

E-Government, Corruption Reduction and the Role of Culture: A Study Based on Panel Data of 57 Countries

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ABSTRACT

Using a panel dataset gathered from 57 countries over the period 2003 to 2014, this paper examines the impact of cultural factors on the relationship between e-government development and corruption. The analysis reveals that e-government development have a weak and positive impact on the corruption levels across all countries but varied according to the different cultural factors. Based on the cultural typology of the GLOBE project, the authors found that e-government development was more effective in reducing corruption in countries with certain cultural characteristics. Cultures that put less emphasis on controlling uncertainty shared power more equally among members, valued individualism, and focused more on future development were more favorable to e-government development than others. Finally, they discussed the cultural implications on e-planning.

KEYWORDS

Corruption Reduction, Culture, E-Government, E-Planning, Panel, Random Effects

INTRODUCTION

According to the Corruption Perceptions Index, corruption persists in various forms in many nations often resulting in negative consequences and major obstacles for the nation's progress (Transparency International, 2016). However, the growing use of the Internet and Information and Communication Technologies (ICTs) provide a glimmer of hope in reducing corruption and improving the effectiveness, transparency, and accountability of government (Bertot et al., 2010, Kim et al., 2009; Bhatnagar, 2003). Many cross-national studies have shown a positive association with e-government development and the reduction in corruption (Andersen, 2009; Lio et al., 2011; Elbahnasawy, 2014), however, few studies have examined the role of culture in this relationship (Zhao et al., 2014; Arslan; 2009).

While numerous studies have examined the relationship between e-government development and corruption, few studies have considered the various cultural contexts under which an e-government system can influence the level of corruption at the national level. This article aims to study how culture

DOI: 10.4018/IJEPR.20210701.oa6

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influences the link between e-government and corruption and open a discussion on these important “mediating factors”. The article is structured as follows: The first section presents a literature review of corruption, e-government and the role of culture. Next, an analytical framework of the way that e-government affects corruption in varying cultural contexts is illustrated. Then, the discussion of the choice of data, measurements, methodology, and the results of the analysis follows. This research will close with the policy implications of our findings.

LITERATURE REVIEW

Corruption and E-Government Theory

The principal-agent-client model considers corruption as a problem of asymmetric information (Klitgaard, 1988). According to the model, the principals engage public administrators as agents to deliver essential public services and information to the citizen clients. Since the agents have a greater knowledge of the administration than the principals and clients, there is always the problem of asymmetric information. If the agents take advantage of their position and pursue their own interests, this asymmetric information could potentially result in corruption. In this model, there are primarily two sources of corruption: asymmetric information and power. Jain (2001) posited that the existence of corruption requires three elements -- 1) discretionary power, which includes the power of legislation, administration, and regulation, 2) economic rents associated with those powers, and 3) less frequent detection of and low penalties for corruption. Once the three factors co-exist in a system, corruption is unlikely to avoid. Therefore, if the development of e-government could help to eliminate some or all of these three elements, then e-government would be an effective tool to cure corruption.

E-government involves the use of information technology to improve the efficiency of public service delivery and citizens' quality of life (Carter and Belanger, 2005). During the early stages of e-government development, scholars identified the potential of new ICT tools to reduce corruption through multiple channels (Bhatnagar, 2003). These channels include accessible information, transparent rules, filing and tracking requests to public officials, and reducing discretionary power by standardizing service delivery. Studies have consequently focused on the relationship between e-government and corruption reduction, with many pointing towards a causal relationship in which e-government reduces corruption. Based on a panel of 149 countries (t=1996, 2006) and 2SLS regression, Andersen (2009) found that e-government reduced corruption significantly, even controlling for two corruption predictors: GDP per capita and press freedom. Using a panel of 70 countries (1998, 2005), Lio et al. (2011) confirmed the bi-directional causality between Internet adoption and corruption. Similarly, a later study by Elbahnasawy (2014) also concluded that e-government was an effective tool in reducing corruption. Moreover, as the phenomenon of e-government is often considered multi-dimensionally as e-information, e-transaction, and e-participation (Manoharan, 2013), the use of technology can reduce corruption across all dimensions. For example, e-information could reduce the issue of asymmetric information. E-transaction would address the issue of discretionary power and economic rents. E-participation would enable a more participatory community that reduce discretionary power and bring more policy awareness and transparency.

Contingency Theory and Organizational Culture

Both organizational culture theory and contingency theory suggests that culture is a factor to consider in e-government development. According to the organizational culture theory, organizations can be viewed as extended families or clans that are held together by shared values and beliefs (Morgan et al., 1983). Such values and beliefs are established over time and shape how members view themselves as an organization. The organizational culture is an expression of those values and beliefs, it guides the decision-making inside the organization and keeps it together (Tompkins, 2005). Banuri and Eckel (2012) suggest there are two channels through which culture operates: formal institutions and

informal institutions. Formal institutions involve formal rules that guide social interactions (North, 1990) and informal institutions consist of social norms. These are the values and beliefs that guide such interactions and an important determinant of corruption is the culture of the respective nations (Seleim and Bontis, 2009; Husted, 1999).

Contingency theory emphasizes the significance of culture in influencing the success of the organization. The organizational structure and effectiveness are often shaped by internal and external environmental factors, along with strategy, technology, public accountability, and culture. According to Child (1979), culture, values, and beliefs have a significant influence on the decision-making process in organizations. This cultural influence can also be extended to the national context, particularly to how e-government is adopted by both the government and citizens. This, in turn, can influence the impact of e-government on corruption (Zhao et al., 2014; Arslan, 2009). A detailed discussion of how different cultural dimensions affect e-government and corruption will be elaborated in the following section.

