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The Effect(s) of E-Government on Corruption: Examining the Role of Development Level

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تأثير الحكومة الإلكترونية على الفساد: دراسة دور مستوى التنمية

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Abstract

E-government is one of the important innovations that has recently changed public administration. Although many governments have implemented e-government initiatives to reduce corruption in the public sector, the effectiveness of e-government in this regard is still a subject of debate. This paper examines the effectiveness of e-government in reducing corruption in the public sector for 168 countries from 2012 to 2022. Thus, this paper studies the relationship between the United Nations E-Government Development Index (EGDI) as the independent variable and corruption as the dependent variable, measured by the Corruption Perceptions Index developed by Transparency International and the Control of Corruption (COC) index alternately. To this end, three models were estimated: The baseline model examined the overall effect of the E-Government Development Index on corruption for the whole sample. The second one examined the impact of each sub-indicator of EGDI, namely, Online Service Index (OSI), Telecommunication Infrastructure Index (TII), and Human Capital Index (HCI), on corruption, also for the whole sample. Finally, the third model divided the data set into three subsets: developed, developing, and in-transition countries by adding a dummy variable to account for the development level, and compared the effect of EGDI on reducing corruption among the three groups of countries. The models were estimated using Ordinary Least Squares (OLS) fixed effects. The results of the baseline model showed that e-government can reduce corruption. As for the second model, results showed that OSI and HCI are significant. Finally, the third model showed that the impact of e-government on corruption is the highest in developing countries, followed by in-transition countries, and then developed countries. Therefore, this paper recommends a multi-faceted approach, encompassing e-government, institutional strengthening, transparency, and international cooperation to fight corruption effectively. Moreover, future research should address methodological limitations, such as employing panel dynamic analysis (e.g., GMM), and incorporate a wider range of indicators, including cultural, behavioral, and religious factors, to enhance the robustness of the findings.

Keywords: E-government, corruption, transparency, developing countries, developed countries

Introduction

The digital age has transformed many aspects of life, including how governments operate. E-government, which uses technology to deliver services and interact with citizens, is gaining attention worldwide. Although the scope and scale of implementation vary greatly between countries, many governments have adopted e-government initiatives (Mossberger et al., 2007; Weill and Woerner, 2013; Halpin, 2013).

While definitions of e-government vary, the World Bank offers a comprehensive definition as it states that e-government is "*The use of information technologies (such as Wide Area Networks, the Internet, and mobile computing) by government agencies that can transform relations with citizens, businesses, and other arms of government. These technologies can serve various ends: better delivery of government services to citizens, improved interactions with businesses, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reduction*" (Kingham, 2003).

This is the most comprehensive definition found in the literature, as it identifies some of the ICT tools used to implement e-government programs. Moreover, it identifies the main benefits that come with e-government. However, previous literature presented other definitions for e-government. For instance, The Department of Economic and Social Affairs (UNDESA) defined e-government as "*The public sector's use of the most innovative information and communication technologies, like the Internet, to deliver to all citizens improved services, reliable information, and greater knowledge to facilitate access to the governing process and encourage deeper citizen participation*" (UNDESA, 2002). This definition is slightly different from the other definition as it focuses primarily on the relationship between the government and citizens. In addition, it focuses on increasing citizens' participation. This definition emphasizes the potential of e-government to improve service delivery, transparency, and efficiency, all of which can combat corruption, a major obstacle to development.

Corruption has long been recognized as a major obstacle to the development of a country. It diverts public resources, undermines the rule of law, and distorts markets, which in turn hampers economic growth and social progress. Corruption also erodes public trust in government institutions and discourages both domestic and foreign investment. As a result, the provision of essential public services such as healthcare, education, and infrastructure is often compromised, leading to a decline in citizens' overall quality of life (Mauro, 2002; Villoria et al., 2013; Farrag & Ezzat, 2016). Economists have turned their attention to this issue a long time ago; however, measuring and reducing corruption has never been an easy task for countries. The World Bank (1997) defines corruption simply as "*The abuse of public power for private benefit*". While governments often try to combat corruption by strengthening laws and penalties, these traditional methods have proven largely ineffective (Jain, 2001; Shim and Eom, 2009; Park & Kim, 2020).

Corruption can be classified differently, but the most discussed distinction is between "grand" and "petty" corruption. Grand or political corruption, occurs at the elite level, where politicians manipulate policies and systems for personal gain, enriching themselves or their groups. In contrast, petty corruption involves lower-level public officials who demand bribes from the public in exchange for services that should be free, often due to a lack of accountability or bureaucratic inefficiencies (Jain, 2001).

Additional classifications include coercive versus collusive corruption, based on whether the bribe is forced or agreed upon by both parties, and systemic versus individual corruption, where systemic corruption is widespread and entrenched, while individual corruption involves isolated incidents. Despite these various distinctions, none fully capture all forms of corruption, and this paper focuses on the petty-grand corruption dichotomy, particularly petty corruption, as it is most relevant to the study of e-government initiatives designed to address this issue (Tanzi, 2006; Farrag & Ezzat, 2016; Boisvert, 2019).

Previous studies suggested that e-government reduces opportunities for corruption by minimizing direct contact between citizens and officials. Additionally, it provides cost-effective platforms for monitoring and supporting transparent decision-making (Mistry and Abu Jalal, 2012; El-Bahnasawy,2014; Park & Kim, 2020). Developed nations have successfully utilized e-government for this purpose, but developing countries still face challenges related to infrastructure, cultural factors, and digital literacy (Ifinedo, 2007; Sodhi, 2016). These hurdles must be addressed to fully harness the anti-corruption potential of e-government.

Consequently, the main objective of this paper is to explore the relationship between e-government and corruption theoretically and empirically. In the empirical analysis of this paper, we first estimate the effect of e-government, measured as the composite index, on the levels of petty corruption in a country. Given that the composite index consists of three sub-indices, we also investigate which of the three—OSI, TII, and HCI— drives the effect of e-government on corruption. Then, a third model is proposed by dividing the sample into three sub-groups to reflect the three development levels: developed, developing, and in-transition.

Our empirical analysis is based on a panel data set to test whether e-government can reduce corruption through three models from 2012 to 2022. The first one estimates the overall effect of e-government on corruption for all countries with available data for the chosen variables, which are almost 168 countries. In contrast, the second one disaggregates the E-government Development Index (EGDI) components. The third one compares the impact of e-government on corruption across developed, developing and in-transition countries by adding a dummy variable to account for the development level. In this regard, the OLS fixed and random effects method is applied to three model specifications, and then the Hausman test is conducted to choose the appropriate model.

To this end, this paper is organized into three sections. The first section explores various corruption theories and connects them to e-government. The second section reviews the existing empirical literature to examine the link between e-government and corruption. The third section presents the empirical analysis, followed by a discussion of the key results and findings. Based on the empirical outcomes, the paper concludes with policy recommendations.

