

Factors that impacted the degree of corruption and its variation: An empirical analysis based on international panel data

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ABSTRACT

Investigating factors that impacted the degree of corruption and its variation are essential prerequisites for decreasing the degree of corruption and improving the ability to curb corruption. Based on the international panel data published by the World Bank, a new database that links closely to the topic is coded. Subsequently, with the assistance of the ordinary least squares method, this paper builds up a multiple regression model and a lagged variable model to test the contribution of government effectiveness, "institutional inertia of corrupt governance", political stability, and citizens' political right to the degree of corruption and its variation. Finally, it provides specific suggestions and references on how to decrease corruption and strengthen the capacity of corruption prevention.

HIGHLIGHTS

- ① As the effectiveness of government continues to rise, the level of corruption will continue to decrease.
- ② Under the influence of the "institutional inertia of corrupt governance", governments with a low degree of corruption are more likely to promote the construction of a clean government.
- ③ The more stable the political situation, the less corrupt the government.
- ④ Corruption governance is a kind of after-the-fact reflection and summary of lessons, and it is also a prescient move to prevent problems before they occur.

Keywords: Degree of corruption, influential factors, variation, government effectiveness, corruption governance, institutional inertia of corrupt governance

Corruption will cause severe economic losses and intensify social contradictions and trigger political turmoil. Some studies have found that with the continuous improvement of the economy, corruption has shown a significant upward trend (Ning, 2016; Li, 2021; Treisman, 2007; Zhou *et al.* 2017). To ensure the sustainable and high-quality development of the economy and society, improving the ability to curb corruption has become a task that governments around the world urgently need to accomplish (Zhao *et al.*

2017). Corruption is a complex social phenomenon with various characteristics (Dell'Anno, 2020). Such as concealment, diversity, and mass occurrence (Dell'Anno, 2020; Dincer *et al.* 2019). Therefore, for the government, the control of corruption is a systematic engineer filled with challenges. Continuously decreasing the level of

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corruption is the primary goal of improving the ability to curb corruption. Exploring the main factors affecting the variation in the degree of corruption is an essential prerequisite for decreasing corruption.

At present, the research on “causes of corruption” and “variation in the degree of corruption” can be roughly divided into the following two categories according to different research methods: The first category is mainly empirical analysis. Through the construction of econometric models, different factors that cause corruption or exacerbate corruption are analyzed. For example, Dell’Anno (2020), Treisman (2015), and others have used different data models, such as structural equations or multiple regression equations, to examine factors that may lead to corruption or improve the degree of corruption. The present research results also put forward corresponding recommendations that could generate positive effects on curbing corruption (Pellegrini, 2011; Elbahnasawy, 2012; MacDonald, 2011). The second category consists of theoretical analysis. With the help of existing theoretical frameworks and research results, they speak highly of exerting the function of national auditing (Zhou *et al.* 2017), implementing specific measures for constructing a clean and honest government (Xiong, 2016), etc., via drawing on the advanced experience of Western countries. Thus, the practical strategies for curbing corruption have been explained and discussed to a large extent (Wu, 2017; Dincer *et al.* 2019).

Judging from the existing literature, the study on what impacts the degree of corruption involves seven aspects. Taking the government aspect as an example, the mainstream is discussing the impacts of government size (Elbahnasawy *et al.* 2012), scope (Andersson, 2017), educational background (Dincer, 2008), salary level (Xu *et al.* 2020), and gender ratio of civil servants (Andersson, 2017) on the degree of corruption. Whereas the articles that analyze the contribution of government effectiveness, “institutional inertia of corrupt governance”, and citizens’ political right to curb corruption are minimal. Studies on projecting the further fluctuations of corruption levels in governments are even rarer. Therefore, this study aims to achieve

the following two goals through multiple regression analysis: Firstly, to further clarify the contribution of government effectiveness, “institutional inertia of corruption governance”, political stability, and citizens’ political right to the degree of corruption. Secondly, to create a projection that can be used to predict the further fluctuations of corruption levels to provide a specific mirror for the formulation of corruption prevention strategies.

