Examining the relationship between control of corruption and government effectiveness in the GCC countries allows for a targeted analysis of the specific dynamics and challenges faced by these nations in their governance and anti-corruption efforts (Biygautane, 2015). The impact of controlling corruption on government effectiveness in GCC countries is significant. By combating corruption, these nations can foster transparency, accountability, and ethical behavior within their governance systems. This, in turn, leads to more effective and efficient government operations, including improved public service delivery, better allocation of resources, and increased public trust in institutions. By creating an environment where corruption is minimized, GCC countries can enhance their ability to implement policies, attract investments, and promote sustainable economic development (Kapoor and Ravi, 2012). Therefore, controlling corruption is crucial in ensuring governments' overall effectiveness and stability in the GCC region.

Several studies instigated the impacts and relationship between government effectiveness and the control of corruption. Ramesh and Vinayagathasan (2024) investigated the relationship between corruption, rule of law, accountability, government expenditure, and government effectiveness in Sri Lanka. The study uses data from 1996 to 2020 and applies the Johansen method of cointegration and vector error correction model for

analysis. The findings reveal that control of corruption has a significant positive impact on government effectiveness in both the long and short run. The rule of law positively affects government effectiveness in the long run. However, voice and accountability, as well as government expenditure, have a negative impact on government effectiveness in the long run but a positive impact in the short run. The study highlights the importance of anti-corruption mechanisms and robust legal and criminal justice systems in improving government effectiveness in developing countries.

Similarly, Montes and Paschoal (2016) conducted a study to investigate the effects of corruption on government effectiveness in both developed and developing countries. The study examines a sample of 130 countries and considers variables such as corruption perception, control of corruption, gross government debt, inflation, trade openness, government effectiveness, rule of law, and democracy. The findings indicate that countries with lower levels of corruption have better quality public services, policies, and government commitment. The impact of corruption on government effectiveness is more significant in developed countries. High public debt and inflation levels are also associated with less efficient governments. Moreover, developing countries with more democratic regimes exhibit higher government effectiveness. Reducing corruption is crucial for improving government effectiveness and enhancing public service quality. Ahmed and Asmaa (2016) examined the relationship between corruption and growth in the context of the Arab world, and they estimated a panel cross-country regression for a sample of 15 Arab countries from 1998 to 2009. The study's findings corroborate the direct harm that corruption causes to economic growth in the sample of Arab nations, yet the degree to which this harm varies greatly depends on the governance framework. An effective system of governance demonstrates how corruption has a definite effect on economic progress. Corrupt practices generally have a less negative or even beneficial effect on growth when the governance framework is very weak.