Theoretical Framework

As corruption is a complex phenomenon, no one theory explains it all. However, several scholars have tried to explain the causes of corruption and how it can be tackled. Theoretically, the potential of e-government to reduce corruption can be explained through different theories, such as the principal-agent theory. According to this theory, conflicts arise when one party acts for another with information asymmetry. This can lead to self-serving actions by the agent (Ross, 1973). In the government context, citizens are the principals, and officials are the agents. Corruption occurs when

the principal cannot monitor the agent effectively, and the agent betrays the principal's interest in the pursuit of self-interest (Laffont and Martimort, 2002; Miller, 2005; Norris & Moon, 2005; Persson et al., 2013). Therefore, the principal needs to control the agent and narrow the information gap. Consequently, it would be crucial to reform the principal-agent relationship to prevent corruption by reducing the amount of discretionary power given to agents and increasing their accountability to the principal.

In this regard, e-government can be seen as a powerful tool in restructuring the principal-agent relationship to decrease corruption through increased access to information, simplifying rules and procedures, and increased transparency. It also provides detailed data on transactions, making tracking the actions made by agents easier. It reduces their discretionary power through standardizing service delivery and encourages accountability. Additionally, it permits the keeping of complete transaction records, increasing the likelihood of exposure. As a result, e-government may typically provide disincentives for public servants to commit corruption (Bhatnagar, 2009; Ojha et al.,2008; Garcia-Murillo, 2013).

While the principal-agent theory has long been used to explain corruption, other scholars have seen the emergence of collective action theory as an alternative explanation for the persistence of corruption despite anti-corruption laws. This theory views corruption as a collective problem, where individuals rationalize their behavior based on the actions of others, leading to corruption becoming a social norm. People engage in corrupt practices not because they are unaware of their negative consequences but because they believe it is futile to be the only honest person in a corrupt system (Marquette & Peiffer, 2015). To address this, collective and coordinated efforts are needed, and e-government can play a key role by fostering communication, cooperation, and shared responsibility among local and central governments, as well as private agencies, ultimately helping to reduce corruption by involving all sectors of society (Appolloni and Nshombo, 2014).

Moreover, scholars have explored the relationship between e-government and corruption through the lens of General Deterrence Theory (GDT), which posits that individuals are rational decision-makers who weigh the expected costs and benefits before committing crimes. In the context of corruption, rational actors are more likely to engage in corrupt acts when the expected benefits outweigh the perceived costs. To deter corruption, GDT suggests increasing the costs of engaging in such acts by enhancing the certainty, swiftness, and severity of punishment (Gibbs, 1968).

While e-government may not directly influence the severity or swiftness of punishment, it can increase the certainty of punishment by improving the monitoring, tracking, and sharing of data, making it easier to detect corruption and hold individuals accountable. By reducing the opportunities for undetected corruption, e-government raises the costs of engaging in corrupt behavior, thus discouraging rational individuals from participating in it (Bhattacherjee & Shrivastava, 2018).

Literature Review

Most of the past literature addressing the relationship between e-government and corruption has used different approaches and samples to explore this relationship. Some studies have examined this relationship globally, while others have focused on specific regions or countries. Yet, all these studies have achieved mixed results. Some empirical studies claim that e-government reduces corruption. Others have shown that e-government has no significant impact on reducing corruption, and even in some cases, it creates new opportunities for corruption.

On a global level, for instance, Seiam and Salman (2024) utilized a panel dataset of 110 countries spanning 2003-2021 to examine the impact of the E-government Development Index (EGDI) and its components (OSI, TII, HCI, and EPI) on the Corruption Perception Index (CPI). The study employed a fixed-effects model, and findings suggest that higher levels of e-government development are associated with lower levels of corruption. Similarly, Castro and Lopes (2023) used a large panel data set of 175 countries from 2003 to 2019 and applied random effects and GMM linear models. The results showed that e-government can be an effective tool in curbing corruption, particularly after reaching a threshold of 0.39 for the e-government development index. Also, they emphasized the importance of factors such as political stability, accountability, and sound regulation in enhancing the impact of e-government on corruption.

In a similar framework, Martins et al. (2021) used two more indices for corruption, along with CPI and the COC index, which are the International Country Risk Guide (IC_ICRG) and the Public Sector Corruption Index (PSCI). The study used EGDI for e-government along with a set of control variables for more than 170 countries from 2002 to 2020. The empirical results suggest that e-government serves as a deterrent to corrupt activities, highlighting that the potential of e-government to deter corruption is higher in countries where corruption is moderate or high and economic development is lower.

Other studies have delved deeper into the moderating factors of the relationship between e-government and corruption. For example, Park and Kim (2020) studied data from 214 countries from 2003 to 2016, and fixed-effects analysis was applied to explore the role of the rule of law, suggesting that e-government is more likely to reduce corruption in countries with stronger legal frameworks. Similarly, Nam (2018) used path analysis instead of OLS to investigate the moderating role of cultural factors, highlighting that e-government's effectiveness may vary across different cultural contexts.

Further, some studies used both measures of corruption to check for robustness. For example, Máchová et al. (2018) have also used the two corruption proxies and used three different indices for e-government, namely EGDI, the Networked Readiness Index (NRI) by the World Economic Forum (WEF), and the ICT Development Index (IDI) by the International Telecommunication Union (ITU) between 2002 and 2016. The results of the OLS model identified the key factors for a successful e-government initiative, which are the environment sub-index of the NRI, which assesses the extent to which a country's market conditions and regulatory framework support entrepreneurship, innovation, and ICT development; the usage sub-index of IDI, which assesses the level of ICT adoption by a society's main stakeholders; and the telecommunication infrastructure sub-index of EGDI, measuring a country's ICT infrastructure capacity.

On a regional/country level, Kalesnikaite et al. (2023) used OLS to analyze data from Latin America and the Caribbean, a region often affected by corruption. Their study showed that e-government significantly reduces bureaucratic corruption, particularly in services that avoid direct interactions between citizens and street-level officials. They examine the impact of e-government through a composite index and investigate the influence of its sub-indices—OSI, TII, and HCI—on corruption. The findings indicated that the positive effects of e-government primarily stem from the OSI sub-index.

Asorwoe (2014) investigated the impact of e-government on corruption in sub-Saharan Africa. The author stated that Africa remains the region with the lowest ranking in adopting e-government

technology. Thus, data for CPI, EGDI, and a set of control variables for a sample of 48 countries were collected, and the empirical findings showed that e-government has the potential to reduce administrative corruption within public service. Furthermore, Walle et al. (2018) used the same proxies for corruption and e-government for the same region from 2012 to 2016. The results of OLS showed that e-government has the potential to reduce corruption, but realizing such potential requires strengthening law enforcement and political will.

Similarly, Ali et al. (2021) examined the relationship for selected South Asian countries (Pakistan, India, Bangladesh, and Sri Lanka) from 2003 to 2018. The study incorporated other potential determinants of corruption, such as government effectiveness, press freedom, and education. The results of this study indicated that e-government plays a significant role in reducing corruption.