According to the results of this study, it is easy to find these viewpoints. Primarily, under the significant influence of the “institutional inertia of corrupt governance”, countries with low levels of corruption tend to maintain lower variation. In contrast, countries with higher levels of corruption will become more corrupt. Then, the improvement of government effectiveness will have a significant positive impact on weakening corruption. So, improving government efficiency is an important measure that could improve corruption governance’s capability and defense capability. Thirdly, from the perspective of the size of influence, promoting government efficiency is a better choice to effectively decrease the degree of corruption, followed by improving the effective exercise of citizens’ political rights.

The remainder of this study will be developed in the following order: Section 2 sorts out the central literature related to “factors impact the degree of corruption and its variation” and explains the four main assumptions proposed by this article. Section 3 discusses the principal methodology used and the econometric models established. Section 4 presents the main findings. Section 5 summarizes the conclusions. In addition, the original data and its specific operation commands in data are provided in appendix 1.

Theoretical framework and main assumptions

To achieve the common good in all kinds of public activities, public managers are authorized the public power to safeguard the public interest rather than the interests of individuals or groups (Dell’Anno, 2020). If public managers misuse the public power they have to pursue individual or group interests, it can be called corruption (Treisman, 2015). In short, corruption is

“the abuse of public power for personal gains”¹. The degree of corruption is a description and reflection of the corruption of a country or government. The higher the degree of corruption, the more corrupt the country or government is (Dimant *et al.* 2018). Combining the research results related to the degree of corruption is to figure out the research status of this field and provide specific feasibility demonstration and support for new research directions or indicators at the theoretical level. In addition, clarifying the main assumptions of this study can help further narrow the scope of the study to accomplish the core research objectives better.

Theoretical framework

In the context of econometrics, corruption has always been seen as a perceptual and complex social phenomenon (Dell’Anno, 2020). As a result, corruption-related studies contain many categories and draw richer conclusions. The research on the factors that influence the degree of corruption can be roughly divided into seven categories. They are economical, institutional, governmental, media, political, historical, and geographical (Treisman, 2007; Treisman, 2015). First of all, when studying the impact of economic factors on the degree of corruption, researchers tend to discuss from the perspective of economic development, import and export status, and the probability of inflation (Zang *et al.* 2021; Buehn *et al.* 2018). However, the main exploratory perspectives are analyzing institutional factors, laws and regulations, medium-term and long-term continuous democratic systems, institutional inertia, and the quality of supervision (Goel *et al.* 2010) (MacDonald *et al.* 2011). Secondly, researchers favor the quality of newspaper distribution, media freedom, and freedom of speech when analyzing media factors (Dimant *et al.* 2018; Elbahnasawy *et al.* 2012). Unlike the other four types of factors, there are few specialized studies on political, historical, and geographical factors. Due to the limitations of objective conditions, the research involving political, historical, and geographical factors tends to roughly divide them into political stability, national pattern, the probability of political violence, the history of British colonization, Protestant

tradition, mainstream religious tradition, geographical environment, natural resource reserves, etc. (Xu *et al.* 2020; Dincer, 2008; Andersson, 2017; Dincer *et al.* 2019; Dell’Anno 2020).

All in all, judging from the existing conclusions, economic factors, institutional factors, government factors, media factors, political factors, historical factors and geographical factors all have a specific impact on corruption. However, due to differences in the database, research methods, and econometric models, this effect shows various correlation coefficients and significance in different findings. According to incomplete statistics, the significant impacts that are generally recognized at present are:

- ❖ mainly the development level of the economy,
- ❖ the improvement level of institutional,
- ❖ the degree of freedom for social media or expression,
- ❖ the level of education for public servants,
- ❖ the scope of government.

Assessing the current level of corruption has been a common choice of the vast majority of researchers in the past (Dell’Anno, 2020). They usually selected several key indicators through careful analysis. They then used different econometric methods and models to measure the impact of each indicator on the degree of corruption, or use specific testing methods, such as co-integration test, Granger causality test, etc., to demonstrate the causal relationship between each index and the degree of corruption. In contrast, it is rare to use a lagged model to predict future fluctuations of corruption. Corruption governance is a kind of ex post facto control and ex-ante control (Li, 2021). Evaluating the current level of corruption is a form of ex post facto control, while predicting the future level of corruption is a means of ex-ante control. Therefore, exploring the current level of corruption and projecting the future level of corruption play a crucial role in promoting the ability to improve the comprehensive management of corruption, and both of them are indispensable.