Moreover, Duho et al. (2020) conducted a study to examine the variables that affect how effective governments are in Asian and African nations. The study uses convergence models and regression analysis on 100 nations between 2002 and 2018 data. The results show that African and Asian nations exhibit both beta and sigma-convergence. Government effectiveness is positively impacted by elements including the corruption perception index, government size, voice, accountability, regulatory quality, and economic prosperity. Press freedom, though, has drawbacks. The study emphasizes that improving government effectiveness requires a comprehensive strategy, especially when it comes to press freedom and political checks and balances. Mercy (2015) investigated the impact of corruption on good governance in Nigeria. It analyzes indicators such as government legitimacy, accountability of public officials, and government capacity to formulate policies and deliver services. The study reveals that corruption remains a major obstacle to progress despite efforts to promote good governance. Corruption is identified as a cause of poor economic performance, decaying infrastructure, rising living costs, and poverty in Nigeria. The paper emphasizes the urgent need to combat corruption for the nation's survival and suggests recommendations to address the problem. Garcia-Sanchez et al. (2013) investigated the determinants of government effectiveness by analyzing the organizational environment, political factors, and internal characteristics of public administrations. The study uses a sample of 202 countries observed between 2002 and 2008 and employs panel data analysis. The results suggest that government effectiveness is initially influenced by the organizational environment, including economic development and educational status. Furthermore, political constraints and organizational characteristics such as gender diversity and government size can contribute to improving governance quality. Drebee et al. (2020) measured the impact of governance indicators, including political stability, voice and accountability, and regulatory quality, on corruption in 14 Arab countries, including Kuwait, Sudan, Tunisia, Morocco, Egypt, Algeria, Yemen, United Arab Emirates, Saudi Arabia, Qatar, Oman, Lebanon, Iraq, and Bahrain during the period 2005-2016. They used cointegration, forecasting variance error decomposition, and impulse response function for analysis. They found out that all three governance indicators influence corruption in the short and long runs. Raharja et al. (2023) examined the impact of e-government and control of corruption measures on government effectiveness and economic growth in lower-middle-income Asian countries. The study tested concept validity, reliability, and discriminant validity using SMART PLS, and it evaluated data quality using a number of secondary data sources that have been shown to be trustworthy in other investigations. The outcomes demonstrated that e-government and control of corruption have a positive and significant effect on government effectiveness. Lustrilanang et al. (2023) investigated the relationship between control of corruption and governance quality from 1984 to 2021 for eight ASEAN countries. The methodologies used to estimate the long, short-run relationships were Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS). The findings showed that there is a positive and significant relationship between control of corruption and governance quality in ASEAN countries. In addition, Ramesh and Vinayagathasan (2018) studied the impact of corruption on the rule of government effectiveness and the rule of law. They used data for Sri Lanka from the period from 1996 to 2015 and used the Johansen Cointegration technique. They found that there is a significant and positive relationship between government effectiveness and

control of corruption in the long run as well as in the short run. After investigating several literatures that studied the relationship between government effectiveness and the control of corruption, we build our main hypothesis to be that control of corruption has a significant positive impact on government effectiveness in GCC countries. Table 1 summarizes the major studies on the impact of controlling corruption on government effectiveness.

3. Data and model specification

This study examines the effect of controlling corruption on government effectiveness in six GCC countries: Saudi Arabia, the United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman. Data were obtained from the World Bank's World Development Indicators for the period 2003–2022. The unit of analysis is the country, with the six GCC countries serving as the focus of the study. The dependent variable is government effectiveness (GOVEF). The independent variables that are inspired by the literature in Duho et al. (2020), Montes and Paschoal (2016), and Ramesh and Vinayagathasan (2024), are control of corruption (COC), political stability (POS), industry (INDS), gross notational expenditure (GNEXP), regularity quality (REGQU), rule of law (RLAW), voice and accountability (VOCAC), educational attainment (EDUA), GDP, inflation (INFL), and employment (EMPL). The method applied for this evaluation is an OLS. Eq. 1 presents the model specifications.

$$GOVEF = \beta_0 + \beta_1\, COC + \beta_2\, POS + \beta_3\, INDS + \beta_4\, GNEXP + \beta_5\, \text{REGQU} + \beta_6\, \text{RLAW} + \beta_7\, \text{VOCAC} + \beta_8\, EDUA + \beta_9\, GDP + \beta_{10} INFL + \beta_{11} EMPL + U_i \quad (1)$$

where, u_i is the error term. Based on the literature, we assumed that COC has a significant and positive impact on GOVEF. Moreover, we expect that other controlling variables, such as RLAW, VOCAC, REGQU, and EDUA, have a positive impact on GOVEF, while other variables, such as POS, INDS, GNEXP, GDP, and INFL, have a negative relationship with GOVEF. Table 2 presents the variables descriptions.

