Chapter 3

The Impact of the Rule of Law and Control of Corruption on Economic Growth: International Evidence With Panel Bias Corrected LSDV Analysis

Serhat Alpağut[1]

Abstract

This study examines the impact of corruption control and the rule of law on economic growth. Annual data for the period 1990-2023 were used in the study conducted on 134 countries. Panel data analysis was used in the study and bias-corrected LSDV analysis was used to perform econometric analysis. As a result of the study, the first finding is that increasing the control of corruption in countries positively affects economic growth. The strategies and policies implemented by countries in the fight against corruption have a positive impact on economic growth. The second finding is the relationship between rule of law and economic growth. It was observed that most of the countries have negative values in the rule of law index. This situation indicates that the countries have not made significant progress in the rule of law. As a result of the empirical analysis, the effect of this backwardness in the rule of law on economic growth was found to be negative. Developments in the rule of law are important for economic growth. For this reason, it is recommended that countries develop and implement rule of law policies.

1. INTRODUCTION

The concept of the rule of law (ROL) accepts all individuals and institutions as equal before the law. The concept of law, which expresses certain norms, makes individuals and institutions equal in a better norm. For this reason, the ROL emerges as an equalizing concept. Corruption, on the other hand, is the action that affects certain individuals or interest groups.

1 Dr. Öğr. Üyesi, Agri İbrahim Çeçen Üniversitesi, Eleşkirt MYO, Finans-Bankacılık ve Sigortacılık Bölümü, salpagut@agri.edu.tr, https://orcid.org/0000-0001-7326-4048.

https://doi.org/10.58830/ozgur.pub570.c2323

Even if a benefit is obtained that is not legally and morally acceptable, this benefit is to the advantage of a small segment of society. In this respect, corruption is an expression of inequality. Seen from this perspective, corruption and the ROL are opposites.

Countries develop many policies to fight corruption. These policies include a series of incentives for bureaucrats and legal officials not to serve special interests. The implementation of these incentives also requires a series of legal procedures (Frye, 2010: 79). As can be seen; to combat corruption, it is necessary to resort to law and legislation. In this respect, corruption and ROL are concepts that work in harmony with each other.

Many studies in literature have concluded that the ROL and the fight against corruption support economic growth (EG). North et al. (2013: 777) state that the concepts of corruption and ROL should be addressed for a better understanding of modern EG. This study also examines the role and impact of the fight against corruption on EG for 134 countries. The countries are heterogeneous in terms of their level of development or income. The list of countries is presented in Appendix 1. Bias-corrected least squares dummy variable (LSDV) analysis was preferred as the econometric method. Dummy variable models were not preferred due to the econometric problem known as Nickell bias in panel data analysis. Judson and Owen (1999: 9) state that the bias is 20 percent even when the time dimension is 30. However, the development of estimators that correct for the Nickell bias over time has increased the use of LSDV analysis in panel data analyses. It has been observed that the econometric method mentioned in the literature is not widely used. For this reason, it is believed that analyzing the issue using the panel data bias-corrected LSDV method will contribute to the literature.

The second part of the study presents theoretical information on the subject. The third part summarizes the literature. In the fourth part, the econometric method is introduced, data and hypotheses are presented, and the results of the empirical analysis are shared. The last part is the results and evaluation section.

2. THEORETICAL BACKGROUND

Long-standing studies of corruption and the economy have led researchers to focus on two effects. The first of these effects is the "sand the wheels" effect. This effect is used to express that corruption harms EG. The second is the "grease the wheels" effect. This effect expresses that corruption helps EG (Uberti, 2022: 322).

The effect of corruption on EG is a very complex issue, and this effect can occur through many different channels. Researchers have examined the relationship between corruption and EG from different perspectives. Studies have shown that corruption generally has a negative effect on EG. The first of these negative effects is the relationship between corruption and resource allocation problems. Corruption leads to an inefficient allocation of resources. Investment tends to be directed to firms or individuals with political connections in places where corruption is widespread. This situation prevents economic efficiency by reducing competition (Del Monte and Papagni, 2001: 2; Ehrlich and Lui, 1999: 272). The second is the relationship between corruption and investor confidence. Corruption undermines the confidence of domestic and foreign investors. In an environment where corruption is not controlled, investors generally increase their perception of risk and may avoid investing. This situation has a negative impact on EG (Mauro, 1995; Wei, 2000: 3). The third is the relationship between corruption and innovation and entrepreneurship. In an environment where corruption is widespread, it becomes difficult for entrepreneurs to develop new ideas and business models. Corruption negatively affects long-term EG by inhibiting creative and innovative activities. In economies with high levels of corruption, weak property rights are a major obstacle to innovation (Tomaszewski, 2018: 251). The fourth is the relationship between corruption and income inequality. Corruption increases income inequality and can lead to social unrest. Such social problems can threaten EG and negatively affect the investment climate (Sulemana and Kpienbaareh, 2018: 27; Apergis et al., 2010: 125). The fifth is the relationship between corruption and public costs. Corruption increases the cost of public services. The state needs more resources to deal with corruption, which can negatively affect EG. On the other hand, the resources needed to fight corruption may require new tax policies. In this case, the administration trying to fight corruption may shrink the economy through taxation (Aghion et al., 2016: 24). Although the relationship between corruption and EG is divided into five parts in this section, the distinction is much broader in the literature.