Main assumptions Changes in the degree of corruption result from factors within and outside governments. Combined with the analysis and commentary above,

¹<https://www.transparency.org.uk/corruption-statistics>

after trying to eliminate the interference of endogenous problems, this study mainly selects four influential factors, called government effectiveness, “institutional inertia of corrupt governance”, political stability, and citizens’ political right, for empirical analysis. Meanwhile, it puts forward four main theoretical hypotheses, respectively.

Government effectiveness refers to all the practical functions that public managers can perform in public management activities to achieve the common good (Zhou *et al.* 2017; Dincer *et al.* 2019). From the perspective of connotation, the effectiveness of the government is closely related to the scale of the government and the public servants (Guo, 2017). While from the perspective of the coded database, government effectiveness belongs to the influential composite factors, which mainly include five secondary indicators. They are the quality of public services, national services, the ability to get rid of political pressure, the quality of policy formulation and implementation, and the credibility of government policy implementation. The size of government, the quality of civil servants, and the salary of public staff have been shown to have a significant correlation with the degree of corruption. However, some studies have questioned this, arguing that this so-called correlation is not apparent (Andersson, 2017). Nevertheless, the existence and prominence of the correlation between government effectiveness and the degree of corruption have not been definitively verified by former scholars. After considering the actual situation and the results of various studies, this article makes the following assumption (H1): As the effectiveness of government continues to increase, the level of corruption in government will continue to decrease.

The “institutional inertia of corruption governance” mainly refers to the stable performance of a country or government at the level of corruption management and control over a long period (Xu *et al.* 2020). Generally speaking, if the degree of corruption control is maintained to a high level for a long time, then the level of corruption in this country or government is likely to maintain a low development trend. From the perspective of connotation and composition, the “institutional inertia of corruption governance” belongs

to a single type of influential factor. In previous studies, the “institutional inertia of corrupt governance” has often been referred to as “the historical inertia of institutions” or “the tradition of the system”. Scholars have demonstrated a significant causal relationship between the “the historical inertia of institutions” and the degree of corruption by building various models or conducting theoretical analyses (MacDonald *et al.* 2011). At the same time, some researchers have proposed that there is no apparent causal relationship between “the historical inertia of institutions” (such as the Protestant tradition and the British colony tradition) and the degree of corruption (Treisman, 2007), (Dimant *et al.* 2018). After considering the actual situation and the results of each study, this article puts forward the following hypothesis (H2): Under the influence of “institutional inertia of corrupt governance”, governments with low corruption are more likely to promote integrity construction, while governments with higher corruption are just the opposite.

Political stability refers to the degree of stability in the political situation of a country or government (Elbahnasawy *et al.* 2012). From the perspective of connotation and composition, political stability belongs to a single influential factor. The more stable the political situation, the less likely it is to have political violence. On the one hand, Pellegrini (2011), MacDonald (2011), and others have found through various investigations that there is a significant correlation between political stability and the degree of corruption (Treisman, 2015). Elbahnasawy (2012) and others, on the other hand, insist that political stability is not a determinant of the degree of corruption (Goel *et al.* 2010). After considering the actual situation and the results of previous research, this article proposes the following hypothesis (H3): the more stable the political situation, the lower the degree of corruption in the government.

Citizens’ political right mainly refers to the right of citizens to participate in the political life of a country (Zhou *et al.* 2017). Judging from the composition of the coded database, citizens’ political right belongs to the influential composite factors, which mainly include three indicators, just as follows: citizens’ right to elect government officials, citizens’ freedom of speech and

association, and media freedom. Among them, citizens' freedom of speech and media freedom has been proven to be effective measures to control corruption and have been recognized and supported by many researchers such as Treisman (2015). As for the impact of citizens' right to vote and freedom to associate on the degree of corruption, it is hard to find any similar empirical study. After considering the actual situation and the results of each study, this article proposes the following hypothesis (H4): the more influential the exercise of civil political power, the lower the degree of corruption in government.

Methodology and models

Relying on the World Bank's latest "Global Governance Indicators" released in 2021², the study extracted adequate data from the four aspects of corruption control, government effectiveness, citizens' political rights, and political stability and established a new panel data set. The panel database covers all valuable data related to the above four main variables in about 211 countries worldwide in the past 24 years.