4. Results and analysis

4.1. Descriptive statistics and correlation

The descriptive statistics provide insights into the overall trends and variations within the GCC countries across various variables such as GOVEE, COC, POS, INDS, GNEXP, REGQU, RLAW, VOCAC, EDUA, GDP, INFL, and EMPL. The dataset comprises 120 observations for each variable. Table 3 presents the descriptive statistics and the correlation matrix between the panel data variables. Based on descriptive statistics presented in Table 3, the GCC countries exhibit moderate levels of GOVEF (0.439), COC (0.429), and POS (0.288). The standard deviations reflect the variability in the data, with notable variation seen in GDP (5.344), INDS (11.764), and GNEXP (11.827). GOVEF, measured on a scale from -0.380 to 1.505, has a mean of 0.440. This indicates that, on average, the GCC countries exhibit moderate levels of government effectiveness. The range of values, from a minimum of -0.381 to a maximum of 1.505, demonstrates the diversity in the level of government effectiveness across the GCC countries. The standard deviation of 0.462 suggests that there is some variability in the GOVEF scores across the countries. Similarly, for COC, the mean score of 0.430 suggests an average level of corruption management across the GCC countries. It indicates that, on average, efforts are being made to control corruption within these nations. The range of values, from a minimum of -0.337 to a maximum of 1.559, demonstrates the diversity in the levels of COC across the GCC countries. A lower minimum value suggests that some countries in the GCC region may be facing challenges in effectively managing corruption, potentially leading to negative implications for governance and economic development. Furthermore, the GCC countries exhibit moderate levels of REGQU, as reflected by a mean score of 0.430. There is some variation in REGQU across the countries, as indicated by a standard deviation of 0.290.

On the other hand, the correlation matrix provides insights into the relationships between various variables in the dataset, where each cell in the matrix represents the correlation coefficient, which indicates the strength and direction of the linear relationship between two variables within the context of the GCC countries. It can be seen from Table 4 that there is a strong positive correlation (0.863) between GOVEF and COC, suggesting that countries with more effective governments tend to have better control over corruption. This correlation can be relevant for understanding governance and anti-corruption efforts within the GCC countries. Similarly, the moderate positive correlation (0.663) between COC and POS indicates that higher levels of control over corruption are associated with greater political stability. This relationship could be significant for analyzing the political landscape and governance dynamics in the GCC countries. Additionally, variables such as GDP, INDS, and EDUA could provide insights into the economic development and diversification efforts in the GCC countries. Table 4 shows a positive correlation between GDP and INDS (0.536), indicating that countries with higher GDP often have a stronger industrial sector. This highlights the economic policies and strategies adopted by GCC countries to promote industrial development and diversification. Additionally, the correlation between EDUA and variables such as GOVEF (0.504) and EMP (0.525) suggests a connection between education, human capital development, and regional employment opportunities. Moreover, the weaker positive correlation between GOVEF and VOCAC implies that more effective governments tend to create better opportunities for citizen participation and transparent decision-making processes.

Table 1: Summary of the major Studies on the impact of control of corruption on government effectiveness

Author	Study period	Dependent variable	Independent variables	Methodology	Findings
Ramesh and Vinayagathasan (2024)	1996–2020	Government effectiveness	Control of corruption, rule of law, accountability, government expenditure	Johansen cointegration and vector error correction model	Control of corruption significantly and positively impacts government effectiveness in both the long and short run
Montes and Paschoal (2016)	1995–2012	Government effectiveness	Corruption perception index, control of corruption, GDP, inflation, trade openness, rule of law, democracy	OLS	Countries with lower corruption have better quality public services, policies, and government commitment
Ahmed and Asmaa (2016)	1998–2009	Economic growth, government effectiveness	Corruption, rule of law, regulatory quality, political stability, voice and accountability, GDP per capita	OLS	Corruption negatively impacts growth in Arab countries, with effects highly dependent on governance structures
Duho et al. (2020)	2002–2018	Government effectiveness	Corruption perception index, government size, voice and accountability, regulatory quality, economic wealth, press freedom, political constraint index	Panel-corrected standard error regression	Government effectiveness in African and Asian nations is positively influenced by corruption perception, government size, accountability, regulatory quality, and wealth
Mercy (2015)	1995–1997	Government effectiveness	Corruption	Secondary data analysis	Corruption causes poor economic performance, deteriorating infrastructure, rising costs of living, and poverty in Nigeria
Garcia-Sanchez et al. (2013)	2002–2008	Government effectiveness	Organizational environment, political factors, organizational characteristics	Generalized Method of Moments estimator & CHAID algorithm	Organizational environment (e.g., economic development, education) influences government effectiveness
Drebee et al. (2020)	2005–2016	Corruption perception	Political stability, voice and accountability, regulatory quality	Cointegration, forecasting variance error decomposition, impulse response function	Regulatory quality, voice and accountability, and political stability significantly impact corruption in both the short and long term
Raharja et al. (2023)	1996–2020	Government effectiveness, economic growth	Control of corruption, e-government	SmartPLS for secondary data analysis	E-government and control of corruption significantly enhance government effectiveness and economic growth
Lustrilanang et al. (2023)	1984–2021	Governance quality	Control of corruption	Fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS)	Control of corruption positively and significantly impacts governance quality in ASEAN countries
Ramesh and Vinayagathasan (2018)	1996–2015	Government effectiveness	Control of corruption, rule of law	Johansen cointegration technique	Government effectiveness and control of corruption have a significant and positive relationship in both the long and short run

