The Impact of Corruption on Economic Growth: Evidence from Developing Countries

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Abstract

This paper investigates the long-run relationship between corruption and economic growth in 59 developing countries from 1984 to 2021. The sample is based on the availability of data. We used the CS-ARDL model to investigate our sand-the-wheel hypothesis i.e. corruption is harmful to economic growth and there is a negative relationship of corruption and economic growth. We take the data of corruption and institutional quality from ICRG dataset and the data of all other variables from WDI. Our results supported the evidence of the negative impact of corruption on economic growth in the presence of other control variables like natural resources, institutional quality, government consumption expenditures, gross fixed capital formation, and labour force. There is a positive impact of institutional quality on economic growth. We have also evidenced that natural resources have no long-run effect on growth in the presence of corruption. We also used the MG, PMG and DFE estimators of P-ARDL to verify our results. This study suggested that corruption should be controlled in developing countries to foster economic growth.

JEL Classification: F43, D73, P28, O43

Keywords: Economic Growth, Corruption, Developing Countries, CS-ARDL.

1. Introduction

Corruption exists worldwide in developing as well as developed countries in one way or another and it remains one of the major problems of nations for ages, especially in the case of 20th and 21st centuries as we have recently observed well-known corruption scandals worldwide. 155 out of 180 countries, and territories have shown less satisfactory efforts against corruption in the public sector; moreover, about 120 countries showed less than 50 scores on Corruption Perception Index (CPI) ranging from 0 (highly corrupt) to 100 (very clean) (Transparency International [TI], 2022). Researchers have analysed the impact of corruption on economic growth (Mauro, 1995; Barreto, 2000; Uberti, 2022; Trabelsi & Trabelsi, 2021; Ugur & Dasgupta, 2011) by including different aspects like natural resources (Erum & Hussain, 2019), institutions (Shleifer & Vishny, 1993; Aidt, 2009; Rytter, 2021; Bhattacharyya & Hodler, 2010), education (Akai et al., 2005), human capital (Mo, 2001; Al Qudah et al., 2020), financial development (Rivera-Batiz, 2001), trade openness (Swaleheen, 2011), investment (Podobnik et al., 2008), political stability & regime (Saha & Sen, 2021; Mauro, 1997) and government expenditures (Del Monte, & Papagni, 2001). However, less has been investigated about corruption and economic growth while emphasizing natural resources and the role of institutions with other control variables. This study sets out to address this gap in empirical literature by using panel data for the cross-section of developing countries from 1984 to 2021. The following hypothesis is explored in this research, H_0: Corruption is detrimental towards economic growth.

Numerous authors and organizations defined corruption in diverse dimensions and measured it by using different methodologies. The concept of corruption is defined in these acceptable words “abuse of public office for private gain” (World Bank, 1997, p. 8) and identified as one of the most important obstacles to social and economic development (World Bank, 1997). Thus corruption is "the sale by government officials of government property for personal gain" (Shleifer & Vishny, 1993, p. 599).

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From various aspects of corruption, the most common are misuse of political power, bureaucratic corruption, bribery, patronage agreements, as well as nepotism when contracts are awarded, which varies from country to country in extent and form (Jain, 2001). From all these aspects, public sector corruption is more complex and difficult to identify and control due to the involvement of institutions.

Corruption increases inequality and makes life costly especially for the poor by making them more vulnerable to accessing basic social services like education, health, and justice. Corruption reduces private sector investment.

The next section presents a review of extant literature, which is followed by a section on data and methodology, results and discussion. The last section presents the conclusion and policy recommendations.

2. Review of Literature

Most of the existing studies on the relationship between corruption and growth face critical issues in causal inferences because the prevalent literature has relied mostly on cross-country regressions. At the same time, those who have used panel data are not only a few studies but they have used a limited range of overtime variation (Uberti, 2021). This also left a gap in the literature, which, this study has aimed to address the growth nexus of corruption by using panel time series analysis from 1984 to 2021, especially with natural resources along with the role of institutions in developing countries. The findings of this study will help policymakers to design informed policies in developing countries.