THEORETICAL FRAMEWORK

Previous studies have created a number of different cultural typologies from which two emerged as the most popular—studies by Hofstede (1984) and House et al. (2004). This study adopted measures by House et al. (2004) and their nine dimensions of culture. Each cultural dimension potentially has different impacts on both e-government development and the level of corruption in a given society:

- **Uncertainty Avoidance:** the extent to which members of an organization or society strive to avoid uncertainty by reliance on social norms, rituals, and bureaucratic practices to alleviate the unpredictability of future events.
- **Power Distance:** the degree to which members of an organization or society expect and agree that power should be unequally shared.
- **Collectivism I:** Societal Collectivism reflects the degree to which organizational and societal institutional practices encourage and reward collective distribution of resources and collective action.
- **Collectivism II:** In-Group Collectivism reflects the degree to which individuals express pride, loyalty, and cohesiveness in their organizations or families.
- **Assertiveness:** The degree to which individuals are assertive, confrontational, and aggressive in their relationships with others.
- **Gender Egalitarianism:** The degree to which a collective minimizes gender inequality.
- **Future Orientation:** The extent to which individuals engage in future-oriented behaviors such as delaying gratification, planning, and investing in the future.
- **Performance Orientation:** The degree to which a collective encourages and rewards group members for performance improvement and excellence.
- **Humane Orientation:** The degree to which a collective encourages and rewards individuals for being fair, altruistic, generous, caring, and kind to others.

Figure 1 shows the relationship among e-government, corruption, and culture. Link (a) represents the association between e-government and the cultural dimensions, and link (b) represents the association between corruption and the cultural dimensions.

The two associations together influence the way that e-government affects corruption. Table 1 shows the four resulting scenarios of the impacts of culture. For scenario (3), if a certain cultural context could impede the development of e-government, and encourage corruptive behaviors, then the association between e-government and corruption reduction will be largely weakened. This rationale could apply to scenario (2) as well. If culture enhances the development of e-government but impedes corruptive behaviors, the association between e-government and corruption reduction will

Figure 1. E-government reduction of corruption as intervened by culture

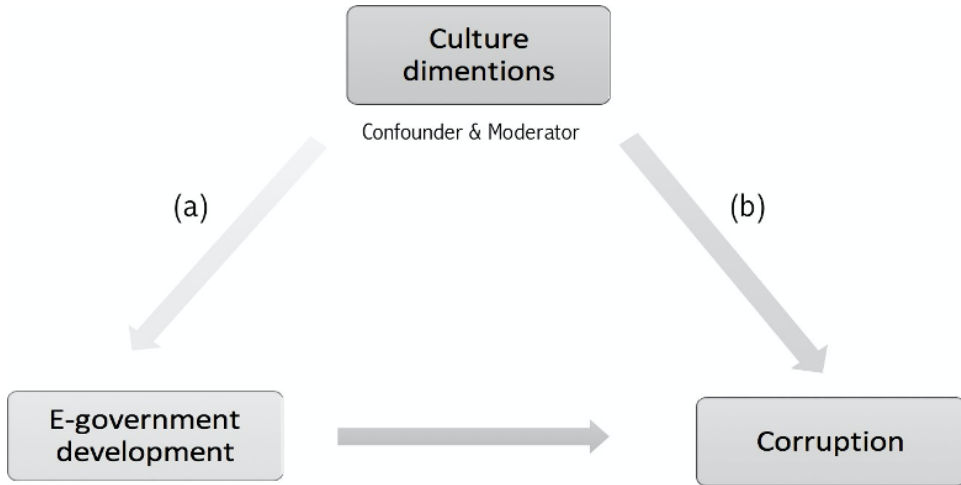


Table 1. Four scenarios of cultural impacts

		<i>(b)</i>	
		<i>Increase corruption</i>	<i>Reduce corruption</i>
<i>(a)</i>	<i>Positive affect e-government</i>	<i>(1) Slightly strengthened</i>	<i>(2) Largely strengthened</i>
	<i>Negative affect e-government</i>	<i>(3) Largely weakened</i>	<i>(4) Slightly weakened</i>

be largely strengthened. On the other hand, if one cultural context could enhance the development of e-government and increase corruption at the same time, then the association between e-government and corruption reduction should be slightly strengthened, as indicated in scenario (1). Similarly, if a certain cultural context could impede the development of e-government and decrease corruption at the same time, then the association between e-government and corruption reduction should be slightly weakened, indicated in (4). The following section discusses the impacts of five cultural dimensions on the relationship between e-government and corruption reduction.

METHODOLOGY

This section discusses some essential choices made around data selection. Table 3 summarizes all variables used in this study with their sources and availability.

Dependent Variable

Two corruption indexes are frequently used by scholars: the Corruption Perception Index (CPI) by Transparency International and the Control of Corruption from World Governance Indicators (WGI), created by Daniel Kaufmann. CPI measures the corruption of a country by aggregating data from 12 different sources and 11 different institutions and then indexes the countries from 0 to 100; higher scores indicate lower levels of corruption (Transparency International 2016). The WGI comprised of six dimensions of governance in over 200 countries. WGI indicators are estimated from over 30 sources that are produced by various research institutes and think tanks (Kaufmann et al., 2011). Some methodology differences between the two indices exist, but the two ratings are highly correlated

Table 2. Five cultural dimensions and impacts on the relationship of E-government and corruption