Table 2: Variable description

Variables	Type	Description	Source
GOVEF	DV	Government effectiveness: Estimate (index). The index has −2.5 (lowest government effectiveness) and 2.5 (highest government effectiveness)	World Bank
COC	IDV	Control of corruption: Estimate (index) The index has values between −2.5 (highest corrupt) and 2.5 (lowest corrupt)	World Bank
POS	IDV	Political stability and absence of violence/Terrorism: Estimate (index). The index has values between −2.5 (lowest level of political stability) and 2.5 (highest level of political stability)	World Bank
INDS	IDV	Industry (including construction), value added (annual % growth)	World Bank
GNEXP	IDV	Gross national expenditure (% of GDP)	World Bank
REGQU	IDV	Regulatory quality: Estimate (index). The index has values between −2.5 (lowest level of regulatory quality) and 2.5 (highest level of regulatory quality)	World Bank
RLAW	IDV	Rule of law: Estimate (index). The index has values between −2.5 (lowest level of rule of law) and 2.5 (highest level of rule of law)	World Bank
VOCAC	IDV	Voice and accountability: Estimate (index). The index has values between −2.5 (lowest level of voice and accountability) and 2.5 (voice and accountability).	World Bank
EDUA	IDV	Educational attainment, at least Bachelor's or equivalent, population 25+, total (%) (cumulative)	World Bank
GDP	IDV	GDP growth (annual %)	World Bank
INFL	IDV	Inflation, GDP deflator (annual %)	World Bank
EMPL	IDV	Employment to population ratio, 15+, total (%) (national estimate)	World Bank

DV: Direct variable; IDV: Indirect variable

Table 3: Descriptive statistics and correlation

	GOVEF	COC	POS	INDS	GNEXP	REGQU	RLAW	VOCAC	EDUA	GDP	INFL	EMPL
Obs	120.000	120.000	120.000	120.000	120.000	120.000	120.000	120.000	120.000	120.000	120.000	120.000
Mean	0.440	0.430	0.288	5.429	79.521	0.430	0.460	-1.083	17.275	4.400	5.602	67.490
SD	0.462	0.461	0.657	11.765	11.828	0.290	0.251	0.385	9.181	5.344	12.616	12.682
Min	-0.381	-0.336	-1.335	-27.534	51.548	-0.177	-0.023	-1.907	8.068	-8.855	-25.958	42.602
Max	1.505	1.559	1.224	58.438	104.376	1.019	1.083	-0.303	47.452	26.170	33.751	92.970
GOVEF												
COC	0.863	1.000										
POS	0.430	0.663	1.000									
INDS	-0.081	0.168	0.125	1.000								
GNEXP	-0.168	-0.252	-0.324	-0.393	1.000							
REGQU	0.710	0.577	0.268	-0.028	-0.044	1.000						
RLAW	0.724	0.734	0.588	0.155	-0.302	0.747	1.000					
VOCAC	0.045	0.213	0.518	0.344	-0.303	0.064	0.301	1.000				
EDUA	0.504	0.372	0.021	-0.207	0.035	0.252	0.287	-0.417	1.000			
GDP	0.050	0.249	0.212	0.536	-0.368	0.062	0.110	0.130	-0.038	1.000		
INFL	-0.098	-0.018	0.110	0.139	-0.317	-0.032	-0.040	0.128	-0.039	0.302	1.000	
EMPL	0.525	0.590	0.499	0.116	-0.273	0.338	0.646	0.465	0.070	0.131	-0.122	1.000