There is a lack of theoretical literature on corruption and economic growth. However, we can divide the literature into two streams. The first stream of the theoretical literature argues that corruption is harmful to growth and there is evidence of the negative impact of corruption on economic growth (Sachs & Warner, 1997). The economists are worried more about the long-term effects of corruption (Uberti, 2021, Rotimi et al., 2022) than the short-term because corruption cripples economic growth by slowing down economic activity (Swaleheen, 2011) and development by an uneven distribution of income and poverty. Corruption not only stops the free flow of foreign investment but also steals local investment from the productive sectors to the unproductive (Wei, 1997) and distorts international trade (Lambsdorff, 1998). On average, corruption tends to be more growth-reducing with fewer domestic investment projects by affecting quality and productivity (Tanzi & Davoodi, 1998; Mauro, 1995), diminishes democratization and creates sociopolitical instability (Mo, 2001).

The researchers also observed an indirect effect of corruption on economic development through transmission channels like natural resources and institutions, also by decreasing private sector investment, especially in terms of physical and human capital (Keefer & Knack, 1997; Mauro, 1995), government expenditures, and education (Al Qudah, et al., 2020). Corruption is not any less detrimental to economic growth in economies characterized by inefficient bureaucracies, or property rights insecurity.

Rytter (2021) found the negative effects of corruption on the growth of both GDP per capita and productivity for 170 countries from 2002 to 2019 by employing fixed effects estimation. Trabelsi and Trabelsi (2021) investigated the cross-sectional framework for the sample of 88 countries from 1984-2011 and proposed a positive relationship between investment, inflation, trade and economic growth on one hand, and an inverse relation of corruption and economic growth on the other. Farooq et al. (2013) investigated the inverse relationship between corruption and growth in the case of Pakistan from 1987 to 2009 by applying structural breaks through the unit root test. Rotimi et al. (2022) followed the Solow-Swan model and found a long-run negative impact on growth and corruption in Nigeria from 1995 – 2019. They further emphasized strong institutions and the role of government especially in the presence of natural resources about zero tolerance for corruption through making anti-corruption policies at the national level.

Ernst (2020) investigated 150 countries from 2015 to 2019 by taking GDP per capita and the Corruption Perception Index (CPI). If a country improves its corruption perception score by 0.8, its GDP per capita will rise by approximately $1000. So, corruption was shown to harm growth in some form for most of the 150 countries included in the study. Similarly, Das et al. (2020) also found the long-run inverse effect of GDP and corruption index in Asian regions even in the presence of innovation. The lack of

growth-oriented expenditures due to corruption in research and development is the core reason for this negative impact in the region, they used global innovation, and corruption indices of 13 countries for ten years for the purpose.

Another stream of the literature advocates the grease-the-wheel hypothesis of growth and corruption, in which they move in the same direction because of increasing private investments by reducing bureaucratic delays and by increasing the efficiency of public sector employees as an under-the-table income incentive (Huntington, 1968). However, empirical literature also suggests that corruption removes rigidities imposed by a cumbersome governmental process resulting in attracting private investment and making the economic environment more growth-oriented by increasing efficiency in terms of timely decision-making. Therefore, the debate on the relationship between corruption and economic growth has yet not been settled which leaves room for further research.

Ahmad et al. (2012) found a non-linear relationship explained by the hump-shaped link between corruption and economic growth by differentiating growth-reducing and enhancing the level of corruption in 71 developed and developing countries from 1984 to 2009. This means each level of corruption does not need to reduce economic growth, especially in the presence of other conducive factors. For instance, Blackburn and Forgues-Puccio (2009) assert that not all countries need to experience low growth in the presence of a high level of corruption. They predicted that the form of corruption matters as countries with organized corruption lead to lower corruption activities and a higher level of growth than countries with unorganized corruption. Trabelsi and Trabelsi (2021) advocated a threshold level of 2.5 to 3 of corruption is beneficial for economic growth to support the "grease-the-wheel" hypothesis at which the marginal cost is equal to the marginal benefit of the corruption.