Research has shown that reducing corruption is a factor that promotes EG. Strengthening the fight against corruption is crucial for more sustainable EG. However, there are some studies that claim that corruption can have a positive impact on EG. These studies generally emphasize that corruption is a factor that promotes EG under certain conditions. The first of these views is that bureaucratic obstacles can be overcome through corruption. Developing countries may have complex and poorly functioning bureaucratic systems. Corruption can be seen as a tool to overcome these bureaucratic

barriers. Especially in places where the ease of doing business is low, paying bribes can speed up transactions and allow resources to be used more quickly in the process (Leff, 1964: 9; Huntington, 1968). The second view is that corruption can foster innovation. Some studies suggest that corruption can lead firms to develop more creative and innovative strategies. It is argued that in environments where low taxes and regulatory burdens are combined with corruption, firms can gain competitive advantage and thus grow (Paul, 2010). At the same time, combating corruption increases trust in the economy. This increase in trust leads to the development of trade (Anokhin and Schulze, 2009: 465). Ensuring the liberalization of trade and reducing barriers to trade are expected to increase economic growth (Ertürkmen and Çelik; 2023: 1917). The third view is that corruption can attract investment. In cases where there are inadequate legal systems and poorly functioning state mechanisms, some investors may see corruption as a risk management tool. In this context, a certain level of bribery may develop in countries where corruption exists, and with it a habit of speeding up transactions. In particular, if the cost of bribery is lower than the bureaucratic transaction costs of the investment, corruption may be attractive for investment entry (Gossel, 2018: 648).

The concept of the ROL is still unclear (Haggard and Tiede, 2011: 674). However, if we are to make a general definition, the concept of the ROL indicates that the laws in a country are applied equally to all individuals and that judicial bodies make independent decisions. In countries where the ROL prevails, the fundamental rights and freedoms of individuals and institutions are protected by law. Acemoğlu et al. (2001), one of the seminal studies, finds that there is a strong positive relationship between the ROL and EG. As the ROL increases the institutional quality of countries, it is expected to accelerate investment processes. For foreign investors in particular, the ROL increases investor confidence in countries. At the same time, increased investor confidence leads to the development of foreign trade. Because foreign trade transactions depend on a series of procedural transactions based on law. The situation where the rules exist and are applied according to a certain standard is an indispensable environment of trust for foreign trade (Boettke and Subrick, 2003: 111).

Although the ROL may seem like an abstract concept, it is an important element that shapes the behavior and morality of individuals and institutions. The ROL, which means that everyone is equal before the law and the judiciary is independent, is an important concept. In countries where the ROL is high, the perception of trust is high (Zywicki, 2003: 26). It is also known that corruption increases in countries where the perception of trust

is low. This situation shows that there may be a relationship between the concepts of corruption and the ROL. In addition, the enforcement of legal rights and the effective implementation of international agreements are not very possible in an environment where corruption is high. Since corruption is a punishable crime in high ROL economies, corruption sanctions also have a deterrent effect. For this reason, the concepts of corruption and the ROL are closely related. Cooter (1996: 203) points out that corruption can increase in countries where the ROL is weak.

3. LITERATURE

The literature on corruption has used different variables. Some studies have used the Corruption Perceptions Index. Many studies using this index have found a negative relationship between corruption perception and EG. Spyromitros and Panagiotidis (2022) and Malanski and Póvoa (2021) have obtained results that differ from the literature, finding a positive relationship between the corruption perception index and EG. Some studies have used the corruption control variable. Theoretically, a positive relationship between corruption control and EG is expected. Nguyen and Bui (2022) found a negative relationship and obtained results different from the literature. Gründler and Potrafke (2019: 10) express this problem in literature. It is stated that some studies use the corruption perception variable, and some use the corruption control variable, which limits the formation of a single and complete structure. In the relationship between ROL and EG, some studies have found a positive relationship, and some studies have found a negative relationship.

David et al. (2024) investigated the links between oil rent, corruption, and economic growth (EG) in Nigeria. Their findings indicated that corruption not only has a positive impact on EG but that oil rent also contributes positively to it. Fengju and Wubishet (2024) analyzed the influence of institutional quality and financial development on EG in West African nations, utilizing corruption and legal aspects as measures of institutional quality. The study concluded that both corruption and law had a beneficial effect on EG.

Bayraktar et al. (2023) explored the correlation between institutional quality indicators and EG across 35 emerging and middle-income countries. They discovered that both corruption control and rule of law (ROL) had a positive effect on EG, while an interaction term with financial development indicators revealed a negative impact on EG. Hamdi and Hakimi (2023) analyzed data from 109 countries, finding that corruption negatively impacted EG, with the exception of countries in Africa.

Dokas et al. (2023) conducted an analysis involving 109 countries, focusing on the connections among corruption, innovation, and EG, using the corruption perception index. The study identified a negative relationship between corruption perception and EG. Simo-Kengne et al. (2023) studied the effects of corruption and ROL on EG in BRICS nations and determined that enhanced corruption control increased EG, whereas ROL had a detrimental impact on EG.

Mohd-Rashid et al. (2023) examined corruption in relation to ROL across 41 countries and found that an increase in ROL led to a decrease in corruption. Mohammed et al. (2022) investigated the effects of corruption and organized crime on EG in West African nations, identifying that rising organized crime alongside increasing corruption perception adversely affected EG. Amoh et al. (2022) assessed the interaction between corruption, an independent judiciary, and EG in developing countries. They found that corruption typically hinders EG, and notably, the strengthening of an independent judiciary negatively influenced EG.

Chapsa and Katrakilidis (2022) evaluated the dynamics between corruption, governance quality, and EG in 15 European countries, incorporating corruption perception and justice perception indices. Their study revealed that heightened corruption perception negatively impacted EG, while an increase in ROL positively influenced it. Nguyen and Bui (2022) explored 16 developing Asian countries, concluding that escalating corruption control negatively affects EG, although public spending can mitigate this effect.