Methodology

To more accurately examine the correlative relationship between government effectiveness, "institutional inertia of corrupt governance", political stability, citizens' political power, and the degree of corruption, and to predict further development trends of corruption, we have coded a proprietary panel dataset. The dataset has three main characteristics: Firstly, the span time is relatively long (containing all valid data from 1996 to the present). Secondly, the geographical scope covered is relatively broad. Thirdly, it has a high degree of fit with this study (including all the variables needed for the study, and the actual observed values of the variables are about 4560).

A comprehensive understanding of the basic situation of each variable is an essential prerequisite for the successful completion of this research. So, in the beginning, we investigated the basic situation of corruption control,

government effectiveness, political stability, and citizens' political right and found their maximums and minimums, respectively, and the countries to which they belong (as shown in Tables 1 and 2).

Table 1: Descriptive statistics for variables

Variable	Number	Average	Standard Deviation	Minimum	Maximum
Year	4708	2009.22	6.796	1996	2020
<i>cc</i>	4530	-1.680	0.998	-1.905	2.470
<i>ge</i>	4516	-1.240	0.998	-2.475	2.437
<i>pv</i>	4540	4.190	0.998	-3.315	1.965
<i>va</i>	4560	5.040	0.998	-2.313	1.801

Table 2: Extreme values of variables and their corresponding countries

Variable	Minimum	Country/ Region for Min	Maximum	Country/ Region for Max
<i>cc</i>	-1.905	South Sudan	2.470	Denmark
<i>ge</i>	-2.475	South Sudan	2.437	Singapore
<i>pv</i>	-3.315	Somalia	1.965	Greenland
<i>va</i>	-2.313	North Korea	1.801	Denmark

Then, with the help of the ordinary least squares method, we established a multiple regression model and a lagged variable model to complete the correlative test of government effectiveness, "institutional inertia of corrupt governance", political stability, citizens' political right, and the degree of corruption, and the prediction of the development trend of corruption.

MODELS

In order to complete the test of H1, H2, H3, and H4 and the projection of variation for corruption shortly, a multivariate regression model (referred to as model A) and a lagged variable model (referred to as model B) were established, employing ordinary least squares regression. Model A was built to examine the impact of government effectiveness, political stability, and citizens' political rights on the degree of corruption. At the same time, the establishment of Model B can be used to test the impact of the "institutional inertia of corruption governance" on the degree of corruption

²<https://databank.worldbank.org/reports.aspx?source=world-development-indicators>

and, to a large extent, to predict the development trend of future corruption.

$$\text{Model A : } cc_{it} = \alpha_i + \beta_1 ge_{it} + \beta_2 va_{it} + \beta_3 pv_{it} + e_i$$

$$\text{Model B : } cc_{it} = \alpha_i + \rho cc_{it-1} + \beta_1 ge_{it-1} + \beta_2 va_{it-1} + \beta_3 pv_{it-1} + e_i$$

Among them, “*cc (it)*” represents the degree of corruption control, “*ge (it)*” represents the effectiveness of the government, “*va (it)*” represents the political rights of citizens, and “*pv (it)*” represents the stability of the political situation; “*cc (it-1)*” “*ge (it-1)*” “*va (it-1)*” “*pv (it-1)*” corresponds to the values of the previous year respectively; “*e*” is a symbol of possible errors.

The results obtained can effectively test H1, H2, H3 and H4. When the p-value of “*cc (it-1)*” “*ge (it)*” “*va (it)*” “*pv (it)*” can pass the significance test of the 0.01 level, it indicates that there is a significant correlation between them and the degree of corruption. Conversely, it indicates that there is no correlation. It is crucial to judge the four coefficients to figure out a positive or negative correlation between the above variables and the degree of corruption. In general, a positive coefficient indicates a positive correlation and vice versa. Moreover, the greater the absolute value of the coefficient, the greater the impact on the degree of corruption is.