Empirical Literature treats natural resources as a transmission channel of corruption through rent-seeking while discussing economic growth (Leite & Weidmann, 1999; Kolstad & Wiig, 2009;), the resource benefits can't reach to public due to corruption (Kolstad & Søreide, 2009). Bhattacharyya and Hodler (2010) illustrated that an abundance of natural resources leads to corruption in less democratic countries due to rent-seeking phenomena, especially in the presence of poor institutional quality. They covered the time of 1980–2004 for 124 countries. Andersen and Aslaksen, (2013) also reaffirmed in the case of resource-rich countries and regions, corruption remains high due to the rent-seeking behaviour of government officials. Similarly, Erum and Hussain (2019) analyzed that corruption slows growth but the abundance of natural resources has growth implications for the economy. They investigated the panel data of 43 OIC member countries from 1984 to 2016 by dividing the sample based on high and low ICT diffusion economies. They also observed a significantly positive combined effect of natural resources and corruption on economic growth. This is further experienced in the case of poor institutions (Meon & Weill, 2010).

Similarly, Thach, Duong and Oanh (2017) analysed that corruption negatively impacted economic growth in 19 selected Asian countries from 2004-15 by using DGMM and also used the quintile level to capture the effect of different levels of corruption on economic growth. They also found that institutional quality and economic and democratic freedom pave the path towards economic development.

Saha and Sen (2021) found a direct effect of both corruption and economic growth in autocracies than in democracies. They also evidenced that democracy negatively affects the growth of the economy if corruption is already widespread. Similarly, in the case of developing countries, Song, Chang and Gong (2021) also suggested that bribes can overcome delays in heavy procedures and minimize administrative costs.

However, some studies posit a neutral nexus of corruption and growth. For instance, Barreto (2000) used a simple neoclassical growth model and suggested that corruption has only redistribution of income in the economy, which is better as it creates economic activity instead of drains economic resources in the case of inefficient public sector agents. Khan et al. (2021) investigated the grease-the-wheel hypothesis for South Asian countries from 2002-17. They examined the impact of corruption on economic growth along

with other controls like population, political stability and trade openness by using fixed and random effects robust least squares estimators to counter the problem of autocorrelation. They found the direct impact of corruption on economic growth in the short run but indirect when we consider the larger time period because corruption adversely affects growth due to lower institutional quality.

Hannan and Mohsin (2015) investigated the growth implications of natural resources in the region and found supporting evidence except for South Asia where an indirect impact was observed between these two due to low level of institutional quality. Entele (2021) suggested that with good quality institutions, countries can avoid the curse as proved in their study by interaction terms of natural resources and intuitions. Moreover, the interaction terms of ICT investment and institutional quality positively affect the economic growth of resource curse economies. However, Brunnschweiler (2008) reported a direct and positive relationship between natural resources with economic growth and evidence of no indirect effects of the abundance of natural resources on institutional quality.

We can conclude that there is not a clear theoretical relation available between corruption and economic growth. There is a series of empirical evidence which substantially examined and proved each strand of the theoretical relationship of both i.e. the negative, the positive and even the neutral. There are two main hypotheses investigated for the corruption and growth nexus i.e. "sand the wheel" which predicts the negative growth effect of corruption and "grease the wheel" proves the growth-enhancing effect of corruption. This is a wide range of topics which can't be covered in one dimension. The study concludes that corruption has a negative growth relationship in the long-run.

3. Data and Methodology

Depending upon the availability of data, we take 59 developing countries to examine the empirical relation between corruption and economic growth for 38 years from 1984 to 2021. We used GDP per capita to indicate economic growth as a dependent variable as the tradition in the empirical literature (Erum & Hussain, 2019; Chakravorty, 2019; Mo, 2001). The independent variable of the study is corruption along with other control variables like natural resources, institutional quality, government consumption expenditures (% of GDP), gross fixed capital formation (% of GDP), and labour force. It is expected that the labour force and fixed capital formation have growth effects. Government expenditures have an important growth impact especially in the presence of corruption and natural resources because public expenditures are used to explore resources. The selection of appropriate control variables is based on the growth literature and availability of data. We take the data of corruption and institutions from ICRG and the data of all other variables is from WDIs.

We check the issue of Cross-sectional dependence of our sample of developing countries with the CD test developed by Pesaran (2004) because the nations are well connected and integrated in terms of the free flow of goods, services, technology and finance.

The equation (1) shows CD test as follows:

$$CD = \left(\frac{TN(N-1)}{2}\right)^{1/2} \bar{\hat{P}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\bar{\hat{P}} = \left(\frac{2}{N(N-1)}\right)\sum_{i-1}^{N-1} \sum_{j=i+1}^{N} \hat{P}_{ij} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where demonstrate pairwise correlation coefficient for cross-sectional residuals. N and T show the cross-sectional and time dimension. The null hypothesis of the CD test is H_0: $\beta_i = 0$ for all i and H_1: $\beta_i < 0$ for some i.