Cultural dimensions	Definition	Impact on e-government (a)	Impact on corruption (b)	Hypothetical scenario
Uncertainty Avoidance	Uncertainty Avoidance defined as the extent to which society, organizations, or groups rely on social norms, rules, and procedures to alleviate uncertainty or unknown situations (Hofstede, 1984; House et al., 2004).	Studies have also shown that uncertainty avoidance has been negatively associated with e-government diffusion (Zhao et al., 2014; 2009). Such governments are often hesitant to implement new innovative ideas.	As the level of uncertainty avoidance practices increases, the level of corruption decreases (Seleim and Bontis, 2009; Husted, 1999). Countries with high uncertainty avoidance levels also tend to have clear and transparent rules, which in turn results in lower levels of corruption	Scenario (4), resulting in a slightly weakened association between e-government and corruption.
Power Distance	Power distance defined as the degree to which members of a society expect power to be distributed unequally (Hofstede, 1984; House et al., 2004). A culture of paternalism is common in countries with high levels of power distance (Husted, 1999). In high power distance societies, high ranking officials are likely to have more privileges, and lower-level staff members or the general public tend to use bribery to access power privileges (Getz and Volkema, 2001).	High power distance society prevents e-government diffusion (Zhao et al., 2014; Arslan, 2009).	Empirical evidence also shows that the higher the level of power distance practices, the higher the level of corruption in the society (Seleim and Bontis, 2009; Husted, 1999). A culture with high power distance tends to see an increase in its level of corruption	Scenario (3) High power distance countries are corruptive and they are less likely to adopt anti-corruption techniques.
Individualism and collectivism	Individualism and collectivism are two ends of one dimension. Individualism refers to the decision-making by individuals or the groups surrounding individuals, such as their family, friends, and peers. On the other hand, the culture of collectivism allows people to adopt different attitudes, standards, and explanations for different groups and situations (Hofstede et al., 2010).	Although individualism is positively correlated with e-government diffusion, collectivism is also found to be negatively correlated to e-government diffusion (Zhao et al., 2014; Arslan, 2009).	Previous research has shown that cultures with higher levels of collectivism tended to exhibit higher levels of corruption (Seleim and Bontis, 2009; Husted, 1999).	Scenario (3). the association between e-government and corruption will be largely weakened in a high collectivism culture.

continued on following page

Table 2. Continued

Cultural dimensions	Definition	Impact on e-government (a)	Impact on corruption (b)	Hypothetical scenario
Future Orientation	<i>Future Orientation measures the extent to which individuals engage in future-oriented behaviors such as planning and investing (House et al., 2004). Successful e-government development requires adequate planning and implementation. The GLOBE project reports positive associations between various economic indicators and higher future orientation levels (Ashkanasy et al., 2004).</i>	<i>(Zhao et al. (2014) found a positive relationship between future orientation and e-government diffusion since e-government can provide useful public service in the age of the internet and innovation.</i>	<i>In a study of culture and corruption, (Seleim and Bontis, 2009) found that a society with a high level of future orientation culture was associated with a low level of corruption.</i>	<i>Scenario (2); the association between e-government and corruption will be largely strengthened.</i>
Performance Orientation	<i>Performance Orientation measures the degree to which a country encourages and rewards its members for performance improvement (House et al., 2004).</i>	<i>Cultures with high levels of performance orientation favor innovation and e-government development (Zhao et al., 2014).</i>	<i>States with high levels of performance orientation are more competitive and economically successful (Ashkanasy et al., 2004), and tend to have lower levels of corruption (Seleim and Bontis, 2009).</i>	<i>Scenario (2); this research expects that e-government can reduce corruption more effectively in countries with high future orientation cultures.</i>

with each other, 0.9733, in our dataset. Using one is almost identical to using the other in a study of corruption (Treisman, 2007). However, reliability issues appeared in the regression results when the WGI indicators were used, so this research use CPI as dependent variable.

Independent Variable

For the e-government variable, this study used the E-Government Development Index (EGDI) from the United Nations as a measure of the country’s e-government development level. The EGDI is a comprehensive survey of 192 member states and is produced every two years by the UN Department of Economic and Social Affairs (UN, 2015). It is a weighted average of three normalized scores of three dimensions of e-government development: scope and quality of online services, development status of telecommunication infrastructure, and inherent human capital (UN, 2014). EGDI ranges from zero to one, with higher scores representing better e-government development. For the convenience of beta interpretation, this study rescaled EGDI from 0 to 100. Furthermore, the UN e-government survey is finished in the year before its release (Stier, 2015). For example, the 2016 version of the e-government development index was officially released in the year of 2016, but the website coding process for the online services index was conducted from May to the end of July in 2015 (UN, 2016). This study has verified the actual year of assessment across seven editions of EGDI surveys and lists them in Table 4. Therefore, this research used the actual year of assessment rather than its release year to construct the panel dataset.

For cultural dimensions, this research looked at two highly cited cultural typologies from Hofstede (1984) and House et al. (2004). By analyzing a large database of employee value scores collected

Table 3. Data source and variables

Variable type	Variable name	Data source	Year available	countries covered	Min to Max
<i>Dependent variable</i>	<i>Control of Corruption</i>	<i>World Governance Indicators</i>	<i>1996-2015</i>	<i>211</i>	<i>-1.41 to 2.53</i>
	<i>E-Gov. development Index (EGDI)</i>	<i>United Nations</i>	<i>2003-2015</i>	<i>172</i>	<i>0 to 94.6</i>
	<i>Uncertainty Avoidance Power Distance</i>	<i>Project GLOBE House [13]</i>	<i>2004</i>	<i>61</i>	<i>2.88 to 5.37</i>
		<i>Project GLOBE House [13]</i>	<i>2004</i>	<i>61</i>	<i>3.59 to 5.8</i>
	<i>Collectivism practice</i>	<i>Project GLOBE House [13]</i>	<i>2004</i>	<i>61</i>	<i>3.18 to 6.36</i>
	<i>Future Orientation Practices</i>	<i>Project GLOBE House [13]</i>	<i>2004</i>	<i>61</i>	<i>2.88 to 5.07</i>
	<i>Performance Orientation Practices</i>	<i>Project GLOBE House [13]</i>	<i>2004</i>	<i>61</i>	<i>3.2 to 4.94</i>
<i>Independent variable</i>	<i>EGDI*Uncertainty Avoidance EGDI*Power Distance</i>	<i>Researcher created</i>	<i>2004</i>	<i>61</i>	<i>-63.97 to 94.64</i>
		<i>Researcher created</i>	<i>2004</i>	<i>61</i>	<i>-39.45 to 19.78</i>
	<i>EGDI*Collectivism practice</i>	<i>Researcher created</i>	<i>2004</i>	<i>61</i>	<i>-49.77 to 16.52</i>
	<i>EGDI*Future Orientation Practices</i>	<i>Researcher created</i>	<i>2004</i>	<i>61</i>	<i>-12.52 to 38.38</i>
	<i>EGDI*Performance Orientation Practices</i>	<i>Researcher created</i>	<i>2004</i>	<i>61</i>	<i>-21.47 to 25.44</i>
<i>Control variable</i>	<i>Log (GDP per capita) Human Development Index</i>	<i>World development index</i>	<i>2000-2014</i>	<i>249</i>	<i>5.7 to 11.3</i>
		<i>Press freedom index</i>	<i>1990-2015</i>	<i>189</i>	<i>40.6 to 93.9</i>