Despite the fact that evidence for the positive effects of e-government initiatives on reducing corruption is growing, a few studies have found that the implementation of e-government may not help to reduce corruption. Instead, adopting e-government may encourage corrupt public officials to enter new practices. **On a global level**, for instance, Basyal et al. (2018) analyzed panel data from 176 countries between 2003 and 2014 using a probability reduction approach. The study employed CPI and EGDI along with other potential determinants, such as gross domestic product per capita, inflation, political stability, government effectiveness, and press freedom indicators. The study found no significant impact of e-government on corruption, concluding that there was no evidence of an association between these constructs. Furthermore, Mélon & Spruk (2020) conducted a study on 108 countries from 1996 to 2017 using synthetic control estimation and difference-in-difference comparison. The findings of this study suggested that the institutional quality effects of e-government reform are not uniform across countries. The authors further argued that the introduction of e-government in an environment where prospects for widespread and pervasive corruption that breed rent-seeking incentives for business actors may have countervailing impacts.

While the above studies examined this issue globally, other studies have focused on specific regions by applying qualitative analysis. For example, Chernov et al. (2020) examined this relationship in Azerbaijan as they relied upon interviews given by several citizens of the Azerbaijani Republic and descriptive statistics of the access to the Internet and the level of corruption in Azerbaijan in 2013–2017. Based on this, the authors concluded that e-government implementation within the existing governing bodies can decrease corruption only to a certain point. They further explained that despite all the achievements and implementation of new digital services, Azerbaijan took a step backward in its struggle against corruption.

Moreover, Ismail et al. (2020) conducted a qualitative study on a local government in Indonesia to examine the impact of e-government on reducing corruption. The author reached the conclusion that, in reality, the use of electronic-based public services or e-government has not been successful in preventing corruption in Indonesian local government. The author also presented the argument that, to make this system reliable, an increase in a particular set of social attitudes, the professionalism of public officials, and public awareness must go hand in hand with the deployment of e-government and transparency, not just as a result.

In sum, despite the growing research in this field, the impact of e-government on corruption is not yet confirmed, as some studies have found empirical evidence for the role of e-government in reducing corruption on the global and regional or specific country levels. On the other hand, a few

studies have found that e-government initiatives may have no influence on reducing corruption or may even generate adverse effects. Besides these two extreme points of view, several studies argued that the ability of e-government to reduce corruption may vary across countries due to economic, educational, and cultural dimensions. To address this research gap, this study will empirically investigate the impact of e-government on corruption across a panel of 168 countries from 2012 to 2020. Further, the sample will then be divided into three subgroups based on the development level to examine whether the effectiveness of e-government in reducing corruption varies across different levels of economic development.

Empirical Analysis

Model and Variable Specifications

The main objective of this study is to estimate the impact of e-government on reducing perceived corruption using panel data analysis for 168 countries from 2012 to 2022. Some observations were dropped due to data availability. Variables and models are specified in the following part.

Dependent Variable

In this analysis, corruption is the dependent variable, and the study uses two measures of corruption for robustness. The first one is the Corruption Perceptions Index (CPI), issued annually for 180 countries since 1996 by Transparency International (TI). This index initially gives countries a score from zero to 10 (where zero is highly corrupt and 10 is very clean). However, since 2012, the methodology of the CPI has changed, as it has given countries a score from zero to 100 (where zero is highly corrupt and 100 is very clean). Thus, it is worth mentioning that pre-2012 scores are not comparable with post-2012 scores.

The second measure is the Control of Corruption (COC) index from the World Bank's Worldwide Governance Indicators (WGI) database. It measures perceptions of the extent to which public power is exercised for private gain, including petty and grand forms of corruption. The COC scores lie between -2.5 and 2.5, with higher scores indicating better control of corruption (i.e., lower levels of corruption).

Independent Variable

The main independent variable of interest in this study is e-government, which is measured by the E-government Development Index (EGDI). This index is issued by the United Nations for 192 member states as a comprehensive measure of the willingness and capacity of national administrations to use online technology in executing government functions. The index ranges from 0 to 1, where higher scores indicate a better e-government development level. Mathematically, the EGDI is a weighted average of normalized scores on the three most important dimensions of e-government, namely scope and quality of online services (Online Service Index, OSI), status of the development of telecommunication infrastructure (Telecommunication Infrastructure Index, TII), and inherent human capital (Human Capital Index, HCI). Each of these sets of indices is a composite measure that can be extracted and analyzed independently.

Control Variables

The study employs the most important and well-known determinants of corruption as control variables in the empirical analysis. The first variable is Gross Domestic Product (GDP) per capita. Wealthier countries have more resources to combat corruption, explaining why poor countries tend to have higher perceived corruption levels. This study uses the log of GDP per capita (LNGDPPPP)

to control data variability (Elbahnasawy and Revier,2012; Elbahnasawy, 2014; Kalesnikaite et al., 2023; Seiam and Salman, 2024). The second one is openness to international trade (TRADE), which is measured by the sum of exports and imports as a share of GDP. Studies suggest that increased trade openness enhances market competition, which can discourage corrupt behavior by reducing officials' monopoly power (Elbahnasawy and Revier,2012; Elbahnasawy, 2014; Kalesnikaite et al., 2023; Seiam and Salman, 2024).

Also, the rural population (as a percentage of the total population) is included. Its impact on corruption is debated. Rural populations may be less informed about government processes, increasing tolerance for corruption. Alternatively, smaller transaction volumes and closer social ties in rural areas could limit opportunities for corruption or increase potential consequences for corrupt officials. Additionally, this study also includes the level of law enforcement measured by the World Bank's Rule of Law Index (ROL). The ROL assesses public confidence in societal rules, contract enforcement, property rights, policing, courts, and the threat of crime. Higher ROL scores indicate a stricter rule of law and more effective enforcement, which can potentially deter corruption (Elbahnasawy and Revier,2012; Elbahnasawy, 2014; Kalesnikaite et al., 2023; Seiam and Salman, 2024).

The following table summarizes definitions and data sources for the dependent, independent, and control variables.