After the CD Test, we used the second-generation Covariate Augmented Dickey-Fuller (CADF) panel unit root test, which further overcame cross-sectional dependence (Pesaran, 2006).

$$\Delta Y_{it} = \alpha_i + \beta_i Y_{it-1} + \gamma_i \bar{Y}_{t-1} + \emptyset_i \Delta \bar{Y}_t + \epsilon_{it} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Here, i and t for cross sections and time respectively, and $\bar{Y}_t = N^{-1} \sum_{i=1}^{N} Y_{it}$ is the mean, which rules out the correlation among Y_{it}.

Moreover, we have checked the presence of panel co-integration in our model with three test statistics presented by Pedroni, Koa, and Westerlund (Kao, 1999; Pedroni, 1999, 2004; Westerlund, 2007a) by using equation (4);

$$\Delta LGDPC_{it} = \acute{\delta}_i d_t + \alpha_i \left(LGDPC_{it-1} - \acute{\beta}_i X_{i,t-1}\right) + \sum_{j=1}^{P_i} \alpha_{ij} \Delta LGDPC_{i,t-1} + \sum_{j=-qi}^{P_i} \gamma_{ij} \Delta X_{i,t-1} + \varepsilon_{it} \ldots\ldots\ldots (4)$$

Where i and t denote cross sections i.e countries and time respectively, a negative value of α_i indicates the speed of adjustment which helps in turn to decide the long-run co-integration, and d_t shows the deterministic component of the model by assuming the value of 0 or 1 for independence between ΔX_{it} and ε_{it}.

Furthermore, there is another comprehensive alternative that can also be used is the bootstrap method. H_0 of no-cointegration α_i for all i which is tested against H_1 is dependent upon what is assumed for homogeneity of α_i. there are four test statistics, from which P_t and P_a are for the panel cointegration test and G_t and G_a are for group cointegration (whether exists among cross-sectional units or not) against alternate hypothesis (at least one cross-sectional unit is integrated).

After the long-run cointegration among variables, we used Dynamic Common Correlated Effects Estimation (DCCE), also known as the Cross-Sectional Augmented Distributive Lag (CS-ARDL) model (Chudik & Pesaran, 2015) to determine the short-run and long-run effects of corruption and other control variables on economic growth. Chudik and Pesaran (2016) recommended this model as desired especially when unobserved common factors are included in the model. This technique solves the problems of heterogeneity and cross-sectional dependence across countries and establishes an Error Correction Mechanism (ECM) for weakly exogenous regressors.

The equation (5) for regression is as follows:

$$\Delta LGDPC_{it} = \mu_i + \varphi_i \left(LGDPC_{it-1} - \beta_i X_{i,t-1} - \emptyset_{1i} \overline{LGDPC}_{t-1} - \emptyset_{2i} \bar{X}_{t-1}\right) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta LGDPC_{it-j} + \sum_{j=0}^{q-1} \zeta_{ij} \Delta X_{it-j} + \eta_{1i} \Delta \overline{LGDPC}_t + \eta_{2i} \Delta \bar{X}_t + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

i & t represented cross sections and time in the model. β_i shows the coefficient of the X vector of independent variables. $\Delta LGDPC_{it}$ shows dependent variables and X_{it} shows independent variables. We also include the lag of the dependent variable as an independent in the model as $LGDPC_{it-1}$. There are the means of dependent $\overline{LGDPC}_{t-1}$ and $\bar{X}_{t-1}$ independent variables respectively to capture the long-run effects. Short-run effects of the model captured by $\Delta LGDPC_{it-j}$ and ΔX_{it-j} against dependent and independent variables respectively. λ_{ij} shows the short-run coefficient of the dependent variable. ζ_{ij} specifies a short-run coefficient vector of independent variables. η_{1i} *and* η_{2i} representing the coefficients of means of the short-run dependent and independent variables as $\emptyset_{1i}$ and $\emptyset_{2i}$ are the coefficients of means of long-run dependent and independent variables. ε_{it} is an error term.