Table 4. E-government development index release year verification

Official release year	Actual year EGDI measures	Online service survey time	Source
2016	2015	May 2015 until the end of July 2015	United Nations (2016)
2014	2013	May 2013 until the end of June 2013	United Nations (2014)
2012	2011	Completed before December 2011	United Nations (2012)
2010	2009	Completed before December 2009	United Nations (2010)
2008	2007	October and November of 2007.	United Nations (2008)
2005	2005	During July-August 2005	United Nations (2005)
2004	2004	Same year	United Nations (2004)
2003	2003	Same year	United Nations (2003)

from IBM between 1967 and 1973, Hofstede (1984) developed a model of national culture that consists of six cultural dimensions. House et al. (2004) conducted a ten-year culture and leadership research program: Global Leadership and Organizational Behavior Effectiveness (GLOBE) in 61 nations. The GLOBE project surveyed thousands of middle managers in food processing, finance, and telecommunications industries and collected data between 1994 to 1997. Cultural measures from

the GLOBE study were adopted in this study since it provides us the latest available assessment of cultural dimensions.

One essential difference between the two typologies is that the GLOBE project distinguishes between a country's cultural values and cultural practices (House et al., 2004). This separation is meaningful since what people value may differ from their actual practice. Cultural practice scores reflect the way that things have been done and cultural values demonstrate the desires and aspirations for the way that things should be done (House et al., 2004). The difference between cultural practice and cultural values in a country can be huge in different cultural dimensions. This study uses the cultural practice score since it better represents the cultural realities. Moreover, this research assumed the culture of each country did not change significantly over the study period, so the culture dimension scores were duplicated in every time period (2003, 2004, 2005, 2007, 2009, 2011, 2013, 2015) in the panel. Accordingly, this study constructed five interaction terms between five cultural dimensions and the e-government development index. All variables were centered at their means during model construction to obtain meaningful interpretations.

Although the GLOBE culture dimensions provide us a comprehensive examination of culture, they only cover 62 countries. This reduces the range of our analysis from 160 countries to 57 countries after including all cultural dimensions into the dataset. Therefore, this study seeks to answer the following research questions using different datasets: 1) Does e-government development affect corruption? (160 countries); 2) What is the role of culture in the relationship between e-government development and corruption? (57 countries).

Table 5. Country list in this study

<i>Albania</i>	<i>Greece</i>	<i>Philippines</i>
<i>Argentina</i>	<i>Guatemala</i>	<i>Poland</i>
<i>Australia</i>	<i>Hungary</i>	<i>Portugal</i>
<i>Austria</i>	<i>India</i>	<i>Qatar</i>
<i>Bolivia</i>	<i>Indonesia</i>	<i>Russia</i>
<i>Brazil</i>	<i>Iran</i>	<i>Singapore</i>
<i>Canada</i>	<i>Ireland</i>	<i>Slovenia</i>
<i>China</i>	<i>Israel</i>	<i>South Africa</i>
<i>Colombia</i>	<i>Italy</i>	<i>South Korea</i>
<i>Costa Rica</i>	<i>Japan</i>	<i>Spain</i>
<i>Czech Republic</i>	<i>Kazakhstan</i>	<i>Sweden</i>
<i>Denmark</i>	<i>Kuwait</i>	<i>Switzerland</i>
<i>Ecuador</i>	<i>Malaysia</i>	<i>Thailand</i>
<i>Egypt</i>	<i>Mexico</i>	<i>Turkey</i>
<i>El Salvador</i>	<i>Morocco</i>	<i>United Kingdom</i>
<i>Finland</i>	<i>Namibia</i>	<i>Usa</i>
<i>France</i>	<i>Netherlands</i>	<i>Venezuela</i>
<i>Georgia</i>	<i>New Zealand</i>	<i>Zambia</i>
<i>Germany</i>	<i>Nigeria</i>	<i>Zimbabwe</i> <i>57 Total</i>

Control Variable

This study includes two commonly used control variables for corruption: GDP per capita and human development index. GDP per capita is considered a consistent estimator of corruption (Jain, 2001; Treisman, 2007; Andersen, 2009). According to the United Nations (United Nations, 2014), the e-government development level must be placed in context with a country's overall development level. In an empirical study review of the causes of corruption over ten years, Treisman (2007) concluded that long-established liberal democracies with higher economic development and free media had lower perceived corruption. Therefore, this study used a log-transformed GDP per capita as a control variable in the regression.

The Human Development Index (HDI) published by the United Nations was used as a control variable. It measures achievements of three dimensions of human development (Jāhāna 2015): a long and healthy life (Life expectancy in years), access to knowledge (Education index) and a decent standard of living (GNI per capita).

ANALYTICAL FRAMEWORK

Fixed Effects and Random Effects Model

Figure 2 displays the correlation between e-government and corruption. Across time and geographic locations, countries with higher e-government development tended to have a lower level of corruption and vice versa. However, the level of corruption in different countries varied dramatically due to various factors such as history, ethnicity, and cultural traditions. Despite the strong association between the two, whether a lower level of corruption is a result of a high level of e-government development is unclear. One possible way to answer this question is to study the association between the change in corruption over time and that of e-government development. So, this study examines two research questions: (1) does the development of EGDI influence the level of corruption and (2) does the magnitude of this association depends on culture?

Both random effects and fixed effects model transformation can eliminate the country-specific time-invariant effects and produce consistent estimates. While a fixed effect model is more straightforward it removes a great deal of information from the data, it also very intolerant to measurement inaccuracy. Biased measurements could cause serious estimation issues. So this study chooses random-effects models primarily in analysis. Researchers have used RE models to study corruption and e-government (Elbahnasawy 2013).