Spyromitros and Panagiotidis (2022) researched 83 countries using corruption perception and control metrics, finding a negative correlation between corruption and EG. Interestingly, they noted that increased corruption perception in Latin American countries was associated with boosted EG—contrasting with the general negative correlation established in other research. Malanski and Póvoa (2021) investigated the impact of corruption on EG in Latin America and Asia, discovering that higher corruption perception correlated negatively with EG, while ROL had a positive relationship.

Trabelsi and Trabelsi (2021) analyzed the connection between corruption and EG in 88 countries from data spanning 1984-2011, utilizing a positively valued corruption index. They identified a complex asymmetric relationship, showing that corruption initially harms EG, eventually leading to a positive influence beyond a certain threshold. Ibrahim (2020) explored the relationships among corruption, public spending, and EG in 20 developing

nations, concluding that corruption negatively impacts EG and public debt via elevated public expenditures.

Mauro et al. (2018) researched the roles of institutions and ROL on EG in 23 OECD countries, concluding that ROL detrimentally affects EG and that decentralized public spending has a similar negative effect. Thach et al. (2017) studied 19 Asian countries, showing that corruption positively affects EG to a certain extent before having a negative impact thereafter. Yalçınkaya and Yazgan (2016) examined how institutional quality indicators relate to EG in developed nations and found a negative correlation between ROL and EG. Omoteso and Ishola Mobolaji (2014) focused on SAA countries and discovered with their study that corruption control had a positive effect on EG whereas ROL had a negative impact.

De la Croix and Delavallade (2011) conducted a dynamic panel data analysis on 62 countries, concluding that ROL has a negative effect on EG and increases in ROL lead to improvements in corruption control. Gani (2011) investigated governance and institutional quality indicators' relationships with EG across 84 low and middle-income developing countries, identifying a significant negative effect of corruption and ROL on EG. Yapraklı (2008) examined 36 upper-middle-income countries and found that ROL diminishes EG in those nations.

4. FINDINGS

4.1. Econometric Method

Panel data models are created by combining cross-sectional and time series of units. The advantage of panel data analysis over cross-sectional and time series analysis is that a group of countries can be analyzed instead of a single country.

$$Y_{it} = \alpha_{it} + X_{1,it} + X_{2,it} + u_{it} \quad , \; i:1....N \quad , t:1.....T \tag{1}$$

Equation (1) shows the structure of a panel data analysis. Y, dependent variable; X, independent variable; i, units; t, time parameter; u, error term. In equation (1), all parameters have i and t symbols in their subscripts. This indicates that all parameters include unit and time effects. However, not all models include both unit and time effects. Some models include only unit effects, some models include time effects, and some models include both effects.

$$Y_{it} = \beta_0 + \overline{\beta}_{1,it} X_{1,it} + \zeta_i + u_{it} \tag{2}$$

Equation (2) represents the fixed effects model with both unit and time effects under the assumption that the slope parameter is homogeneous. β_0 is the constant parameter. The constant parameter varies according to the unit and time information. β_1 is the slope parameter. The slope parameter does not change (Tatoğlu, 2020: 80).

In the LSDV method, unit effects are accepted as dummy variables. If there are fixed parameters in the model, N number of dummy variables are used, if there are no fixed parameters, N-1 number of dummy variables are used.

$$S = \sum_{i=1}^{N} u_i' u_i = \sum_{i=1}^{N} (Y_i - e\mu_i - X_i\beta)' (Y_i - e\mu_i - X_i\beta \qquad (3)$$

The Pooled Least Squares estimators of the prediction coefficients are obtained by minimizing the equation given in equation (3).

$$\hat{\mu}_i = \overline{Y}_i - \beta' \overline{X}_i \quad , \quad \overline{Y}_i = \frac{1}{T}\sum_{t=1}^{T} Y_{it} \quad , \quad \overline{X}_i = \frac{1}{T}\sum_{t=1}^{T} X_{it} \qquad (4)$$

If the derivative of "S" with respect to "u" given in equation (3) is taken and set to zero, equation (4) is obtained. $\overline{Y}_i$ and $\overline{X}_i$ are the mean values of the dependent and independent variables with respect to time.

$$\hat{\beta}_{LSDV} = \left[\sum_{i=1}^{N}\sum_{t=1}^{T} \left(X_{it} - \overline{X}_i\right)' \left(X_{it} - \overline{X}_i\right) \right]^{-1} \left[\sum_{i=1}^{N}\sum_{t=1}^{T} \left(X_{it} - \overline{X}_i\right)' \left(Y_{it} - Y_i\right) \right] \qquad (5)$$

i) Equality (4) is substituted into equation (3). ii) The derivative of "S" with respect to "β" is taken. iii) When the biases from the mean are used, equation (5) is obtained. Equality (5) is the LSDV estimator (Tatoğlu, 2020: 82).

There are two options for fixed effects analysis: least squares with dummy variables (LSDV) or within-group estimation (WE). "Nickell's Bias occurs in the WE and LSDV models. Nickell's Bias is particularly evident when N (number of units) is small, and T (number of times) is large. Under these conditions, the relationship between the lagged dependent variable and the fixed effects leads to a bias in the estimated parameters. It also causes the parameters extracted in the estimation of dynamic panel data models with small N to be inconsistent. This situation reduces the reliability of

the analyses carried out (Nickell, 1981: 1418). The autoregressive panel data model can be estimated using the least squares method with dummy variables, correcting for the Nickell bias that occurs due to the use of dummy variables when N is large, and T is small.