FINDINGS

Figs. 1, 2, 3, 4, 5, and 6 reveal that government effectiveness, political stability, citizens’ political right, and corruption control have roughly the same variation trend. Still, there are also significant differences between various countries or regions. In terms of the magnitude of the fluctuations of each variable, the fluctuations of Denmark, Greenland, and Singapore are relatively flat. In contrast, the fluctuations of South Sudan, Somalia, and North Korea are relatively violent. The indicators of South Sudan and Somalia have shown a downward trend in terms of their development momentum. In addition, between 2016 and 2020, there was a diametrically opposite trend between the degree of corruption control and political stability in North Korea, which shows that there is a specific negative correlation between corruption control and political stability in

North Korea (whether such a relationship is significant needs to be further tested if necessary).

By reviewing the results of Tables 3, 4, and 5, it can be found that a significant positive correlation between government effectiveness, political stability, citizens’ political rights, and the degree of corruption. Then, the “institutional inertia of corruption governance” has had an undeniable positive impact on the variation in the degree of corruption. Thirdly, political stability is difficult to play a significant role in predicting corruption trends. Fourthly, for model B, it is possible, to a large extent, to better predict the development trend of corruption by removing the variable of political stability.

Table 3: Fixed-effects Regression Analysis

<i>cc</i>	Coefficient	Standard Error	T value	P value
<i>ge</i>	0.424	0.013	32.14	***
<i>va</i>	0.254	0.014	18.65	***
<i>pv</i>	0.039	0.008	4.81	***
Intercept	-0.0004	0.003	-0.15	0.882

Error: 0.176; R-side: 0.8593. Note: *** indicates that the correlation coefficient passed the significance test of 0.01 level.

Table 4: Fixed-effects Regression Analysis

<i>cc</i>	Coefficient	Standard Error	T value	P value
<i>cc_{it-1}</i>	0.711	0.013	56.86	***
<i>ge_{it-1}</i>	0.047	0.012	3.93	***
<i>va_{it-1}</i>	0.087	0.012	7.54	***
<i>pv_{it-1}</i>	0.004	0.006	0.67	0.505
Intercept	-0.001	0.002	-0.72	0.474

Error: 0.117; R-side: 0.9815. Note: *** indicates that the correlation coefficient passed the significance test of 0.01 level.

Table 5: Fixed-effects Regression Analysis

<i>cc</i>	Coefficient	Standard Error	T value	P value
<i>cc_{it-1}</i>	0.710	0.013	56.59	***
<i>ge_{it-1}</i>	0.045	0.012	3.80	***
<i>va_{it-1}</i>	0.088	0.012	7.53	***
Intercept	-0.002	0.002	-1.08	0.280

Error: 0.118; R-square: 0.9811. Note: *** indicates that the correlation coefficient passed the significance test of 0.01 level.

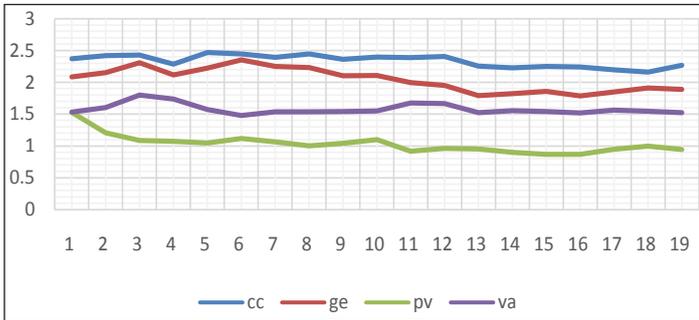


Fig. 1: Numerical variations of factors influencing the degree of corruption in Denmark from 2002 to 2020

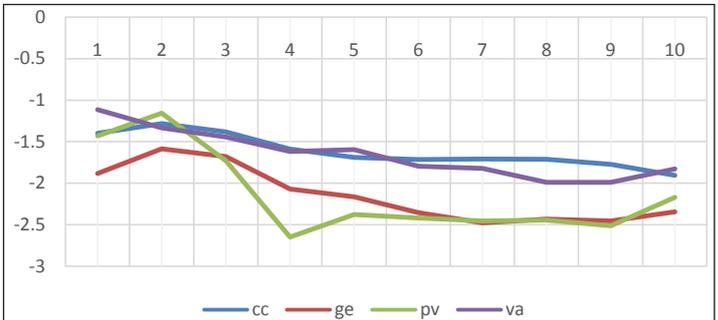


Fig. 2: Numerical variations in factors influencing corruption in South Sudan from 2011 to 2020