Obs: Observations; SD: Standard deviation

4.2. Model estimation

The model used to analyze the impact of control of corruption on government effectiveness in GCC countries is a panel least squares regression. The dependent variable, GOVEF, represents the effectiveness of the government in the GCC countries. The researcher selected several independent variables inspired by the literature and checked for the significance level of those variables in the model (Duho et al., 2020; Montes and Paschoal, 2016; Ramesh and Vinayagathasan, 2024). Accordingly, serval models have been developed to reach the final reliable model. In the context of the 2008 recession and COVID-19, a recession dummy variable and a COVID-19 dummy variable were created to capture the effect of the financial crisis in 2008 and COVID-19 on government effectiveness. Therefore, the two dummy variables introduced in all the estimated model are (COVID19_D1) and (RECES_D2) to check their impact on the government's effectiveness. Table 4 provides details of the specifications and significance levels of the various OLS models. The first model included all independent variables along with the two dummy variables. It can be shown from regression model 1 that GOVEF has a strong positive relationship with COC and REGQU, EDUA and a strong negative relationship with POS, INDS, and GNEXP, where all those variables are statistically significant at a 1% confidence interval, except for GNEXP that is statistically significant at level 5%.

This means as COC increases by one index, GOVEF increases by 0.766 index, partially outweighing the effect of other variables. Also, as REGQU increases by one index, GOVEF increases by

0.766 index, partially outweighing the effect of other variables. The remaining variables, including RLAW, VOCAC, GDP, INFL, and EMPL, are statistically insignificant. Those insignificant variables were deleted one by one in separate models as a remedial measure to enhance the overall reliability and significance of the model. The final model developed is model 6, which includes several independent variables: COC, POS, INDS and GNEXP, REGQU, COVID19_D1, and Recess_D2. The results show that COC has a highly significant positive impact on GOVEF, while POS has a significant negative effect. Reliance on the industrial sector and higher levels of GNEXP also negatively affect government effectiveness. Also, a higher level of REGQU and RLAW are associated with a positive impact on government effectiveness. The inclusion of dummy variables representing the impact of COVID-19 and the 2008 recession showed that COVID-19 does not have a significant impact on government effectiveness, while the 2008 recession dummy variable showed that this recession had a significant impact on government effectiveness.

Based on model 6 in the model estimation Table 4, the dummy variable for the 2008 recession (RECES_D2) is statistically significant with a coefficient of -0.099010. The negative coefficient indicates that the 2008 recession had a detrimental effect on government effectiveness in GCC countries. The government's effectiveness during the 2008 recession period was less than its effectiveness in other periods with no recession by 0.099. the government effectiveness index in GCC countries during the 2008 recession period is estimated to be (-0.803803).

The magnitude of the coefficient suggests that for each unit increase in the impact of the dummy variable (indicating the occurrence of the recession), government effectiveness decreases by approximately 0.099. This implies that the economic downturn during the 2008 recession hurt the ability of governments in GCC countries to carry out their functions effectively. The 2008 recession had profound implications for the GCC countries, including economic contraction, fiscal challenges, vulnerabilities in the financial sector, job market disruptions, and the need for policy reforms. These countries faced declining economic activity, reduced government revenues, and fiscal constraints. The financial sector experienced difficulties, and job losses impacted the labor market. The 2008 recession prompted the GCC countries to implement policy reforms to diversify their economies and reduce reliance on oil revenue.