Table 1

Definitions of Variables

Variable	Definition	Source
Dependent Variable		
Corruption Perception Index	The CPI Score relates to perceptions of the degree of corruption as seen by businesspeople, risk analysts, and the general public and ranges between 100 (highly clean) and 0 (highly corrupt).	Transparency International
Control of Corruption Index	Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. The estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, ranging from approximately -2.5 to 2.5, with higher scores corresponding to better control of corruption.	World Governance Indicators by the World Bank
Independent Variable		
E-government Development Index	A comprehensive measure of the willingness and capacity of national administrations to use online and mobile technology to execute government functions. The index ranges from 0 to 1, where higher scores indicate better e-government.	United Nations

Telecommunication Infrastructure Index	Arithmetic average composite of five indicators: (i) estimated internet users per 100 inhabitants; (ii) number of main fixed telephone lines per 100 inhabitants; (iii) number of mobile subscribers per 100 inhabitants; (iv) number of wireless broadband subscriptions per 100 inhabitants; and (v) number of fixed broadband subscriptions per 100 inhabitants.	International Telecommunication Union / United Nations
Human Capital Index	It consists of four components, namely: (i) adult literacy rate; (ii) the combined primary, secondary, and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling.	International Telecommunication Union / United Nations
Online Service Index	It assesses the level of web content accessibility in each country according to the Web Content Accessibility Guidelines of the World Wide Web Consortium. This index is based on a four-stage model of online service maturity: the emerging online presence with simple websites; the enhanced information services with the deployment of multimedia content and two-way interaction; the online provision of transactional services; and the connected services where government websites communicate with citizens using interactive tools.	International Telecommunication Union / United Nations
Control Variables		
GDP Per Capita (Purchasing Power Parity- PPP)	GDP PPP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the US dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the country, plus any product taxes, and minus any subsidies not included in the value of the products. It is calculated without making deductions for the depreciation of fabricated assets or for the depletion and degradation of natural resources. Data are in constant 2017 international dollars.	WDI
Openness to International Trade	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI
Rule of Law	Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, particularly the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The estimate gives the country's score on the aggregate indicator in units of standard normal distribution, ranging from approximately -2.5 to 2.5.	World Governance Indicators by the World Bank
Rural Population (% of total population)	Rural population refers to people living in rural areas as defined by national statistical offices. It is calculated as the difference between the total population and the urban population.	WDI

Source: Prepared by the authors based on the official data sources.

The specified models are estimated using OLS fixed/random effects models. We then use the Hausman test to identify the appropriate model among the three models. The baseline model estimates the general effect of e-government on corruption while controlling GDP per capita, rule of law, trade openness, and rural population as determinants of corruption, as shown by equation (1.1). Furthermore, to give more insights, the second model disaggregates the EGDI into its three sub-indicators and estimates the effect of each one separately on COC and CPI alternately (Kalesnikaite et al., 2023) while controlling for the same set of control variables as shown in equations (2.1), (2.2), and (2.3). The first two models are estimated for the whole sample (168 countries).

The third model divides the sample into three groups by adding an interaction term between EGDI and a dummy variable that accounts for the country's development level[1]. Three dummy variables are created to account for three different development levels, namely, developed, developing, and in transition. The first dummy variable takes the value of 1 if the country is developed and zero otherwise. The same applied to the second and third dummy variables that account for developing and transition countries, respectively.[2] Consequently, two interaction terms are created by multiplying the EGDI by two dummy variables and then estimated, as shown in equation (3.1).

$$\boldsymbol{CI_{it} = \beta_0 + \beta_1 EGDI_{it} + \gamma\, Z_{it} + \varepsilon_{it}} \quad \textbf{(1.1)}$$

$$\boldsymbol{CI_{it} = \beta_0 + \beta_1 HCI_{it} + \gamma\, Z_{it} + \varepsilon_{it}} \quad \textbf{(2.1)}$$

$$\boldsymbol{CI_{it} = \beta_0 + \beta_1 TCI_{it} + \gamma\, Z_{it} + \varepsilon_{it}} \quad \textbf{(2.2)}$$

$$\boldsymbol{CI_{it} = \beta_0 + \beta_1 OSI_{it} + \gamma\, Z_{it} + \varepsilon_{it}} \quad \textbf{(2.3)}$$

$$\boldsymbol{CI_{it} = \beta_0 + \beta_1 EGDI_{it} + \beta_2 ROL + \beta_2 EGDI * Developed_{it} + \beta_3 EGDI * Developing_{it} + \gamma\, Z_{it} + \varepsilon_{it}} \quad \textbf{(3.1)}$$

Where:
$\mathbf{CI_{it}}$: Corruption Index (either CPI or COC) in country *i* at time *t*.
$\mathbf{EGDI_{it}}$: E-government Development Index in country *i* at time *t.*
$\boldsymbol{HCI_{it}}$: Human Capital Index in country *i* at time *t*.
$\boldsymbol{TCI_{it}}$: Telecommunication Infrastructure Index in country *i* at time t.
$\boldsymbol{OSI_{it}}$: Online Service Index in country *i* at time t.
$\boldsymbol{EGDI * Developed_{it}}$**:** Interaction term between EGDI and the dummy for developed in country *i* at time t.
$\boldsymbol{EGDI * Developing_{it}}$**:** Interaction term between EGDI and the dummy for developing in country *I* at time t.
$\mathbf{Z_{it}}$: Vector of control variables representing the determinants of corruption.
$\boldsymbol{\varepsilon_{it}}$**:** Error term in country *i* at time *t*.

Descriptive Statistics:

Before proceeding to the empirical analysis, this section includes some descriptive statistics and correlation analysis for the variables used in the analysis. Descriptive statistics for the variables are presented in Table (2).

[1] The classification of the selected countries is based on the classification of the United Nations, 2023
[2] The selected countries are presented in Table (1) in the appendix.

Table 2
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
COCSCORE	1980	-.054	.971	-1.816	2.407
CPISCROE	1855	43.679	18.893	0	92
EGDI	1979	.536	.217	0	.976
OSI	1978	.504	.26	0	1
HCI	1978	.675	.199	0	1
TCI	1978	.431	.255	0	.998
LNGDPPPP	1788	9.309	1.147	6.571	11.666
RURAL	1979	41.648	22.607	0	88.806
ROL	1980	-.05	.952	-2.423	2.13
TRADE	1850	89.29	53.934	.785	396.625

Source: Prepared by the authors based on statistical results.

Table (3) shows the correlation matrix for all variables, which is considered a primary tool to efficiently describe and measure the strength of relationships between variables of interest in this study. First, it is evident from the table below that the two corruption indices are highly correlated (0.98), with all correlation coefficients significant at the 5% significance level. Additionally, there is a strong positive correlation between CPI-IT and EGDI since higher values of CPI-IT mean lower levels of corruption. This implies that corruption and e-government are negatively correlated. The same correlation holds for the COC-WB. In addition, the two measures of corruption have a strong positive correlation with the three sub-indicators of EGDI, namely, OSI, TCI, and HCI. The two measures of corruption almost have the same correlation coefficient, with TCI having the highest correlation, followed by OSI and then HCI. As for the correlation between corruption and the control variables, it seems that the two measures of corruption are positively correlated with ROL, LNGDPPPP, and TRADE, with a positive sign. On the other hand, CPI-IT and COC-WB are negatively correlated with RURAL.