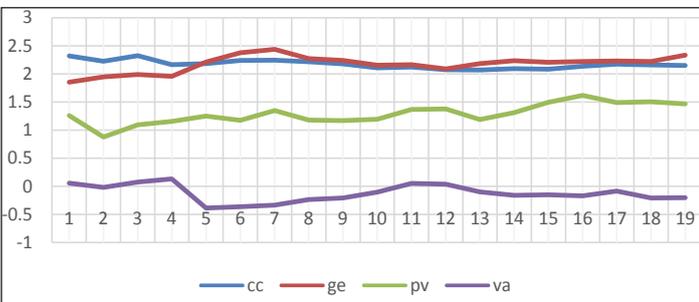


Fig. 3: Numerical variations in factors influencing the degree of corruption in Singapore from 2002 to 2020

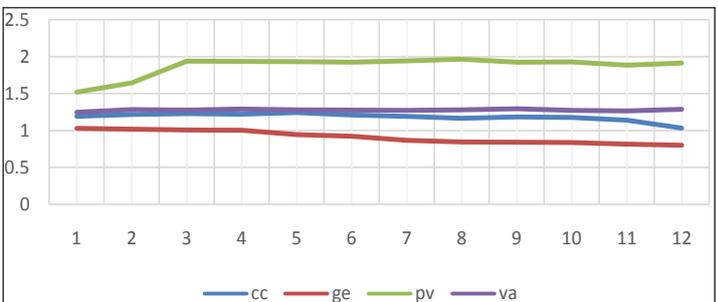


Fig. 4: Numerical variations in factors influencing corruption in Greenland from 2009 to 2020

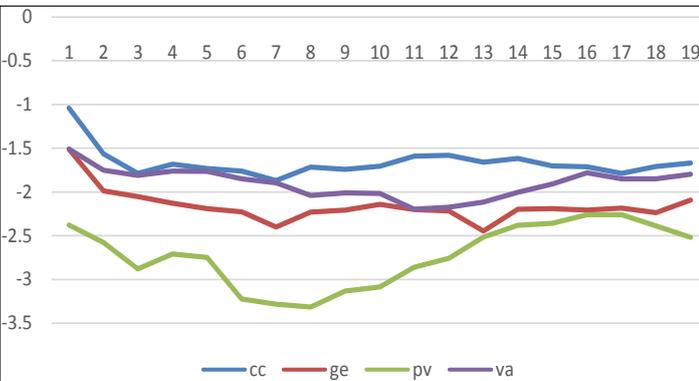


Fig. 5: Numerical variations in factors influencing the degree of corruption in Somalia from 2002 to 2020

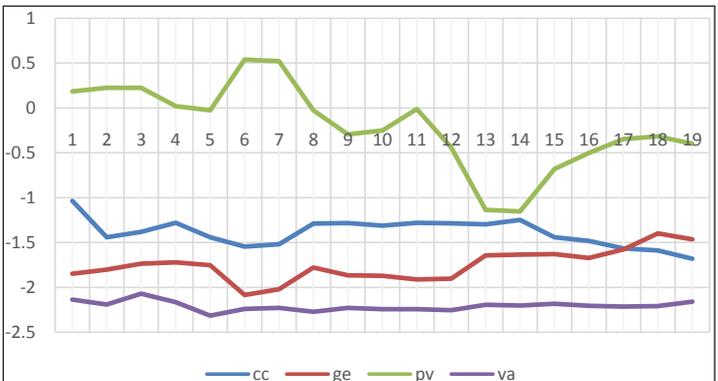


Fig. 6: Numerical variations of factors influencing the degree of corruption from 2002 to 2020

Factors that impacted the degree of corruption

Judging from the results of this study, H1, H2, H3, and H4 all passed the significance test. There is a significant correlation between government effectiveness, the “institutional inertia of corrupt governance”, political stability, citizens’ political right, and the degree of corruption. Among the four influential factors, the

“institutional inertia of corrupt governance” has the most significant impact on the degree of corruption, followed by government effectiveness, citizens’ political right, and political stability is the last one. Specifically, when the “institutional inertia of corrupt governance”, government effectiveness, citizens’ political right and political stability increase by one unit each, the degree of corruption control will be correspondingly increased

(or the degree of corruption will be correspondingly reduced) 0.711, 0.424, 0.254 and 0.039 units, respectively. The so-called “institutional inertia of corruption governance” rose, mainly referring to the phenomenon that the government has continued to increase its policy intervention in corruption governance. Thus, it can be easily seen that continuously increasing policy intervention, improving government efficiency, ensuring the effective exercise of citizens’ political rights, and maintaining political stability are the four essential methods to decrease the degree of corruption and improve the ability of corruption governance.