Economic diversification strategies, such as promoting sectors like tourism, finance, and technology, gained importance in mitigating the impact of future economics and focused on building long-term resilience to mitigate the effects of future economic downturns. Contrary to expectations, the dummy variable for COVID-19 (COVID19_D1) was found not statistically significant with a coefficient of (0.027). This indicates that the COVID-19 pandemic did not significantly impact government effectiveness in GCC countries during the observed period. The impact of COVID-19 on government effectiveness in GCC countries was found to be positive. The pandemic necessitated swift and decisive actions by governments, resulting in enhanced coordination, increased transparency, and improved governance practices. The crisis prompted GCC countries to prioritize public health, strengthen healthcare systems, and implement effective policies to manage the spread of the virus. This proactive response, coupled with the need for efficient resource allocation and crisis management, contributed to an overall increase in government effectiveness in the GCC region during the COVID-19 pandemic.

The model's overall fit is good, with an adjusted R-squared value of 0.874267, indicating that approximately 87.4% of the variation in government effectiveness is explained by the independent variables included in the regression model, considering the number of variables and the sample size. The remaining 12.5% represents the unexplained variation in government effectiveness, which could be due to factors not included in the model or measurement errors. A higher adjusted R-squared value suggests a better fit of the model to the data, indicating that the independent variables collectively have a relatively strong explanatory power for government effectiveness in GCC countries. The F-statistic tests highlight the overall significance of the regression model. In the F-statistic, we compare the p-value associated with it to a chosen significance level (often 0.05 or 0.01). The p-value of 0.0000 indicates that the probability of obtaining an F-statistic as extreme as the observed value under the null hypothesis (no relationship between any independent and dependent variables) is very low. Since the p-value is less than the chosen significance level (in this case, it is less than 0.05), we reject the null hypothesis and accept our alternative hypothesis. Therefore, we conclude that there is a statistically significant relationship between the COC and the dependent variable GOVEF, in which COC positively impacts the GOVEF of GCC countries.

This panel least squares regression model suggests that control of corruption, political stability, industry, national expenditure, regularity quality, and rule of law significantly influence government effectiveness in GCC countries, while the impact of COVID-19 by the dummy variables does not appear to be statistically significant. However, the 2008 recession had an impact on government effectiveness as the dummy variable was significant. The relation between control of corruption and government effectiveness is estimated using the following regression Eq. 2 with u_i as the error term:

$$GOVEF = 0.186 + 0.856\,COC - 0.179\,POS - 0.009\,INDS - 0.003\,GNEXP + 0.303\,\text{REGQU} + 0.218\,\text{RLAW} + 0.027\,COVID19_{D1} - 0.099\,\text{RECES}_{\text{D2}} + U_i \quad (2)$$

Table 4: Models estimation

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 6 (cross-section white)
Obs	120	120	120	120	120	120	120
Constant β_0	0.087110	0.206022	0.154187	0.130610	0.191758	0.186297	0.186297
	(0.217447)	(0.168384)	(0.160560)	(0.161718)	(0.165714)	(0.153408)	(0.140239)
COC	0.766954***	0.786065***	0.794797***	0.789549***	0.858057***	0.856612***	0.856612***
	(0.064571)	(0.060609)	(0.060013)	(0.060574)	(0.057688)	(0.055139)	(0.056273)
POS	-0.135115***	-0.144029***	-0.148806***	-0.161950***	-0.180409***	-0.178723***	-0.178723***
	(0.040430)	(0.039051)	(0.038776)	(0.038497)	(0.039242)	(0.034284)	(0.030800)
INDS	-0.006796***	-0.007250***	-0.007144***	-0.008631***	-0.009323***	-0.009280***	-0.009280***
	(0.001781)	(0.001700)	(0.001697)	(0.001502)	(0.001533)	(0.001449)	(0.001859)
GNEXP	-0.003899**	-0.003963**	-0.003523**	-0.003036**	-0.003302**	-0.003306**	-0.003306**
	(0.001547)	(0.001544)	(0.001483)	(0.001474)	(0.001520)	(0.001513)	(0.001367)
REGQU	0.421012***	0.393845***	0.381147***	0.351557***	0.302767***	0.302874***	0.302874***
	(0.094580)	(0.089119)	(0.088262)	(0.087660)	(0.088923)	(0.088517)	(0.094432)
RLAW	0.012639	0.069990	0.093535	0.143018	0.217060*	0.218096*	0.218096**
	(0.145896)	(0.129840)	(0.127794)	(0.126175)	(0.127722)	(0.126627)	(0.090770)
VOCAC	0.047801	0.067698	0.061505	0.073865	0.004555		
	(0.059511)	(0.054830)	(0.054503)	(0.054646)	(0.050838)		
EDUA	0.007301***	0.007114***	0.006826***	0.006515***			
	(0.002251)	(0.002238)	(0.002220)	(0.002237)			
GDP	-0.006229	-0.005674	-0.006498				
	(0.003724)	(0.003664)	(0.003574)				
INFL	-0.001135	-0.001362					
	(0.001362)	(0.001335)					
EMPL	0.001604						
	(0.001853)						
COVID19_D1	0.084552	0.084707	0.088880	0.065868	0.026978	0.027240	0.027240
	(0.055545)	(0.055480)	(0.055339)	(0.054438)	(0.054541)	(0.054218)	(0.055612)
RECES_D2	-0.061033	-0.060080	-0.078576	-0.082037	-0.098760	-0.099010	-0.099010***
	(0.069824)	(0.069734)	(0.067347)	(0.068028)	(0.070053)	(0.069683)	(0.024132)
Adjusted R^2	0.883444	0.883716	0.883673	0.881213	0.873133	0.874267	0.874267
Sum squared res	2.637906	2.656561	2.682383	2.764469	2.979608	2.979825	2.979825
P(F-Statistics)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