Therefore, this study proposed the following models:

Random Effect Model:

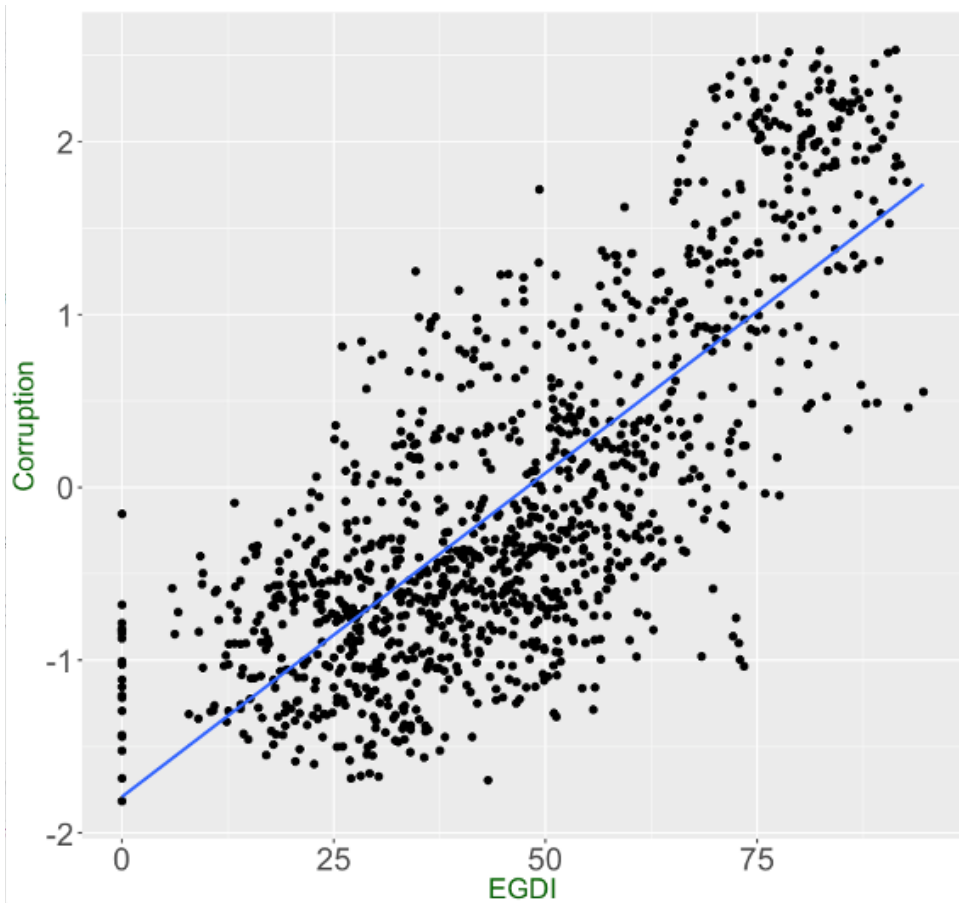
$$Corruption_i = \alpha_i + \lambda_i + \beta_1 EGDI_{it} + \beta_2 GDPperCapita_{it} + \beta_3 HDI_{it} + \beta_{4,5,6,7,8} EGDI_{it} * CULTURE_{1,2,3,4,5} + \beta_{9,10,11,12,13} CULTURE_{1,2,3,4,5} + u_{it}$$

Fixed Effect Model:

$$Corruption_{it} = \alpha_i + \lambda_i + \beta_1 EGDI_{it} + \beta_{2-6} EGDI_{it} * CULTURE_{2001} + \beta_7 GDP Per Capita_{it} + \beta_8 HDI_{it} + u_{it}$$

λ_i is a vector of time-invariant variables. CULTURE as a set of five cultural dimension variables was included in this model. Random effects (RE) regression can partially remove the time-invariant

Figure 2. Association between e-government and corruption (2003 to 2015)

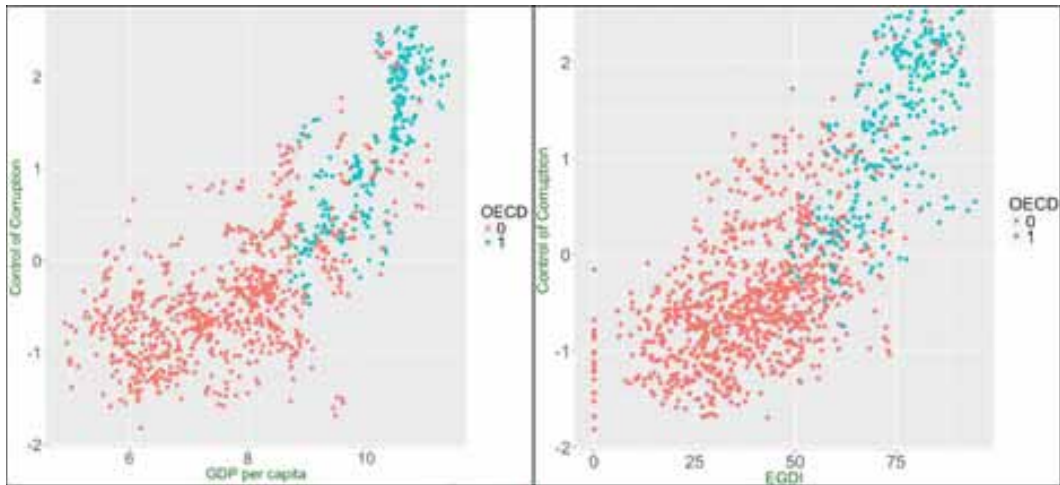


factors and give consistent estimates. The key assumption of the RE model is that the unobserved effect was assumed to be uncorrelated with all independent variables. The advantage of using random-effects models is that it allows us to put time-invariant variables in the regression. So this research includes cultural dimensions separately into the model and test the impact of culture.