Variation for the degree of corruption

For Model B, only the lagged variable “political stability” failed the significance test. So it might be a wise choice to exclude this variable. After the re-adjustment, the three lagged variables (corruption control, government effectiveness, and citizens’ political right) passed the significance test. The degree of fitting of the variables was 98.11% (compared with the 98.15% before the adjustment, the change was minimal). When the three lagged variables are increased by one unit each, the corruption control will be correspondingly increased (and the degree of corruption in the future will be correspondingly decreased) by 0.710, 0.045, and 0.008 units. Therefore, improving the current degree of corruption control, government effectiveness, and the effective exercise of citizens’ political rights are practical approaches to preventing corruption and stimulating the potential of corruption governance.

CONCLUSION

This study used the ordinary least squares method to conduct an empirical analysis of the newly formed international panel data examined and predicted the four significant factors that impacted the degree of corruption and its variation. Furthermore, concluded the following five essential conclusions: Firstly, there is a significant correlation between government efficiency, “institutional inertia of corrupt governance”, political stability, and citizens’ political right and the degree of corruption. Secondly, as the effectiveness of

government continues to rise, the level of corruption in government will continue to decrease. Thirdly, under the influence of the “institutional inertia of corrupt governance”, governments with a low degree of corruption are more likely to promote the construction of a clean government. In contrast, governments with a higher degree of corruption are just the opposite. Fourthly, the more stable the political situation, the less corrupt the government. Fifthly, the more effectively citizens’ political right is exercised, the less corrupt the government is. In short, corruption governance is a kind of after-the-fact reflection and summary of lessons, and it is also a proactive move to prevent problems before they occur. The emergence of the lagged variable model has opened up a new way to explore the early prevention and control of corruption. It has also greatly improved the scientific and forward-looking anti-corruption work.

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Appendix 1

Informal operation: preparation

download the data from The World Bank in form of excel
 open and duplicate the whole items of data from the excel
 open stata and click the button of "Editor"
 paste the duplicated contents in the sheet of stata and recognized the first row as variables' name

Formal Operation start stage 1

bro (browse the database and make sure the string/numerical data is arranged correctly or not__Not correct)
 the color of the string data is red, while the color of the numerical data is black
 destring cce, replace force (change the type of "cce" from string data to numerical datab)
 destring gee, replace force
 destring pve, replace force
 destring rqe, replace force
 destring rle, replace force
 destring vae, replace force
 bro (make sure that all mistakes has been corrected)
 summarize
 save "/Users/yuxiulin/Desktop/control-of-corruption-data.dta"
 file /Users/yuxiulin/Desktop/control-of-corruption-data.dta saved

Formal Operation start stage 2

drop if missing(year) [delete the missing data of "year"]
 drop if missing(cce)
 drop if missing(gee)
 drop if missing(pve)
 drop if missing(rqe)
 drop if missing(rle)
 drop if missing(vae)

Formal Operation start stage 3

egenctn=group(country) [group the data according to the name of a "country"]
 xtsetctn year [tell stata this is a panel data]
 xtregcce gee vaepve, fe[multiple regression]
 xtregccel.ccel.geel.vael.pve, fe [multiple regression]
 xtregccel.ccel.geel.vae, fe [multiple regression]

.sum

Variable	Obs	Mean	Std. Dev.	Min.	Max.
Year	4,708	2009.227	6.795986	1996	2020
cce	4,530	-1.68e-08	.9976789	-1.905176	2.469991
gee	4,516	-1.24e-08	.9976717	-2.475142	2.436975
pve	4,540	4.19e-09	.997684	-3.314937	1.965062
rqe	4,516	-5.76e-09	.9976717	-2.645041	2.260543
rle	4,588	-1.09e-09	.9977083	-2.606445	2.129668
vae	4,560	5.04e-09	.9976942	-2.313395	1.800992
Country	0				