In practice, the first step estimates the fixed parameterless autoregressive model using LSDV. In the second stage, the parameters are corrected. Kiviet (1999), Bun and Kiviet (2003), Bruno (2005) can be used for the correction. In the second step, the variance-covariance matrix is used to calculate the standard errors in the model with the corrected parameters.

4.2. Data

The panel was constructed with annual data from 1990 to 2023 for 134 countries (see Appendix 1 for the list of countries) for which reliable data could be accessed. Although the data source contained data for 217 countries, 83 countries did not have data at a level that could be analyzed. So, the analysis was conducted with 134 countries. In addition, the fact that the study started in 1990 is also due to the lack of data. These two elements were presented as limitations of the study.

$$gdp_{i,t} = gdp_{i,t-1} + inv_{i,t} + emp_{i,t} + trd_{i,t} + inf_{i,t} + pop_{i,t} + law_{i,t} + cor_{i,t} + u_{i,t} \qquad (6)$$

In the research, the model was constructed using the Cobb-Douglas production function. Accordingly, the dependent variable is EG, the independent variables are capital and labor. Other variables were included as control variables. The functional form of the model is shown in equation (6).

Table 1: Variables, their descriptions and sources

Variables	Explanations	Sources	Expected effect
Economic Growth	GDP growth (annual %)	World Development Indicators	
Investment	Gross capital formation (% of GDP)		+
Employment	Employment to population ratio, 15+, total (%) (national estimate)		+
Trade	Trade is the sum of exports and imports of goods and services (% of GDP)		+/-
Inflation	Inflation, GDP deflator: linked series (annual %)		+/-
Population	Population, total		+/-
Rule of Law	Rule of Law: Estimate (index) The index measures perceptions of the degree of trust and adherence of individuals and institutions to community rules, enforcement of contracts, enforcement of property rights, quality of police and courts, and likelihood of crime and violence. The index ranges from approximately -2.5 to 2.5.	Worldwide Governance Indicators	+/-
Control of Corruption	Control of Corruption: Estimate (index), The index measures perceptions of the extent to which public power is used for private gain across all forms of corruption. The index ranges from approximately -2.5 to 2.5.		+

All data were obtained from the World Bank database. Table 1 shows the variables and their explanations. *Economic growth*, *Employment*, and *İnflation* variables represent percentage changes in the data. *Investment* and *Trade* are ratio variables. *Rule of Law* and *Corruption* are index variables. No adjustment was made for these variables prior to analysis. Since the *Population* variable is a level value, its logarithm was taken.

Table 2: Descriptive statistics of variables

Variables	Obs.	Median	Mean	Std. Dev.	Min.	Max.
Economic Growth	4513	3.666	3.391	6.679	-64.04	153.4
Investment	4287	22.72	23.62	8.287	-12.88	76.78
Employment	2690	56.88	56.19	10.03	7.350	98.38
Trade	4371	74.09	86.41	55.40	0.020	442.6
Inflation	4512	4.430	35.95	516.6	-30.19	2676
Population	4556	15.94	15.83	1.836	11.09	21.07
Rule of Law	3211	-0.158	0.005	0.981	-2.333	2.124
Control of Corruption	3211	-0.195	0.035	0.992	-1.712	2.459

Table 2 presents descriptive statistics for the variables. Since there are missing data for some years for variables belonging to countries, the number of observations differs from each other. This situation indicates that the panel is unbalanced. The *Inflation* variable is the variable with the highest standard deviation. Inflation, which expresses the percentage change in inflation, has quite small changes in some countries, while it has quite large changes in some countries. The variables with the lowest standard deviation are *Rule of Law* and *Corruption*, which are index variables. Volatility is lower for these variables compared to other variables. This is because they are index variables, and the data range is between -2.5 and 2.5.

An important point is that for the *Rule of Law* variable, 64 out of 134 countries have positive values in this index, while 70 countries have negative values. Among the countries with positive scores are developed countries. The fact that 64 countries have negative values for the *Rule of Law* is a sign of regression rather than development in this regard. On the *Corruption* variable, 62 out of 134 countries have positive values and 72 countries have negative values. This means that while 62 countries have made significant progress in the fight against corruption, 72 countries are lagging in the fight against corruption.

4.3. Empirical Results

This section begins with the stationarity test of the variables. Stationarity, which refers to the return of a series to its own means, is very important in econometric analysis. The fact that a series does not return to its own meaning indicates that the change in the independent variable has a permanent effect on the dependent variable.

Table 3: Cross-Section Dependency Test Results

	Economic Growth	*Investment*	*Employment*	*Trade*	*Inflation*	*Population*	*Rule of Law*	*Control of Corruption*
CD stat.	28.38	80.20	117.03	131.50	62.54	139.47	135.05	135.22
Prob.	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

In panel data analysis, the choice of the stationarity test to be applied to variables depends on whether the variables exhibit cross-section dependence. If a variable is found to be independent across sections, the first-generation unit root test is utilized. Conversely, if cross-section dependence is present, the second-generation unit root test is employed. This distinction arises because first-generation unit root tests are based on the assumption of independent cross-sections. Therefore, the Cross-Section Dependency (CD) test proposed by Pesaran (2004) was initially applied to determine the cross-sectional dependencies of each variable. The results are shown in Table 3. According to Table 3, all variables exhibit cross-section dependence. As a result, the second-generation unit root test is applied.