Table 3
Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) CPISCROE	1.000									
(2) COCSCORE	0.986*	1.000								
(3) EGDI	0.733*	0.712*	1.000							
(4) OSI	0.641*	0.610*	0.908*	1.000						
(5) TCI	0.730*	0.704*	0.938*	0.779*	1.000					
(6) HCI	0.637*	0.618*	0.864*	0.649*	0.762*	1.000				
(7) LNGDPPPP	0.715*	0.689*	0.864*	0.706*	0.846*	0.820*	1.000			
(8) ROL	0.941*	0.933*	0.748*	0.643*	0.723*	0.671*	0.723*	1.000		
(9) RURAL	-0.525*	-0.471*	-0.622*	-0.518*	-0.614*	-0.571*	-0.712*	-0.454*	1.000	
(10) TRADE	0.301*	0.306*	0.232*	0.122*	0.296*	0.225*	0.350*	0.303*	-0.250*	1.000
*** $p<0.01$, ** $p<0.05$, * $p<0.1$										

Source: Prepared by the authors based on statistical results**.**

Stylized Facts

Before moving to the empirical analysis, some stylized facts are given to provide key insights into the patterns and relationships observed in the data. Figures (1) and (2) show a scatter plot for COC-WB and EGDI for the countries included in the analysis at two points in time: 2012 and 2022. The graphs show a positive association between the two variables, reflected by the upward-sloping lines, which signifies that higher development levels of e-government are associated with lower levels of perceived corruption. (higher COC scores).

Figure 2: COC-WB and EGDI in 2012

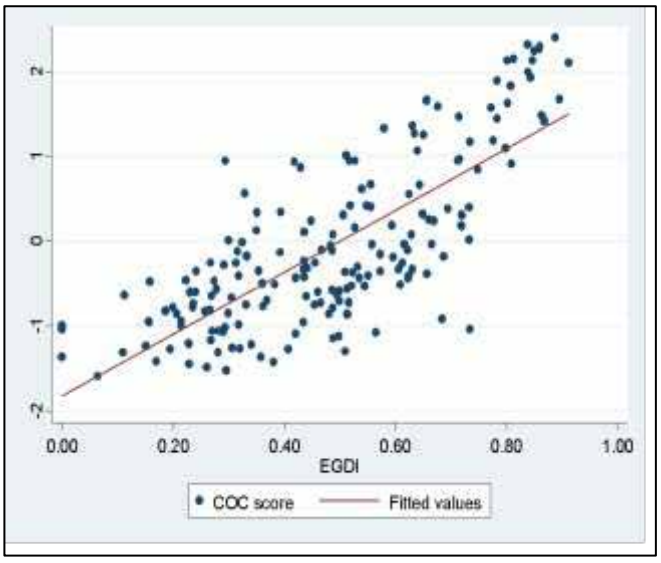
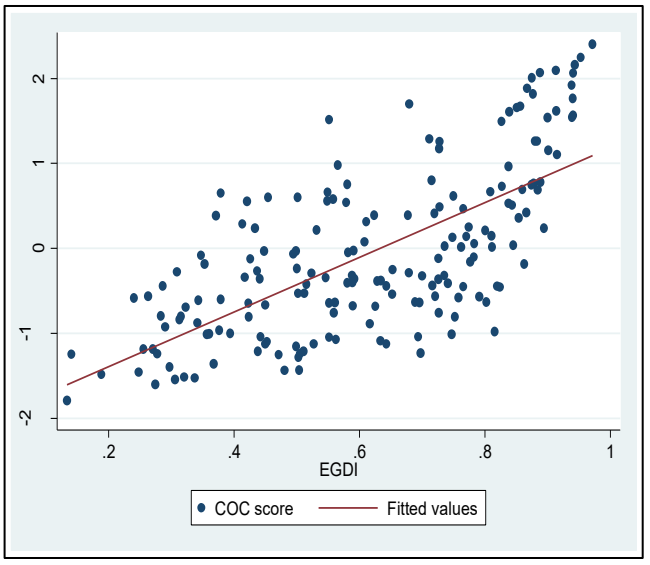


Figure 1: COC-WB and EGDI in 2022



Source: Prepared by the authors using data from the WB and the UN.

Figures (3-5) give different insights into the association between e-government and corruption across countries with different development levels over the period 2012-2022. For instance, Figure 3 plots the relationship between COC-WB and EGDI in developed countries. As is evident, developed countries are experiencing low levels of corruption, as reflected by the high scores of COC-WB. Also, this group of countries has high levels of EGDI. In contrast, developing countries are experiencing high levels of corruption (reflected by the low scores of COC-WB) and lower levels of EGDI compared to developed countries, as shown in Figure 4. This, in turn, clarifies that, although the association between COC-WB and EGDI exists in both developed and developing countries, it is much stronger in the latter than in the former. This is because the role of e-government in reducing corruption depends on the level of corruption within countries. Accordingly, e-government in these countries will have a lower potential to reduce corruption, whereas there are already low levels of corruption. In contrast, it has proved to be more effective in developing countries with higher levels of corruption.

As for the in-transition countries, it is shown in Figure (5) that these countries have different levels of corruption and moderate levels of e-government development. The Figure reveals a more scattered relationship between corruption and e-government development, suggesting that the impact of e-government in these countries remains unclear.

Figure 4: COC-WB and EGDI for Developed Countries

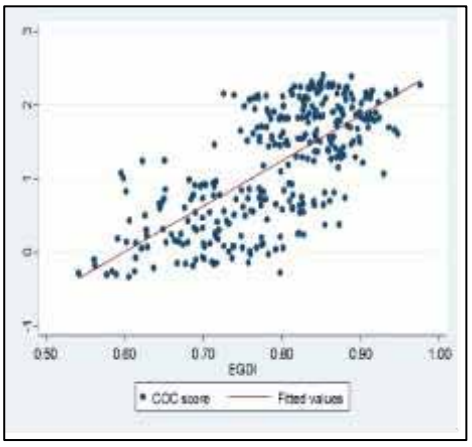


Figure 5: COC-WB and EGDI for Developing Countries

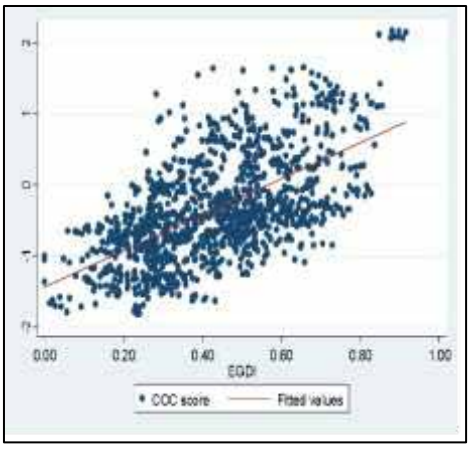
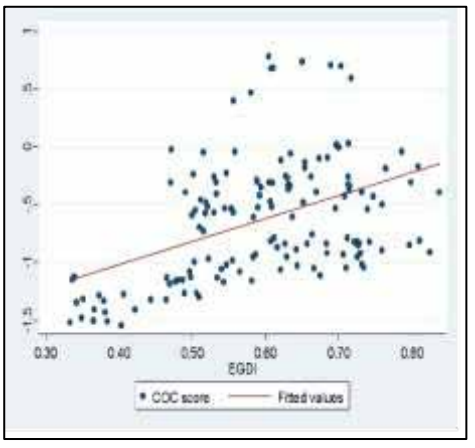


Figure 3: COC-WB and EGDI for in-transition Countries



Source: Prepared by the authors using data from the WB and the UN.