For the robustness of our estimation, we also applied the three estimators Mean Group (MG), Pooled Mean Group (PMG) and Dynamic Fixed Effects (DFE) of the Panel Auto Regressive Distributed Lag (P-ARDL) Model in our study (Pesaran, Shin & Smith, 1999). PMG assume heterogeneity only in the short run but MG & DFE estimators assume heterogeneity and homogeneity in both short-run as well as in the long-run respectively. We further applied the Hausman test to ensure consistency in the model.

The Error Correction Model (ECM) is developed in equation (6) as follows:

$$\Delta LGDPC_{i.j} = \mu_i + \varphi_i\big(LGDPC_{i,t-1} - \lambda_1 GFCF_{i.t-1} - \lambda_2 GCE_{i.t-1} - \lambda_3 LF_{i.t-1} - \lambda_4 IQ_{i.t-1} - \lambda_5 CRR_{i,t-1} - \lambda_6 NR_{i.t-1}\big) + \sum_{j-1}^{p-1} \gamma_j^i \Delta(LGDPC_{it})_{t-j} + \sum_{j=0}^{q-1} \delta_{1j}^i \Delta(GFCF_{it})_{t-j} + \sum_{j=0}^{q-1} \delta_{2j}^i \Delta(GCE_{it})_{t-j} + \sum_{j=0}^{q-1} \delta_{3j}^i \Delta(LF_{it})_{t-j} + \sum_{j=0}^{q-1} \delta_{4j}^i \Delta(IQ_{it})_{t-j} + \sum_{j=0}^{q-1} \delta_{5j}^i \Delta(CRR_{it})_{t-j} + \delta_{i,t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

In equation (6), μ_i is a constant while φ_i representing the speed of adjustment and presence of long-run relationship when it approaches zero.

4. Results and Discussion

In the table 1, we present the description of the statistics of all the variables included in our study. 42863 is the highest mean value of GDP per capita and corruption is the lowest among all the variables included in the model. Labour force, Gross fixed capital formation and to some extent, institutional quality show heterogonous attributes in our sample countries, but the other variables show homogenous attributes in terms of the mean and standard deviation values.

Table 1: Descriptive Analysis

	GDPC	CRR	NR	GFCF	GCE	LF	IQ
Mean	4840.916	2.4786	9.1411	21.8724	13.9370	64.6450	3.4966
Median	2645.125	2.5000	5.0565	20.8724	13.3088	64.5663	3.5265
Maximum	42863.40	6.0000	66.653	81.0210	40.8354	90.3400	4.9715
Minimum	312.6240	0.0000	0.0173	-2.4243	0.0000	43.2600	1.1742
Std. Dev.	6317.711	0.9207	10.8350	7.9142	5.2552	10.0842	0.6923
Skewness	2.737448	0.4106	2.0229	1.1270	0.8676	0.0057	-0.2927
Kurtosis	11.41892	3.6699	7.3592	7.4049	4.7769	2.5849	2.6515
Jarque-Bera	9421.324	104.937	3304.278	2287.249	576.2384	16.1078	43.3535
Observations	2242	2242	2242	2242	2242	2242	2242

Source: Authors' own results

Table 2: Correlation Matrix

	LGDPC	CRR	NR	GFCF	GCE	LF	IQ
LGDPC	1						
CRR	0.2236	1					
NR	0.2002	-0.1117	1				
GFCF	0.2211	0.1255	0.0767	1			
GCE	0.3179	0.2086	0.2627	0.0731	1		
LF	-0.1544	0.0735	-0.2116	-0.0511	-0.0114	1	
IQ	0.5713	0.4059	-0.1247	0.2060	0.2236	0.1125	1

Source: Authors' own results.

Table 2 shows a weak association among the regressors, which eliminates the possibility of multicollinearity. According to the correlation results, we can observe the correlation in all the factors of the model except the labour force. The sign of LF is not according to our expectations because of developing countries' scenario, in which the labour force is not as educated as in developed countries in the form of human capital. I only signify a positive coefficient in case of corruption, which is again an attribute of the developing country.

Table 3 shows the results of 2nd generation CADF panel unit root test for all the variables with two different specifications i.e. with constant and with constant & tend. All variables are at level stationary apart from the LGDPC & LF. Which are stationary at 1st difference as shown in the results, means the order of integration is mixed and the cross sections of the sample show unbiased results which justifies the application of the CS-ARDL technique to investigate the short and long-run effects of the model.