OECD Countries

In a study of e-government and corruption reduction in 149 countries, Andersen (2009) argued that OECD countries generally had lower levels of corruption and higher levels of e-government development between 1996 and 2006 (p. 204). In our dataset, the country distribution of several variables was clustered between OECD and Non-OECD countries. For example, Figure 3 shows the distribution of GDP per capita and EGDI across two groups. Green dots represent OECD countries and red refers to Non-OECD countries. OECD countries scored high in all dimensions and clustered at the upper right corner in two plots. The correlation between GDP per capita and control of corruption turns into negative as it moves to the upper right corner. Therefore, this research ran separate regressions models for OECD and non-OECD countries.

Figure 3. Scatter plots of GDP per capita, E-government development index and corruption



RESULTS

First-Level Analysis

In the first step, this study used a full dataset that comprised of 160 countries to study the association between e-government and corruption. The regression results of both the random effects (models 1 to 6) and the fixed effects (models 7 to 12) models are reported in table 6. According to model (1), with a one percent increase in the e-government development index, the control of corruption score declined by 0.00192 (-2.5 to 2.5), which is equivalent to a 0.03 percent decrease. For non-OECD countries, the association between EGDI and corruption was small and statistically insignificant. For OECD countries, the association even became slightly negative. Figure 3 depicts the changes in CPI against the change of EGDI for the study period 2004 to 2014. The two figures display random spots around the center. This indicates that a minimal linear relationship existed between CPI and EGDI from 2004 to 2014, regardless of OECD and non-OECD countries. The association between e-government and corruption was not as strong as the theory suggested.

For GDP per capita, this research found a somewhat consistent estimation of GDP per capita across different models. Although there is a big difference between coefficients of GDP per capita between OECD and non-OECD countries, the estimated coefficients remain statistically significant at the one percent level.

Second-Level Analysis

In the second step, this research performed both random effects and fixed effects models to understand the moderating effects of cultural dimensions by using a highly balanced panel dataset of 57 countries from the period 2003 to 2015. Table 4 provides a list of all 57 countries.

Table 7 reports the random effects regression results. From model 1 to model 6, each set of culture variables and their interaction terms were included in the models. In model 7, all the variables are included. Across seven models, EGDI was weakly associated with corruption. For cultural variables, this research found that a society with a higher level of future orientation culture was associated with less corruption. On the other hand, a society with a higher level of collectivism culture was associated with more corruption. For cultural interaction terms, almost all estimated beta coefficients were consistent with the hypothesis in Table 2. E-government was more effective in reducing corruption in cultural contexts that had a high level of future orientation, performance orientation, and uncertainty

Figure 4. Scatter plot of the changes of corruption against the change of EGDl for OECD and non-OECD countries

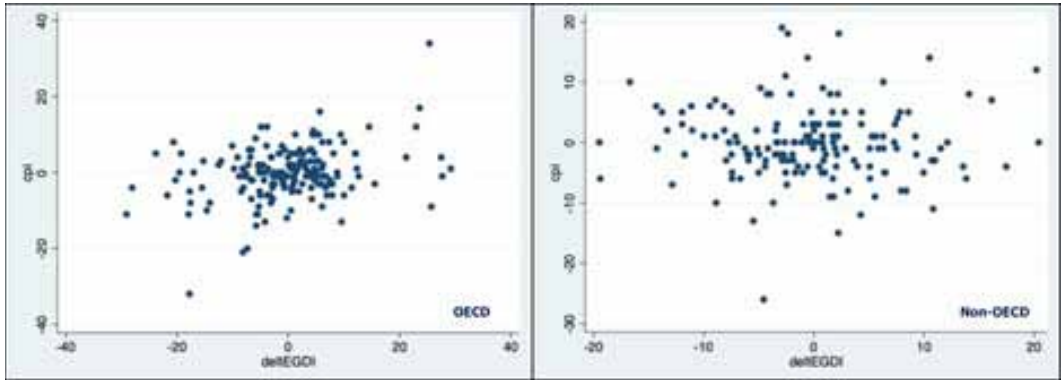


Table 6. Results of Random Effects and Fixed effects regression by OECD and Non-OECD groups

	Non-OECD countries			OECD countries			
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	
<i>Dependent variable Control of Corruption from WGI</i>							
<i>Independent variable</i>							<i>Random effects Regression</i>
<i>EGDI</i>	0.00192*	-0.00161	-0.00068	-0.00137	-0.00411*	0.000272	
	(2.17)	(-1.58)	(-0.62)	(-0.70)	(-1.98)	(0.13)	
<i>GDP per capita</i>		0.240***	0.344***		0.681***	1.047***	
		(7.44)	(6.84)		(7.10)	(8.65)	
<i>Human development index</i>			-0.00985*			-0.0463***	
			(-2.54)			(-5.02)	
<i>_cons</i>	-0.488***	-2.156***	-2.374***	1.374***	-5.338***	-5.377***	
<i>N of observations</i>	917	776	765	280	245	245	
<i>Model Number</i>	(7)	(8)	(9)	(10)	(11)	(12)	
<i>Dependent variable Control of Corruption from WGI</i>							
<i>Independent variable</i>							<i>Fixed Effects Regression</i>
<i>EGDI</i>	0.000218	-0.00129	-0.000745	-0.00398*	-0.00400*	-0.000397	
	(0.25)	(-1.23)	(-0.68)	(-2.17)	(-1.97)	(-0.19)	
<i>GDP_per_capita</i>		0.107*	0.221**		0.258	0.818***	
		(2.21)	(2.96)		(1.83)	(4.46)	
<i>Human development index</i>			-0.00897*			-0.0448***	
			(-1.98)			(-4.52)	
<i>_cons</i>	-0.433***	-1.163**	-1.487***	1.566***	-1.045	-3.137*	
<i>N of observations</i>	917	776	765	280	245	245	

T statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Table 7. Random effects estimation results of corruption and e-government with culture interaction terms