Results

For all specifications of the three described models in the previous section, fixed and random effects were applied. Then we employed the Hausman specification test to choose the appropriate model. According to the results of the Hausman test, as shown in Table (4), under the current specifications, it is appropriate to use the fixed effects model. In addition, a VIF test was also conducted to check for collinearity. Results are shown by tables (5-9), where the highest variance inflation factor value across all models is 6.83, which is below the common threshold value of 10 (Salmerón et al., 2018) and indicates no serious collinearity issues.

The results of the first model are reported in columns (1-2), which showed a positive and significant relationship between EGDI and corruption measured by CPI-IT and COC-WB alternately at a significance level of 10%. This means that the higher the development level of e-government is, the lower the level of perceived corruption, where an increase in EGDI by 1 unit leads to a decrease in CPI-IT by 2.349 points and a decrease in COC-WB by 0.109 points. This significant relationship confirms the correlations previously obtained and strongly verifies the first hypothesis of this thesis (H1). These empirical findings are in alignment with the findings of many previous studies, including Elbahnasawy (2014), Martins et al. (2021), Kalesnikaite et. al. (2023), and others.

Moving on to the results of the second model, which disaggregates the components of EGDI to its three sub-indicators, columns (3-4) show that OSI has a positive and significant relationship with both measures of corruption (CPI-IT and COC-WB) at 10% and 5% significance levels, respectively. Similarly, columns (5-6) show that HCI has a positive and significant relationship with the two measures of corruption, with a significance level of 5% and 10%, respectively. In contrast, surprisingly, TCI has an insignificant effect on both measures of corruption, as shown in columns (7-8). This suggests that the impact of e-government on corruption is mainly driven by the OSI and HCI.

Turning to the results of the third model, it is evident from columns (9-10) that EGDI is statistically significant at 1% with both measures of corruption. Also, as shown, the interaction terms of the developed countries are significant at 1% with both measures of corruption. Meanwhile, the interaction terms of the developing countries are significant, at 1% with CPI-IT and 5% with COC-WB. According to the coefficients of the interaction terms, the impact of e-government on reducing

corruption is lower for the developed countries by 0.75 and 0.137 points compared to the in-transition countries. However, it is higher for developing countries at 0.29 and 0.106 points compared to the in-transition countries.

As for the control variables, ROL is statistically significant at 1% across all models with a positive sign. This supports the argument that enforcement of laws is an important factor in the fight against corruption. Likewise, LNGDPPPP is found to be significantly positive in both models at different significance levels. This supports the argument that rich countries can devote more resources to fighting corruption. These results were supported by many scholars, such as Jain (2001), Elbahnasawy (2014), Elbahnasawy and Revier (2012), and Kaufmann, Kraay, & Mastruzzi (2010). On the other hand, trade and rural population are found to be insignificant in all estimated models, which contradicts the results of the correlation analysis along with some previous studies (Treisman, 2007; Elbahnasawy, 2014).

Table 4

Results of the Hausman test

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	CPI-IT	COC-WB	CPI-IT	COC-WB	CPI-IT	COC-WB	CPI-IT	COC-WB	CPI-IT	COC-WB
Chi-square test value	321.53	321.53	329.24	301.94	318.13	299.491	325.344	307.875	284.478	269.377
P-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Prepared by the authors based on statistical results.

Table 5

VIF for the first model

	CPI-IT	COC-WB
	VIF	VIF
LNGDPPPP	6.375	5.97
EGDI	4.917	4.833
ROL	2.836	2.536
RURAL	2.537	2.24
TRADE	1.197	1.194
Mean VIF	3.572	3.354

Source: *Prepared by the authors based on statistical results.*

Table 6

VIF for the second model

	CPI-IT	COC-WB
	VIF	VIF
LNGDPPPP	5.97	4.856
EGDI	4.833	2.788
ROL	2.536	2.548
RURAL	2.24	2.534
TRADE	1.194	1.221
Mean VIF	3.354	2.789

Source: Prepared by the authors based on statistical results.

Table 7

VIF for the third model

	CPI-IT	COC-WB
	VIF	VIF
LNGDPPPP	6.831	5.527
HCI	3.538	3.191
RURAL	2.536	2.242
ROL	2.417	2.239
TRADE	1.182	1.164
Mean VIF	3.301	2.872

Source: Prepared by the authors based on statistical results.

Table 8

VIF for the fourth model

	CPI-IT	COC-WB
	VIF	VIF
LNGDPPPP	5.542	5.24
TCI	4.011	3.897
ROL	2.754	2.405
RURAL	2.563	2.249
TRADE	1.156	1.148
Mean VIF	3.205	2.988

Source: Prepared by the authors based on statistical results.

Table 9

VIF for the fifth model

	CPI-IT	COC-WB
	VIF	VIF
LNGDPPPP	6.375	5.971
EGDI	5.001	4.949
ROL	3.678	3.169
RURAL	2.544	2.241
EGDI*developed	2.274	2.185
TRADE	1.2	1.195
Mean VIF	3.512	3.285

***Source*:** Prepared by the authors based on statistical results.

Table 10

Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	CPI-IT	COC-WB	CPI-IT	COC-WB	CPI-IT	COC-WB	CPI-IT	COC-WB	CPI-IT	COC-WB
EGDI	2.349*	0.109*							18.90***	0.455***
	(1.288)	(0.0557)							(3.509)	(0.155)
ROL	7.356***	0.446***	7.297***	0.445***	7.348***	0.446***	7.289***	0.446***	7.063***	0.439***
	(0.672)	(0.0245)	(0.673)	(0.0246)	(0.673)	(0.0246)	(0.674)	(0.0246)	(0.672)	(0.0247)
Rural	0.0342	0.000475	0.0237	9.36e-05	0.00796	-0.000758	0.0150	-0.000363	0.0233	0.000613
	(0.0427)	(0.00186)	(0.0412)	(0.00179)	(0.0401)	(0.00174)	(0.0435)	(0.00188)	(0.0429)	(0.00187)
trade	-0.00696	0.000136	-0.00751	0.000107	-0.00754	0.000104	-0.00688	0.000136	-0.0100*	9.60e-05
	(0.00568)	(0.000240)	(0.00568)	(0.000240)	(0.00568)	(0.000240)	(0.00570)	(0.000241)	(0.00567)	(0.000241)
lnGDPppp	1.240*	0.0419	1.193*	0.0386	1.297**	0.0454	1.292**	0.0439	1.108*	0.0455
	(0.648)	(0.0278)	(0.650)	(0.0279)	(0.648)	(0.0278)	(0.649)	(0.0279)	(0.653)	(0.0282)
OSI			1.395*	0.0717**						
			(0.772)	(0.0333)						
HCI					4.369**	0.180*				
					(2.163)	(0.0917)				
TCI							0.431	0.0229		
							(0.830)	(0.0358)		
EGDI*developed									-19.65***	-0.592***
									(4.625)	(0.204)
EGDI*developing									-18.61***	-0.349**
									(3.763)	(0.166)
Constant	30.62***	-0.506*	32.07***	-0.436	29.54***	-0.549*	31.99***	-0.442	32.72***	-0.519*
	(7.065)	(0.304)	(6.982)	(0.300)	(7.132)	(0.307)	(7.064)	(0.303)	(7.088)	(0.306)
Observations	1,573	1,667	1,572	1,666	1,572	1,666	1,572	1,666	1,573	1,667
R-squared	0.089	0.190	0.088	0.189	0.088	0.189	0.086	0.187	0.105	0.194
Number of id	159	167	159	167	159	167	159	167	159	167

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Prepared by the authors based on statistical results.