***, **, and *: Indicate a significance level of 1, 5, and 10%, respectively

4.3. Diagnostic tests

Diagnostic tests are crucial for assessing the quality and validity of statistical models. Researchers can identify and account for potential issues that may affect the validity and reliability of the regression results. Addressing these issues ensures that the regression analysis produces accurate and trustworthy estimates of the relationships between the dependent and independent variables. Table 5 presents the diagnostic tests generated for the Model 6. The researcher has conducted several diagnostics tests to check for autocorrelation, multicollinearity, heteroscedasticity, and normality issues. Such tests include the Durbin-Watson or Breusch-Godfrey tests for autocorrelation, VIF for multicollinearity, the Breusch-Pagan test or the White test for heteroscedasticity, and Jarque-Bera test for normality. Thus, identifying and addressing these issues appropriately can improve the reliability and accuracy of econometric analysis and assist in choosing appropriate remedies. Autocorrelation, also known as serial correlation, arises when the error terms in a regression model are correlated over time.

This violates the assumption of independence, leading to inefficient coefficient estimates and incorrect hypothesis testing. The researcher used the Durbin-Watson test to detect autocorrelation, which examined whether there was a significant correlation between adjacent residuals. Durbin-Watson test value is (0.869697), which suggests the possibility of positive autocorrelation, indicating a potential correlation pattern among the residuals that could impact the reliability of the estimated coefficients.

Breusch-Godfrey tests for autocorrelation were not found in EViews for panel data; therefore, we detected the autocorrelation only on Durbin-Watson statistics. This problem is a potential consequence of dropping theoretically relevant but statistically insignificant variables in Model 6. We used the multicollinearity test to check if COC is correlated with other control variables in the model. Multicollinearity occurs when predictor variables in a regression model are highly correlated, leading to unstable coefficient estimates and less reliable inference. We check the multicollinearity through the variance inflation factor (VIF).

Table 5: Diagnostic test for model 6

Durbin-Watson stat (Autocorrelation)	VIF test (Multicollinearity)	White test Pro(F-statistic) (Heteroscedasticity)	Jarque-Bera test (Normality)
0.869697	(1.031016 - 2.862554)	0.000000	0.354021