Table 4: Fisher-type-demean unit root analysis test results

	Inverse chi-squared	Inverse normal	Inverse logit t	Modified inv. chi-squared	Decision
	P stat. (Prob.)	Z stat. (Prob.)	L stat. (Prob.)	Pm stat. (Prob.)	
Economic Growth	906.13 (0.000)	-26.66 (0.000)	-51.16 (0.000)	87.58 (0.000)	I(0)
Investment	973.50 (0.000)	-27.70 (0.000)	-54.99 (0.000)	94.45 (0.000)	I(0)
Employment	1023.11 (0.000)	-29.16 (0.000)	-57.80 (0.000)	-99.52 (0.000)	I(0)
Trade	1252.94 (0.000)	-33.01 (0.000)	-70.79 (0.000)	122.97 (0.000)	I(0)
Inflation	919.01 (0.764)	-26.16 (0.828)	-51.87 (0.805)	88.89 (0.773)	I(0)
Population	838.13 (0.000)	-26.04 (0.000)	-47.35 (0.000)	80.64 (0.000)	I(0)
Rule of Law	1039.71 (0.000)	-29.30 (0.000)	-58.74 (0.000)	101.21 (0.000)	I(0)
Control of Corruption	1133.46 (0.000)	-31.02 (0.000)	-64.04 (0.000)	110.78 (0.000)	I(0)

Table 4 presents the results of the second generation of the Fisher type unit root test. The reason for choosing this test is that it can produce results in unbalanced panels. The H_0 hypothesis of the test is "all panels contain unit roots". The H_1 hypothesis is that at least one panel is stationary. Checking the probability values of the variables in Table 4, we see that all variables are I(0) and stationary at the level. These results indicate that no stationarity process is applied to the variables in the empirical analysis.

Table 6: Hausman Test Results

	Fe	Re	Difference	Hausman
Investment	0.2175	0.1959	0.0215	
Employment	0.0396	0.0225	0.0170	Stat. : 62.25
Trade	0.0363	0.0314	0.0048	Prob :
Inflation	-0.0008	0.0010	0.0018	(0.000)
Population	-6.0506	-0.5545	-5.5050	
Rule of Law	-2.1231	-2.3509	0.2277	
Control of Corruption	1.1286	1.0132	0.1153	

Table 6 presents the findings of the Hausman test. Hausman (1978) test is conducted to assess the correlation of these effects with the independent variables. If there is no correlation between the unit effect and the independent variables, the random effects model is deemed appropriate. This is based on the fact that the fixed effects estimator excludes unit effects from the model. Conversely, if a correlation exists, the random effects estimator may introduce an endogeneity issue, as the unit effect is incorporated into the error terms of the model. This correlation between the independent variables and the unit effect contradicts the assumption of exogeneity. Thus, if a correlation is found, the fixed effects estimator is considered consistent (Tatoğlu, 2020: 199-200). The results in Table 6 indicate that the fixed effects are consistent according to the Hausman test's outcome.

Assuming fixed effects, both the within-group estimator and the first-difference method can be employed. Under the fixed effects model, the within-group estimator and the shadow variable estimator yield identical results (Tatoğlu, 2020: 121). The autoregressive panel data model is estimated using the LSDV method, which corrects for Nickell bias that may arise when N is large, and T is small. This method estimates the model in two stages: the first stage estimates the fixed parameter-free autoregressive model using the dummy variable least squares (within-group) estimation method. In the second stage, the parameters are adjusted. The correction methods

proposed in the works of Kiviet (1999), Bun and Kiviet (2003), and Bruno (2005) are applied. In this second stage, the variance-covariance matrix is utilized to compute the standard errors for the model with the revised parameters. Initial values can be sourced from the estimators developed by Anderson and Hsiao (1982), Arellano and Bond (1991), and Blundell and Bond (1998) (Tatoğlu, 2020: 122).

Table 7: Results of the Anderson and Hsiao Estimator

	Kiviet (1999)		Bun and Kiviet (2003)		Bruno (2005)	
	Coeff.	z stat. (prob)	Coeff.	z stat. (prob)	Coeff.	z stat. (prob)
Economic Growth$_{-1}$	0.09	2.86 (0.004)	0.09	2.92 (0.004)	0.10	2.92 (0.003)
Investment	0.21	7.93 (0.000)	0.21	7.92 (0.000)	0.21	7.92 (0.000)
Employment	0.04	0.65 (0.513)	0.04	0.65 (0.514)	0.04	0.65 (0.514)
Trade	0.04	3.69 (0.000)	0.04	3.67 (0.000)	0.04	3.67 (0.000)
Inflation	0.02	0.79 (0.428)	0.02	0.79 (0.428)	0.02	0.79 (0.428)
Population	-8.69	-6.14 (0.000)	-8.66	-6.14 (0.000)	-8.66	-6.14 (0.000)
Rule of Law	-2.13	-3.12 (0.005)	-2.13	-3.15 (0.002)	-2.13	-3.15 (0.002)
Control of Corruption	0.45	2.16 (0.031)	0.45	2.15 (0.031)	0.45	2.15 (0.031)

Note: The variance-covariance matrix is computed with a bootstrap 50.

In Table 7, the Anderson and Hsiao estimator is used and the correction methods suggested by the studies of Kiviet (1999), Bun and Kiviet (2003), Bruno (2005) are applied.

Table 8: Results of the Arellano and Bond Estimator

	Kiviet (1999)		Bun and Kiviet (2003)		Bruno (2005)	
	Coeff.	z stat. (prob)	Coeff.	z stat. (prob)	Coeff.	z stat. (prob)
Economic Growth$_{-1}$	0.09	2.73 (0.006)	0.09	2.77 (0.006)	0.09	2.78 (0.005)
Investment	0.21	8.00 (0.000)	0.21	7.98 (0.000)	0.21	7.98 (0.000)
Employment	0.04	0.67 (0.505)	0.04	0.66 (0.506)	0.04	0.66 (0.506)
Trade	0.04	3.92 (0.000)	0.04	3.91 (0.000)	0.04	3.91 (0.000)
Inflation	0.02	0.79 (0.428)	0.02	0.79 (0.429)	0.02	0.79 (0.429)
Population	-8.62	-5.77 (0.000)	-8.59	-5.75 (0.000)	-8.58	-5.75 (0.000)
Rule of Law	-2.11	-2.86 (0.004)	-2.11	-2.87 (0.004)	-2.11	-2.87 (0.004)
Control of Corruption	0.50	2.31 (0.021)	0.50	2.31 (0.021)	0.50	2.31 (0.021)

Note: The variance-covariance matrix is computed with a bootstrap 50.