Discussion

As claimed by previous studies, E-government can play a significant role in reducing perceived corruption in the public sector while considering a variety of factors, including the effectiveness of law enforcement, the level of development in the country, the degree of openness to international trade, and others. Therefore, the previous part intended to empirically examine the effect of e-government on corruption to verify this assumption. According to the results from the baseline model, we can infer that e-government can be used effectively to fight corruption. These results are consistent with those of El-Bahanasawy (2014), Nam (2018), Zuffova (2020), Martin et al. (2021), and others.

Further, despite the fact that many authors have examined the impact of e-government on corruption, few papers have examined the components of the EGDI to know the main constituents that drive the impact of e-government on corruption. This study contributes to the literature by examining the OSI, HCI, and TCI separately on corruption. However, these results need to be interpreted with caution. The results showed that OSI and HCI are significant constituents working together to reduce corruption. The increased offering of online services and the resultant reduction in direct communication between citizens and bureaucrats limit petty corruption in a country. This finding emphasizes the role of online platforms in facilitating communication between the public and government institutions. The use of mobile applications, data analysis, artificial intelligence, and websites contributes to the fight against corruption by increasing access to public information, digitizing government services, monitoring officials' operations, and facilitating corruption reporting. What was surprising is that TCI is not significant, which means that although having a sound technological infrastructure is an important requirement for transforming the traditional government into an electronic one, this transformation still does not guarantee that corruption will be reduced. Yet, it depends on the level of education and participation of the citizens or businesses.

This study also compared the impact of e-government on corruption across developed, developing, and in-transition countries. This comparison showed different insights, as the results showed that the impact of e-government on corruption is the highest in developing countries, followed by in-transition countries, and then developed countries.

Limitations and Future Research

Several limitations are identified in the empirical analysis used, which should be considered when interpreting the conclusions. For example, the empirical findings are mostly determined by the variable specification, the control variables included, the number of countries included and their characteristics, and the time and methodology used for the analysis. Furthermore, there may be certain limitations to the current research, which are primarily due to the presence of missing data in corruption measures and some control variables. Furthermore, we believe that the likely endogeneity of several explanatory factors (such as e-government and GDP per capita) is a source of constraint for our findings.

Consequently, future study extensions are suggested that should attempt to fill gaps in the existing literature and address methodological issues in the empirical analysis used. Different estimation approaches, such as panel dynamic analysis (i.e., GMM), can be employed to account for endogeneity. Furthermore, other WGI sub-indicators, such as cultural, behavioral, and religious indicators, could be addressed in the future. Furthermore, this empirical analysis might be extended in terms of country coverage or across time to test the robustness of the reported results.

Conclusion and Policy Recommendations

Corruption is a serious problem that threatens the achievement of economic development goals in different countries, and it can also cause government inefficiency. Corruption is defined as using public power to gain personal or private gains. Therefore, countries have been trying to fight corruption with different approaches, yet these approaches have not successfully reduced corruption, as it is still prevailing in all countries with varying degrees. Recently, there has been much focus on the role of e-government in reducing corruption in the public sector. Previous studies have claimed that e-government can be used as one of the key tools to fight corruption. It is argued that e-government reduces the incentives for corruption by removing the direct contact between citizens and public officials.

Developed countries have gone a long way in implementing e-government, while developing countries are still struggling to adopt this method to control corruption due to technical, cultural, and other challenges. Despite that, previous studies that empirically examined this claim have reached mixed results, as some studies claim that e-government can successfully reduce corruption. Other studies have shown that e-government has no significant effect on reducing corruption, and even in some cases, it has countervailing effects.

Consequently, this paper examined empirically the role of e-government in reducing corruption for a panel of 168 countries from 2012 to 2022. The results showed that e-government can effectively reduce corruption. After that, this impact was compared across developed, developing, and in-transition countries. The results revealed that the influence of e-government on decreasing corruption is greater in developed countries than in developing and in-transition countries.

Based on the preceding review and analysis, the paper proposes the following policy implications:

- While e-government initiatives offer significant potential to reduce corruption, a comprehensive approach is necessary to address this complex issue effectively. Countries should combine e-government strategies with other measures, such as strengthening institutions, promoting transparency and accountability, and enhancing international cooperation. By adopting a multi-faceted approach, governments can create a more robust and resilient anti-corruption framework
- Although developed countries have made significant progress in implementing e-government, developing countries continue to face challenges due to a variety of contextual factors such as resource constraints, a lack of digital infrastructure, low literacy levels, poor basic education, a lack of internet access, particularly among rural populations, a low level of technological adaptation, poor IT literacy, and political aspects that revolve around lack of cyber laws, low budget allocation among others. Thus, developing countries must make greater efforts to overcome these obstacles and benefit from e-government.
- To improve the efficiency of e-government, governments must review their laws, administrative manuals, and codes to make them amenable to e-government, as results have proved that law enforcement facilitates the influence of e-government on the corruption level. This should be done to ensure that government processes can be moved to e-government channels. In cases where the e-government service has been offered alongside outdated laws and procedures, its utility to the citizen or business could be marginal.
- To fully leverage the potential of ICTs in the public sector, governments must invest in the training and retraining of their workforce. Governments can enhance service delivery, improve efficiency, and foster innovation by equipping public servants with the necessary

digital skills. Regular training programs should focus on a range of ICT skills, including data analysis, cybersecurity, and digital literacy. Additionally, it is essential to create a supportive work environment that encourages the adoption of new technologies and continuous learning.

- To avoid creating new forms of corruption after the implementation of e-government, security measures must be strategically incorporated in all phases of implementation, starting from the design phase. Cybersecurity is a critical component of resilient e-government systems. Governments can protect sensitive information and prevent cyberattacks by implementing robust security measures, such as encryption, firewalls, and access controls. Additionally, regular security audits and training programs for government employees can help to mitigate the risk of cyber threats.