Table 3: Panel Unit-root test

CADF					
	Level		1st Difference		
Variable	Constant	Constant & trend	Constant	Constant & trend	Order of Integration
LGDPC	-1.965**	-2.385	-3.731***	-3.944***	I(1)
CRR	-2.317***	-2.670***	-4.138***	-4.215***	I(0)
NR	-2.460***	-2.883***	-4.980***	-4.983***	I(0)
GFCF	-2.481***	-2.912***	-4.392***	-4.428***	I(0)
GCE	-1.779	-2.574**	-4.311***	-4.353***	I(0)
LF	-1.053	-2.271	-3.182***	-3.241***	I(1)
IQ	-2.545***	-2.968***	-4.440***	-4.553***	I(0)

Source: Authors' own results Note: *,**,*** shows statistical significance level at 10, 5, and 1% respectively.

Table 4: Panel co-integration tests

Westerlund (2007) Statistic			Pedroni (1999, 2004)		
	Value	Z-value		Statistic	p-value
Gt	-3.285*** (0.000)	-3.594	Phillips–Perron t	-33.9756***	(0.00)
Ga	-7.077 (1.000)	8.628	Augmented Dickey–Fuller t	-31.6694***	(0.00)
Pt	-24.880*** (0.000)	-4.728	**Kao (1999)**		
Pa	-15.509** (0.031)	-1.870	Augmented Dickey–Fuller t	-23.8108***	(0.00)

Source: Authors' own results

The panel co-integration test results are shown in Table 4, all three tests namely Westerlund (2007), Pedroni (1999, 2004) and Kao (1999) indicate the presence of a long-run co-integrated relationship among the selected variables. Moreover, one of the two group statistics i.e Gt is significant, and two statistics of panels are also significant i.e Pt and Pa values of Westerlund statistic and reject the null hypothesis of no co-integration and infers that there is a long-run cointegration relationship exists among LGDPC and other independent variables included in the model. Only one value of group mean statistics i.e. Ga among four is insignificant and does not reject the null hypothesis of no co-integration. But if there are three values out of four that are significant, then we can conclude that there is a long-run co-integration relationship exists.

Table 5 presents the results of the model of corruption and growth in the presence of control variables. There are four estimators to investigate the relationship. For comparison, we report the results of CS-ARDL and P-ARDL (PMG, MG and DFE). The negative and statistically significant values of ECM / Adjust. term LGDPC interpreted as there is an indirect impact of corruption and growth in the short and long run as well.

Our hypothesis that corruption is detrimental to economic growth in developing countries is fully accepted in all of the four techniques (Mauro, 1995; Sachs & Warner, 1997; Uberti, 2021; Rytter 2021).

In the first two models, the coefficient of natural resources has a negative sign with a very small significant effect on economic growth in the short run, but a negative and insignificant effect in the long run under CS & PMG but a significant and positive effect under DFE. So, the natural resources also negatively impact the economic growth in the case of developing countries like corruption in the short run but positively impact the growth in the DFE estimator.

All other control variables are also significant in the short run and long run in CS and PMG. Investment and institutions positively impact the economic growth as per expectations but government spending and labor force have a negative impact. However, government expenditures adversely affect growth because,

without proper accountability and checks and balances of public funds in developing countries, there is growth reducing and increasing cost attribute of public sector projects.