In Table 8, the Arellano and Bond estimator is used and the correction methods suggested by the studies of Kiviet (1999), Bun and Kiviet (2003), Bruno (2005) are applied.

Table 9: Results of the Blundell and Bond Estimator

	Kiviet (1999)		Bun and Kiviet (2003)		Bruno (2005)	
	Coeff.	z stat. (prob)	Coeff.	z stat. (prob)	Coeff.	z stat. (prob)
Economic Growth$_{-1}$	0.10	3.33 (0.001)	0.11	3.40 (0.001)	0.11	3.41 (0.001)
Investment	0.21	8.52 (0.000)	0.21	8.51 (0.000)	0.21	8.51 (0.000)
Employment	0.04	0.72 (0.470)	0.04	0.72 (0.471)	0.04	0.72 (0.471)
Trade	0.05	4.22 (0.000)	0.05	4.22 (0.000)	0.05	4.22 (0.000)
Inflation	0.02	0.83 (0.404)	0.02	0.83 (0.404)	0.02	0.83 (0.405)
Population	-9.38	-6.36 (0.000)	-9.38	-6.35 (0.000)	-9.38	-6.35 (0.000)
Rule of Law	-2.07	-2.78 (0.005)	-2.06	-2.78 (0.005)	-2.06	-2.78 (0.005)
Control of Corruption	0.48	2.51 (0.012)	0.48	2.52 (0.012)	0.48	2.52 (0.012)

Note: The variance-covariance matrix is computed with a bootstrap 50.

In Table 9, the Blundell and Bond estimator was employed, along with the correction methods proposed by Kiviet (1999), Bun and Kiviet (2003), and Bruno (2005). It is evident that the outcomes from the three estimators are closely aligned. The first lagged value of the dependent variable, *Economic Growth*, positively influences the current value of EG, suggesting that EG is affected by its own previous values. Consistent with economic theory, the

capital and employment variables, fundamental components of the growth model, also exert a positive influence on EG. However, the results from all three estimators indicate that the impact of *Employment* on EG is not statistically significant. The effect of *Trade* on EG can vary between positive and negative according to economic literature, as trade openness reflects the overall volume of trade. This variable, representing the ratio of imports and exports to national income, may negatively affect EG if imports exceed exports. Conversely, if exports are greater, trade is expected to positively influence EG. The estimation results reveal that *Trade* contributes positively to EG across countries. Although Inflation has a positive effect on EG, the results across all three estimators are not statistically significant.

A notable finding of the study is the formidable negative influence of the *Population* variable on EG, suggesting that an increasing population diminishes EG in countries.

Additionally, the index used to measure the *Rule of Law* also negatively affects the EG of nations. The *Rule of Law* variable is an indexed measure ranging from -2.5 to +2.5. In many countries within the study group, the *Rule of Law* variable reflects a negative index value, indicating a lack of success in enforcing the *Rule of Law*. Consequently, the insufficient achievement in the *Rule of Law* correlates negatively with EG. These results align with the research conducted by Simo-Kengne et al. (2023); Amoh et al. (2022); Mauro et al. (2018); Yalçınkaya and Yazgan (2016); Omoteso and Ishola Mobolaji (2014); De la Croix and Delavallade (2011); Gani (2011); and Yapraklı (2008).

Furthermore, the study highlights the impact of *Control of Corruption* on EG. Statistically significant findings demonstrate that enhanced measures to combat corruption positively affect EG. These results are consistent with the studies of David et al. (2024); Fengju and Wubishet (2024); Bayraktar et al. (2023); Simo-Kengne et al. (2023); Spyromitros and Panagiotidis (2022); and Omoteso and Ishola Mobolaji (2014).

5. CONCLUSION

This study examines the impact of control of corruption and ROL on EG. The study used annual data for the period 1990-2023. The study used panel data, bias-corrected LSDV analysis for econometric analysis. The study included 134 developed, developing, underdeveloped or low-income and high-income countries. The countries have a heterogeneous structure in terms of development or income. They were taken from the data source without selection.

The first result of the empirical analysis is that the increase in the control of corruption in countries has a positive effect on EG. The international results obtained show that the policies or measures adopted by countries in relation to corruption are appropriate. It shows that the strategies implemented in the fight against corruption have positive effects on factors such as the development of the investment environment of the countries, the increase in foreign trade, the increase in the confidence of foreign investors and the transparency and accountability of public institutions. Most studies in the literature also conclude that the control of corruption increases EG. The findings are similar to David et al. (2024); Fengju and Wubishet (2024); Bayraktar et al. (2023); Simo-Kengne et al. (2023); Spyromitros and Panagiotidis (2022); Omoteso and Ishola Mobolaji (2014).