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Appendix

Table 1

Countries included in the study

Australia *	Afghanistan [d]	Egypt [d]	Marshall Islands [d]	South Africa [d]
Austria *	Algeria [d]	El Salvador [d]	Mauritania [d]	Sri Lanka [d]
Belgium*	Angola [d]	Equatorial Guinea [d]	Mauritius [d]	Sudan [d]
Bulgaria*	Antigua and Barbuda [d]	Eswatini [d]	Mexico [d]	Suriname [d]
Canada*	Argentina [d]	Ethiopia [d]	Mongolia [d]	Thailand [d]
Croatia*	Bahamas [d]	Fiji [d]	Morocco [d]	Timor-Leste [d]
Cyprus*	Bahrain [d]	Gabon [d]	Mozambique [d]	Togo [d]
Czech Republic*	Bangladesh [d]	Gambia [d]	Myanmar [d]	Tonga [d]
Denmark*	Barbados [d]	Ghana [d]	Namibia [d]	Trinidad and Tobago [d]
Estonia*	Belize [d]	Grenada [d]	Nauru [d]	Tunisia [d]
Finland*	Benin [d]	Guatemala [d]	Nepal [d]	Turkey [d]
France*	Bhutan [d]	Guinea [d]	Nicaragua [d]	Tuvalu [d]
Germany*	Bolivia [d]	Guinea-Bissau [d]	Niger [d]	Uganda [d]
Greece*	Botswana [d]	Guyana [d]	Nigeria [d]	United Arab Emirates [d]
Hungary*	Brazil [d]	Haiti [d]	Oman [d]	United Republic of Tanzania [d]
Iceland*	Brunei Darussalam [d]	Honduras [d]	Pakistan [d]	Uruguay [d]
Ireland*	Burkina Faso [d]	India [d]	Palau [d]	Vanuatu [d]
Italy*	Burundi [d]	Indonesia [d]	Panama [d]	Vietnam [d]
Japan*	CÃ´te d'Ivoire [d]	Iran (Islamic Republic of) [d]	Papua New Guinea [d]	Zambia [d]
Latvia*	Cabo Verde [d]	Iraq [d]	Paraguay [d]	Zimbabwe [d]
Lithuania*	Cambodia [d]	Israel [d]	Peru [d]	Albania [T]
Luxembourg*	Cameroon [d]	Jamaica [d]	Philippines [d]	Armenia [T]
Malta*	Central African Republic [d]	Jordan [d]	Qatar [d]	Azerbaijan
Netherlands*	Chad [d]	Kenya [d]	Rwanda [d]	Belarus [T]
New Zealand*	Chile [d]	Kiribati [d]	Saint Kitts and Nevis [d]	Bosnia and Herzegovina [T]
Norway*	China [d]	Kuwait [d]	Saint Lucia [d]	Georgia (Country) [T]
Poland*	Colombia [d]	Lao People's Democratic Republic [d]	Saint Vincent and the Grenadines [d]	Kazakhstan [T]
Portugal*	Comoros [d]	Lebanon [d]	Samoa [d]	Kyrgyzstan [T]
Romania*	Congo [d]	Lesotho [d]	São Tomé and Príncipe [d]	Montenegro [T]

Slovakia*	Costa Rica [d]	Liberia [d]	Saudi Arabia [d]	North Macedonia [T]
Slovenia*	Cuba [d]	Libya [d]	Senegal [d]	Russian Federation [T]
Spain*	Democratic Republic of the Congo [d]	Madagascar [d]	Seychelles [d]	Serbia [T]
Sweden*	Djibouti [d]	Malawi [d]	Sierra Leone [d]	Tajikistan [T]
Switzerland*	Dominica [d]	Malaysia [d]	Singapore [d]	Turkmenistan [T]
United Kingdom of Britain*	Dominican Republic [d]	Maldives [d]	Solomon Islands [d]	Ukraine [T]
United States of America*	Ecuador [d]	Mali [d]	Somalia [d]	Uzbekistan [T]

([*]) Refers to developed countries, ([d]) refers to developing countries, and ([T]) refers to transition countries.
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تصدر عن مركز المعلومات ودعم اتخاذ القرار

تأثير الحكومة الإلكترونية على الفساد:
دراسة دور مستوى التنمية

المستخلص

تعد الحكومة الإلكترونية من أهم الابتكارات التي غيرت الإدارة العامة في السنوات الأخيرة. وعلى الرغم من قيام العديد من الحكومات باستخدامها للحد من الفساد في القطاع العام، فإن فاعلية الحكومة الإلكترونية في هذا الصدد ما تزال موضع نقاش. لذلك، تدرس هذه الدراسة فاعلية الحكومة الإلكترونية في الحد من الفساد في القطاع العام لـ168 دولة خلال الفترة من 2012 إلى 2022. ولتحقيق هذا الهدف، تحلل هذه الدراسة العلاقة بين مؤشر الأمم المتحدة لتطوير الحكومة الإلكترونية باعتباره المتغير المستقل، والفساد باعتباره المتغير التابع، ويتم قياسه من خلال مؤشر مدركات الفساد التي وضعتها منظمة الشفافية الدولية ومؤشر مكافحة الفساد بالتناوب. وتم تقدير هذه النماذج الثلاث على النحو التالي: النموذج الأساسي لدراسة الأثر الكلي لمؤشر الأمم المتحدة لتطوير الحكومة الإلكترونية على الفساد، والنموذج الثاني لدراسة أثر كل من المؤشرات الفرعية لمؤشر الأمم المتحدة لتطوير الحكومة الإلكترونية، وهي: مؤشر الخدمات عبر الإنترنت، ومؤشر البنية التحتية للاتصالات، ومؤشر رأس المال البشري، على الفساد. وأخيرا، يقارن النموذج الثالث أثر مؤشر الأمم المتحدة لتطوير الحكومة الإلكترونية على الحد من الفساد بين الدول المتقدمة والنامية والدول التي تمر بمرحلة انتقالية. وتم احتساب النماذج المذكورة باستخدام تحليل انحدار الآثار الثابتة. وقد دعمت نتائج النموذج الأساسي الفرضية الأولى بأن للحكومة الإلكترونية دورا فعالا للحد من الفساد. علاوة على ذلك، أظهرت نتائج النموذج الثاني أن مؤشر الخدمات عبر الإنترنت، ومؤشر رأس المال البشري ذو أهمية فعالة للحد من الفساد، بينما أظهرت النتائج أن مؤشر البنية التحتية للاتصالات ليس له تأثير على الفساد. وأخيرا أظهرت نتائج النموذج الثالث أن الدول النامية لديها القدرة على الاستفادة بشكل أكبر من الحكومة الإلكترونية في مكافحة الفساد مقارنة بالدول المتقدمة والدول التي تمر بمرحلة انتقالية. لذلك، توصي هذه الورقة باتباع نهج متعدد الجوانب لمكافحة الفساد، يشمل دمج استراتيجيات الحكومة الإلكترونية مع تدابير أخرى، مثل: تعزيز المؤسسات، وتعزيز الشفافية والمساءلة، وتعزيز التعاون الدولي. علاوة على ذلك، يجب أن يتناول البحث المستقبلي القيود المنهجية، مثل استخدام تحليل ديناميكي لوحدة البيانات (على سبيل المثالGMM)، وتضمين مجموعة أوسع من المؤشرات، بما في ذلك العوامل الثقافية والسلوكية والدينية، لتعزيز قوة النتائج.

الكلمات الدالة: الحكومة الإلكترونية، الفساد، الشفافية، مساءلة، القطاع العام