Table 5: Corruption and Growth

	Corruption & Growth			
	CS-ARDL	**PMG**	**MG**	**DFE**
Long-run				
$GFCF_{t-1}$	0.0040*** (0.000)	0.0385*** (0.000)	0.0184** (0.014)	0.0234*** (0.001)
GCE_{t-1}	-0.0066*** (0.000)	-0.0290*** (0.001)	0.0362 (0.161)	-0.0126 (0.387)
LF_{t-1}	-0.0183* (0.056)	-0.0134* (0.073)	0.0288 (0.107)	-0.0099 (0.472)
IQ_{t-1}	0.0293** (0.019)	0.5578*** (0.000)	0.2356** (0.028)	0.6237*** (0.000)
CRR_{t-1}	-0.0147** (0.010)	-0.3499*** (0.000)	-0.1702** (0.011)	-0.1852*** (0.001)
NR_{t-1}	-0.0063 (0.162)	-0.0008 (0.872)	0.0150 (0.844)	0.0304*** (0.002)
Short-run				
$\Delta LlGDPC$	0.0974*** (0.004)	–	–	–
$\Delta GFCF$	0.0032*** (0.000)	0.0040*** (0.000)	0.0023*** (0.000)	0.0011*** (0.000)
ΔGCE	-0.0056*** (0.000)	-0.0069*** (0.000)	-0.0074*** (0.000)	-0.0030*** (0.000)
ΔLF	-0.0152** (0.041)	-0.0120* (0.064)	-0.0203** (0.013)	0.0008 (0.498)
ΔIQ	0.0316** (0.024)	0.0194** (0.034)	-0.0030 (0.742)	0.0296*** (0.000)
ΔCRR	-0.0107** (0.010)	0.0008 (0.836)	-0.0005 (0.874)	-0.0027 (0.419)
ΔNR	-0.0059* (0.094)	-0.0021** (0.041)	-0.0009 (0.648)	-0.0011*** (0.000)
ECM / Adjust. Term $lGDPC$	-0.9025*** (0.000)	-0.0279*** (0.000)	-0.1998*** (0.000)	-0.0282*** (0.000)
$Constant$	–	0.2127*** (0.000)	1.333*** (0.000)	0.1890*** (0.000)
CD Statistic	-0.82 (0.4101)	–	–	–
Observations (N×T)	59 x 36 = 2124	59 x 37 = 2183	59 x 37 = 2183	59 x 37 = 2183

Source: Authors' own results.

5. Conclusion and Policy Implications

This study has analyzed the growth nexus of corruption and natural resources with institutional quality and other aspects as controls in developing countries. The focus of the study was to investigate the relationship between corruption and economic growth. Under the empirical results of our study, we have concluded that corruption hurts growth in the case of 59 selected developing countries. We have also observed that natural resources have no significant long-run impact on growth in the presence of corruption. We have applied the CS-ARDL method to investigate the relationship. We have also used the panel ARDL estimators to check the robustness of the model. In addition to the main model, our results are also evidence of the existing literature as institutions have a positive and significant impact on growth in both the short-run and long-run. According to the empirical evidence of our study, it is strongly recommended that corruption should be controlled in developing countries with the help of strong

institutions and efficient bureaucracy. There could be some more important aspects like the combined effects of natural resources and institutional quality can be included in future research. The interaction terms could be included in the different models to make comparisons. There could also be a regional comparison within the developing countries for future research.

Appendix

Table: Variables and data sources

Sr.	Variable	Abbreviation	Definition	Source
1.	GDP per Capita Growth	GDPC	GDP per capita growth(constant 2015 US$)	WDI
1.	Initial period real GDP per capita		measure the existence of convergence or not, according to neoclassical growth theory	WDI
2.	Corruption index	CRR		ICRG
3.	Natural Resources	NR	Total natural resource rents as % of GDP	WDI
4.	Gross Fixed Capital Formation	GFCF	Fixed Capital Formation as percentage of GDP	WDI
5.	Government Consumption Expenditures	GCE	Government final consumption expenditures as % of GDP	WDI
6.	Labor Force	POP	Labor force participation rate, total (% of total population ages 15-64) (modeled ILO estimate)	WDI
7.	Institutional Quality	IQ		ICRG

Table: List of countries

Algeria	China	Gambia, The	Jamaica	Nigeria	Sri Lanka
Bahrain	Colombia	Ghana	Kenya	Oman	Syrian Arab Republic
Bangladesh	Congo, Rep.	Guatemala	Korea, Rep.	Pakistan	Thailand
Bolivia	Costa Rica	Guinea	Madagascar	Paraguay	Togo
Botswana	Cote d'Ivoire	Guinea-Bissau	Malaysia	Peru	Tunisia
Brazil	Dominican Republic	Honduras	Mali	Philippines	Turkiye
Brunei Darussalam	Ecuador	India	Mexico	Saudi Arabia	Uganda
Burkina Faso	Egypt, Arab Rep.	Indonesia	Mongolia	Senegal	Uruguay
Cameroon	El Salvador	Iran, Islamic Rep.	Morocco	Sierra Leone	Zimbabwe
Chile	Gabon	Iraq	Niger	South Africa	

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