Another finding is that there is a negative relationship between the ROL and EG. Although at first glance it may seem an unexpected result that an increase in the ROL is detrimental to EG, the situation is different. The ROL index used in the study consists of negative and positive values. The index takes a negative value when countries fail to make progress in the ROL. A significant number of countries in the study received a negative score on the ROL index. Thus, in the empirical analysis, the effect on EG was negative. It would be more useful to interpret this situation as meaning that the backwardness of countries in the ROL is detrimental to EG. Indeed, many studies in literature have found negative relationships found in this study. The findings are similar to Simo-Kengne et al. (2023); Amoh et al. (2022); Mauro et al. (2018); Yalçınkaya and Yazgan (2016); Omoteso and Ishola Mobolaji (2014); De la Croix and Delavallade (2011); Gani (2011); Yapraklı (2008).

These results show that taking decisive steps to fight corruption is crucial for EG. In this context, it is recommended that anti-corruption laws are strictly implemented, and that transparency and accountability mechanisms are strengthened. With regard to the ROL, it is clear that the focus should be on legal reforms and strengthening practices. Increasing the independence

of the courts and speeding up judicial processes will help restore investor confidence. In addition, it is recommended as a policy suggestion that ROL efforts be aligned with international standards.

As a result, developments in the fight against corruption and the ROL play a crucial role in achieving EG objectives. It is recommended that future studies focus on a more in-depth examination of the interaction between these two concepts, cross-country comparisons and the evaluation of the effectiveness of policies in this regard.

References

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review*, *91*(5), 1369-1401. https://doi.org/10.1257/aer.91.5.1369

Aghion, P., Akcigit, U., Cagé, J., & Kerr, W. R. (2016). Taxation, corruption, and growth. *European Economic Review*, *86*, 24-51. https://doi.org/10.1016/j.euroecorev.2016.01.012

Amoh, J. K., Awuah-Werekoh, K., & Ofori-Boateng, K. (2022). Do corrupting activities hamper economic growth? Fresh empirical evidence from an emerging economy. *Journal of Financial Crime*, *29*(3), 1114-1130. https://doi.org/10.1108/jfc-11-2019-0150

Anderson, T. W., & Hsiao, C. (1982). Formulation and estimation of dynamic models using panel data. *Journal of Econometrics*, *18*(1), 47-82. https://doi.org/10.1016/0304-4076(82)90095-1

Anokhin, S., & Schulze, W. S. (2009). Entrepreneurship, innovation, and corruption. *Journal of Business Venturing*, *24*(5), 465-476. https://doi.org/10.1016/j.jbusvent.2008.06.001

Apergis, N., Dincer, O. C., & Payne, J. E. (2010). The relationship between corruption and income inequality in US states: Evidence from a panel cointegration and error correction model. *Public Choice*, *145*, 125-135. https://doi.org/10.1007/s11127-009-9557-1

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277-297. https://doi.org/10.2307/2297968

Bayraktar, Y., Ozyilmaz, A., Toprak, M., Olgun, M. F., & Isik, E. (2023). The role of institutional quality in the relationship between financial development and economic growth: Emerging markets and middle-income economies. *Borsa Istanbul Review*, *23*(6), 1303-1321. https://doi.org/10.1016/j.bir.2023.10.002

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115-143. https://doi.org/10.1016/s0304-4076(98)00009-8

Boettke, P., & Subrick, J. R. (2003). Rule of law, development, and human capabilities. *Supreme Court Economic Review*, *10*, 109-126. https://doi.org/10.1086/scer.10.1147140

Bruno, G. S. (2005). Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models. *Economics Letters*, *87*(3), 361-366. https://doi.org/10.1016/j.econlet.2005.01.005

Bun, M. J., & Kiviet, J. F. (2003). On the diminishing returns of higher-order terms in asymptotic expansions of bias. *Economics Letters*, *79*(2), 145-152. https://doi.org/10.1016/s0165-1765(02)00299-9

Chapsa, X., & Katrakilidis, C. (2022). Investigating the Corruption-Growth Nexus for the EU-15: Does the Quality of Governance Matter? *Journal of Economic Issues*, *56*(3), 838-868. https://doi.org/10.1080/00213624.2022.2093579

Cooter, R. D. (1996). The rule of state law and the rule-of-law state: economic analysis of the legal foundations of development. In *Annual World Bank Conference on Development Economics* (Vol. 1997).

David, J., Gamal, A. A. M., Mohd Noor, M. A., & Zakariya, Z. (2024). Oil rent, corruption and economic growth relationship in Nigeria: evidence from various estimation techniques. *Journal of Money Laundering Control*. *27*(5), 962-979. https://doi.org/10.1108/jmlc-10-2023-0160

De la Croix, D., & Delavallade, C. (2011). Democracy, rule of law, corruption incentives, and growth. *Journal of Public Economic Theory*, *13*(2), 155-187. https://doi.org/10.1111/j.1467-9779.2011.01497.x

Del Monte, A., & Papagni, E. (2001). Public expenditure, corruption, and economic growth: the case of Italy. *European Journal of Political Economy*, *17*(1), 1-16. https://doi.org/10.1016/s0176-2680(00)00025-2

Dokas, I., Panagiotidis, M., Papadamou, S., & Spyromitros, E. (2023). Does innovation affect the impact of corruption on economic growth? International evidence. *Economic Analysis and Policy*, *77*, 1030-1054. https://doi.org/10.1016/j.eap.2022.12.032

Ehrlich, I., & Lui, F. T. (1999). Bureaucratic corruption and endogenous economic growth. *Journal of Political Economy*, *107*(S6), 270-293. https://doi.org/10.1086/250111

Ertürkmen, G., & Çelik, H. (2023). Ekonomik büyüme, ticari dışa açıklık ve gıda güvenliği ilişkisi: Akdeniz havzası ülkeleri için ampirik bir analiz. *Third Sector Social Economic Review*, *58*(3), 1917-1929. https://doi.org/10.15659/3.sektor-sosyal-ekonomi.23.08.2194

Fengju, X., & Wubishet, A. (2024). Analysis of the impacts of financial development on economic growth in East Africa: How do the institutional qualities matter? *Economic Analysis and Policy*, *82*, 1177-1189. https://doi.org/10.1016/j.eap.2024.04.002

Frye, T. (2010). *Corruption and the Rule of Law in Russia*. In Russia after the Global Economic Crisis, eds. Anders Aslund, Sergei Guriev, and Andrew Kuchins. Washington, DC: Peterson Institute for International Economics, 79-94.