The VIF measures how much the variance of an estimated coefficient is increased due to multicollinearity. The VIF values ranged from 1.031 to 2.863, which are below the threshold of 5. This indicates a low degree of multicollinearity, suggesting only minor correlations between the independent variables in the model. The White test was used to detect heteroscedasticity, which occurs when the error terms in a regression model do not have constant variance. The p-value of the F-statistic was 0.000, confirming the presence of heteroscedasticity. This indicates that the residual variance varies across different levels of the independent variables, potentially affecting the reliability of the coefficient estimates. The Breusch-Pagan test, another method for detecting heteroscedasticity, was not applicable for panel data; thus, only the White test was conducted. A normality test was also performed to assess whether the residuals follow a normal distribution, a key assumption for valid statistical inference. Techniques such as histograms or formal tests like the Shapiro-Wilk test can evaluate residual normality, with data transformations applied if necessary. The Jarque-Bera test, used to check the normality of residuals, produced a p-value of 0.354, indicating no strong evidence to reject the normality assumption. Therefore, the residuals appear to approximately follow a normal distribution.

5. Research limitations

It is essential to acknowledge the limitations of this research. These may include data limitations, potential endogeneity issues, and the generalizability of the findings beyond the GCC countries. One research limitation is the reliance on panel data analysis, which may overlook significant variations and nuances within individual GCC countries. The aggregated nature of the data could mask potential heterogeneity in the impact of control of corruption and the dummies for the 2008 recession and COVID-19 across different countries within the GCC region. Additionally, the analysis is based on a specific period from 2003-2022, and the findings may not capture long-term dynamics or account for potential changes in the relationship between control of corruption and government effectiveness over time. Furthermore, other unobserved factors, such as cultural and institutional differences, could influence the relationship between control of corruption and government effectiveness, and these factors were not explicitly accounted for in the analysis. Future research could consider addressing these limitations by employing more granular data, extending the period, applying different methods for analysis, and incorporating additional variables to enhance the robustness and generalizability of the findings.

6. Conclusion

In conclusion, this research provides valuable insights into the relationship between control of corruption and government effectiveness in GCC countries. The study reveals statistically significant findings using panel data from 2003 to 2022 and employing OLS regression. The selected independent variables were control of corruption, political stability, industry, gross national expenditure, regularity quality, and the rule of law. The data, sourced from the World Bank database in 2023, enabled a comprehensive analysis of the impact of control of corruption on government effectiveness while accounting for the influence of external factors such as the COVID-19 pandemic and the 2008 recession. Through rigorous diagnostic tests, there are no issues related to multicollinearity and normality, but there are autocorrelation and heteroscedasticity; potential issues were identified and addressed, ensuring the integrity and reliability of the regression results. The estimates from the analysis demonstrate the significance of controlling corruption and other controlling variables in influencing government effectiveness in GCC countries. Also, this research finds the negative impact of the 2008 recession on government effectiveness in GCC countries. This finding suggests that economic downturns can substantially weaken the capacity of governments to perform their functions effectively, highlighting the need for policies that enhance economic resilience. GCC governments should prioritize the development of economic diversification strategies to reduce reliance on volatile sectors, such as oil, and build more stable, diversified economies that can better withstand global economic shocks. Additionally, strengthening fiscal policies and creating contingency plans for economic crises can help mitigate the impact of future downturns on government effectiveness, ensuring that essential public services and governance functions remain robust even during periods of economic instability. Moreover, this research finds a positive but statistically insignificant impact of COVID-19 on government effectiveness in the GCC region, suggesting that the crisis response measures implemented during the pandemic enhanced governance capacities. To build on this momentum, policymakers should focus on institutionalizing the successful strategies and practices adopted during the pandemic. This includes maintaining the heightened levels of coordination, agility, and innovation government agencies demonstrate. Additionally, governments should invest in digital infrastructure and e-governance initiatives that were accelerated during the pandemic, as these can improve service delivery and administrative efficiency. By embedding these practices into standard government operations, GCC countries can continue to enhance government effectiveness beyond the crisis period, ensuring long-term improvements in governance. Overall, the findings of this research contribute to understanding the complex relationship between corruption control and regional governance outcomes. Moreover, the proposed model can serve as a valuable tool for

assessing government effectiveness in other countries, providing a framework for policymakers and researchers to evaluate and improve governance systems.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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