Dependent variable: Control of Corruption							
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EGDI	-0.00111	-0.000919	-0.000537	-0.000819	-0.00121	-0.000622	-9.97E-05
	(-0.70)	(-0.57)	(-0.33)	(-0.52)	(-0.75)	(-0.39)	(-0.06)
GDP per capita	0.998***	0.840***	0.886***	0.925***	0.991***	0.820***	0.768***
	(13.97)	(12.65)	(12.86)	(13.11)	(14.47)	(10.64)	(10.26)
Human Dev. Index	-0.0438***	-0.0347***	-0.0377***	-0.0412***	-0.0435***	-0.0365***	-0.0334***
	(-7.10)	(-5.78)	(-6.28)	(-6.68)	(-7.21)	(-5.97)	(-5.48)
Uncertainty Avoidance		0.00222					-0.0104**
		(1.00)					(-2.58)
EGDI*Uncertainty Avoidance		0.757***					-0.4
		(5.00)					(-1.45)
Future orientation			0.00789**				0.0152***
			(2.80)				(3.37)
EGDI*Future orientation			0.659***				0.181
			(4.89)				(0.96)
Power Distance				-0.00567			0.000132
				(-1.75)			(0.03)
EGDI*Power Distance				-0.554***			0.0269
				(-3.79)			(0.16)
Perform Orientation					0.00169		0.000832
					(0.54)		(0.18)
EGDI*Perform Orientation					0.715***		0.265
					(4.60)		(1.38)
Collectivism						-0.00426*	-0.00418
						(-2.22)	(-1.58)
EGDI*Collectivism						-0.424***	-0.302*
						(-4.24)	(-2.44)
_cons	-5.197***	-7.950***	-7.224***	-1.915*	-8.065***	-2.030*	-2.717
N	399 <i>T statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001</i>	399	399	399	399	399	399

avoidance, e-government becomes less effective in reducing corruption in a culture with a high level of power distance and collectivism. For example, e-government would be 13.18 percent more effective in reducing corruption if the level of future orientation in society was one unit higher than the average level. On the other hand, e-government would be 11.08 percent less effective in reducing corruption if the level of Power distance in society is one unit higher than the average level.

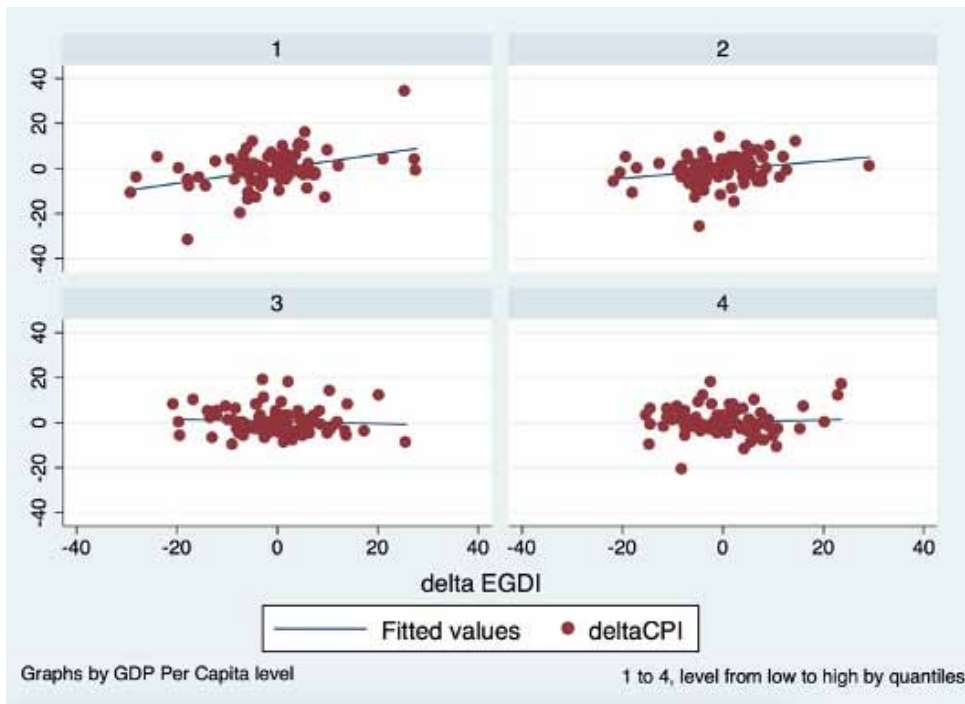
Table 8 reports the results of the fixed-effects models with the culture interaction terms. Across the seven models, the EGDI was weakly and negatively associated with corruption. None of the estimated coefficients were statistically significant and larger than 0.03. Although the result of e-government development is not robust, the cultural interaction terms of uncertainty avoidance and future orientation were statistically significant in model 7.

GDP per capita was a consistent estimator of corruption in all models, which indicates that economic development explains most variance of corruption across countries over the ten years. However, one may wonder whether the association between e-government and corruption may dissipate as GDP per capita increases? To answer this question, researchers graphed the change of EGDI against the change of CPI on scatter plots by four quantiles of the levels of GDP per capita in Figure 5. Researchers found that the linear relationship was particularly strong in countries with low GDP per capita. In the first and second quantiles, there was a positive association between EGDI and corruption. In the third and fourth quantiles of GDP per capita, this association disappeared or were even reversed. This suggests that economically less-developed countries benefit more from the e-government in reducing corruption than their economically more developed counterparts. The level of corruption in developed countries has been low historically, therefore, developed countries have less room, so to speak, for corruption reduction. Since the association between EGDI and CPI varies depends on different cultural dimensions.

Table 8. Fixed effects estimation results of corruption and e-government with culture interaction terms

Dependent variable:	Corruption						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>EGDI</i>	-0.00153 (-0.98)	-0.00171 (-1.08)	-0.000795 (-0.49)	-0.00148 (-0.94)	-0.00148 (-0.92)	-0.00137 (-0.86)	-0.000323 (-0.20)
<i>GDP per capita</i>	0.799*** (6.76)	0.797*** (6.74)	0.799*** (6.80)	0.781*** (6.55)	0.798*** (6.75)	0.805*** (6.80)	0.774*** (6.52)
<i>Human Development Index</i>	-0.0414*** (-5.99)	-0.0416*** (-6.02)	-0.0410*** (-5.95)	-0.0401*** (-5.71)	-0.0414*** (-5.99)	-0.0410*** (-5.91)	-0.0403*** (-5.84)
<i>EGDI*Uncertainty Avoidance</i>		-0.00175 (-0.77)					-0.0169*** (-3.88)
<i>EGDI*Future orientation</i>			0.00564 (1.94)				0.0172*** (3.65)
<i>EGDI*Power Distance</i>				-0.00365 (-1.07)			-0.00363 (-0.79)
<i>EGDI*Perform Orientation</i>					0.000543 (0.17)		0.0034 (0.71)
<i>EGDI*Collectivism</i>						-0.00177 (-0.89)	-0.00314 (-1.14)
<i>_cons</i>	-3.545***	-3.493***	-3.646***	-3.499***	-3.542***	-3.664***	-3.502***
<i>N</i>	399 <i>T statistics in parentheses;</i> * <i>p</i> <0.05, ** <i>p</i> <0.01, *** <i>p</i> <0.001	399	399	399	399	399	399

Figure 5. Scatter plot of the changes of Corruption against the change of EGDI by GDP per capita quantiles



DISCUSSION AND CONCLUSION

Although the cultural dimensions such as uncertainty avoidance, power distance, and collectivism have negative consequence on the impact of e-government on corruption reduction, a culture that emphasizes future orientation and performance orientation will substantially benefit from improvements in e-government effectiveness. This study's results mirror past investigations into e-government in cultural contexts. Erumban and De Jong (2006) concluded that future orientation and performance orientation were important and robust in explaining ICT adoption rates across countries. Ruf'in et al. (2014), in a comparative study between the U.S. and Spain, found that the trust in e-government was significant because Spain's culture placed a higher value on power distance and was more tolerant of uneven distributions of power.

These results have meaningful policy implications regarding e-government development, especially E-planning. E-planning is not just a simple transfer from traditional urban planning to digitized support planning. It involves changes in the nature of the planning process (Silva, C. N. 2010) and a communicative and interactive activity between the public and private stakeholders within public decision-making processes (Innes, 1995). Two elements are highlighted here: government initiative and public participation. Culture would have a strong impact on how the government conducts e-planning activities and how the general public participates. Planning activities that ignoring the embedded cultural context could cause a great loss to the local community (Morobolo et., 2018). Table 9 shows the cultural characteristics of selected countries in the Asian and western world. For example, knowing that Singapore is ranking highly on uncertainty avoidance, future orientation, performance orientation and collectivism, E-planning goals may emphasis on future benefits of the entire society.

Countries from the same geographic regions demonstrate similar cultural characteristics. Countries in Southeast Asia generally have cultures that value performance orientation, future orientation and collectivism. If they want to improve the effectiveness of e-government programs and reduce

Table 9. Cultural practice score ranking of selected countries (House 2004)

Country	Country Cluster	Uncertainty Avoidance Prac Rank	Future Orientation Rank	Power Distance Rank	Intituional Collectivism Rank	Humane Orientation Rank	Performance Orientation Rank	Collectivism Rank	Gender Egalitarianism Rank
Malaysia	Southern Asia	11	5	34	13	4	18	27	25
Indonesia	Southern Asia	28	28	33	15	7	15	15	37
Philippines	Southern Asia	41	16	17	8	2	12	1	17
India	Southern Asia	30	15	16	25	10	23	4	56
Thailand	Southern Asia	39	50	6	43	5	42	14	33
Hong Kong	Confucian Asia	22	21	43	36	42	4	34	29
Singapore	Confucian Asia	3	1	42	4	56	2	17	12
China	Confucian Asia	10	35	41	7	17	13	9	49
Japan	Confucian Asia	34	10	39	3	20	26	45	41
Taiwan	Confucian Asia	21	24	32	14	28	8	20	43
South Korea	Confucian Asia	55	23	7	2	45	9	23	62
Australia	Anglo	20	20	53	29	21	16	52	31
Canada (English-Speaking)	Anglo	16	8	52	26	12	10	50	11
Usa	Anglo	11	17	49	32	27	11	51	34
New Zealand	Anglo	12	49	48	5	19	5	59	39
Ireland	Anglo	23	22	37	10	3	17	39	40
England	Anglo	14	11	36	30	49	35	53	14

corruption, they need to be more future-oriented regarding economic planning and development. Propaganda that emphasizes a vision of future development should be effective in these countries. Although from different regions, Australia and Hong Kong are very comparable in almost all cultural traits rankings. Generally, countries with a similar cultural environment should learn from each other in terms of leadership, social conditions, publicity strategy, implementation experiences, etc.

On the other hand, countries from same regions also demonstrates distinct differences. Singapore is a country that ranked very high on many cultural dimensions, Future orientation, Uncertainty avoidance, Performance orientation, and Institutional collectivism but ranked lowest on Humane orientation. China ranked very top on performance orientation and In-group collectivism. South Korea ranked as the most gender-differentiated country and high on Performance orientation and Institutional collectivism. Policymakers be conscious of the differences of cultural characteristics in their efforts to do E-planning,

This study constructed a highly balanced panel dataset of 57 countries from the period 2003 to 2014. The conclusion is two-fold: (1) there was a negative, but a very weak association between corruption and e-government development across the world in the past ten years, (2) the magnitude of the way that e-government influences corruption various across cultural contexts. E-government development reduced corruption more effectively in countries with a culture that had higher levels of future orientation and performance orientation as well as lower levels of uncertainty avoidance,

power distance, and collectivism. This research also found that GDP per capita was a consistent estimator of corrupt practices and e-government. This implies that economic development is essential to reducing corruption and funding e-government development, however, the impact of e-government on corruption is not uniform and consistent across the board, but contingent on unique cultural characteristics of the country. These cultural characteristics has important implications in E-government, especially E-planning.

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