Gani, A. (2011). Governance and growth in developing countries. *Journal of Economic Issues*, *45*(1), 19-40. https://doi.org/10.2753/jei0021-3624450102

Gossel, S. J. (2018). FDI, democracy and corruption in Sub-Saharan Africa. *Journal of Policy Modeling*, *40*(4), 647-662. https://doi.org/10.1016/j.jpolmod.2018.04.001

Gründler, K., & Potrafke, N. (2019). Corruption and economic growth: New empirical evidence. *European Journal of Political Economy*, *60*, 1-14. https://doi.org/10.1016/j.ejpoleco.2019.08.001

Haggard, S., & Tiede, L. (2011). The rule of law and economic growth: where are we?. *World Development*, *39*(5), 673-685. https://doi.org/10.1016/j.worlddev.2010.10.007

Hamdi, H., & Hakimi, A. (2023). Corruption, imported innovation, and growth: Evidence using the panel smooth transition regression approach for developing countries. *Regional Science Policy & Practice*, *15*(5), 956-973. https://doi.org/10.1111/rsp3.12611

Huntington, S., (1968). *Political Order in Changing Societies*. Yale University Press, New Haven, CT. https://doi.org/10.1017/s000305540025870x

Ibrahim, C. (2020). Corruption, public debt and economic growth–evidence from developing countries. *International Journal of Development Issues*, *20*(1), 24-37. https://doi.org/10.1108/ijdi-12-2019-0208

Judson, R. A., & Owen, A. L. (1999). Estimating dynamic panel data models: A guide for macroeconomists. *Economics Letters*, *65*(1), 9-15. https://doi.org/10.1016/s0165-1765(99)00130-5

Kiviet, J. F. (1999). Expectations of expansions for estimators in a dynamic panel data model; some results for weakly-exogeneous regressors. *Discussion paper-Tinbergen Institute*. https://doi.org/10.1017/cbo9780511493140.010

Leff, N. H. (1964). Economic development through bureaucratic corruption. *American Behavioral Scientist*, *8*(3), 8-14. https://doi.org/10.1177/000276426400800303

Malanski, L. K., & Póvoa, A. C. S. (2021). Economic growth and corruption in emerging markets: does economic freedom matter?. *International Economics*, *166*, 58-70. https://doi.org/10.1016/j.inteco.2021.02.001

Mauro, L., Pigliaru, F., & Carmeci, G. (2018). Decentralization and growth: Do informal institutions and rule of law matter?. *Journal of Policy Modeling*, *40*(5), 873-902. https://doi.org/10.1016/j.jpolmod.2018.05.003

Mohammed, M. I., Hossein, A., & Nwokolo, C. C. (2022). Organized crime, corruption and the challenges of economic growth in the economic community of West African states. *Journal of Financial Crime*, *29*(3), 1091-1101. https://doi.org/10.1108/jfc-05-2021-0115

Mohd-Rashid, R., Mehmood, W., Ooi, C. A., Che Man, S. Z., & Ong, C. Z. (2023). Strengthened rule of law to reduce corruption: evidence from Asia-Pacific countries. *Journal of Money Laundering Control*, *26*(5), 989-1006. https://doi.org/10.1108/jmlc-06-2022-0076

Nguyen, M. L. T., & Bui, N. T. (2022). Government expenditure and economic growth: does the role of corruption control matter?. *Heliyon*, *8*(10), 1-8. https://doi.org/10.1016/j.heliyon.2022.e10822

Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica: Journal of the Econometric Society*, 1417-1426. https://doi.org/10.2307/1911408

North, C. M., Orman, W. H., & Gwin, C. R. (2013). Religion, corruption, and the rule of law. *Journal of Money, Credit and Banking*, *45*(5), 757-779. https://doi.org/10.1111/jmcb.12024

Omoteso, K., & Ishola Mobolaji, H. (2014). Corruption, governance and economic growth in Sub-Saharan Africa: A need for the prioritisation of reform policies. *Social Responsibility Journal*, *10*(2), 316-330. https://doi.org/10.1108/srj-06-2012-0067

Paul, B. (2010). Does corruption foster growth in Bangladesh?. *International Journal of Development Issues*, *9*(3), 246-262. https://doi.org/10.1108/14468951011073325

Simo-Kengne, B. D., & Bitterhout, S. (2023). Corruption's effect on BRICS countries' economic growth: A panel data analysis. *Journal of Economics, Finance and Administrative Science*, *28*(56), 257-272. https://doi.org/10.1108/jefas-04-2021-0041

Spyromitros, E., & Panagiotidis, M. (2022). The impact of corruption on economic growth in developing countries and a comparative analysis of corruption measurement indicators. *Cogent Economics & Finance*, *10*(1), 2129368. https://doi.org/10.1080/23322039.2022.2129368

Sulemana, I., & Kpienbaareh, D. (2018). An empirical examination of the relationship between income inequality and corruption in Africa. *Economic Analysis and Policy*, *60*, 27-42. https://doi.org/10.1016/j.eap.2018.09.003

Tatoğlu, F. (2020). *İleri panel zaman serileri analizi Stata uygulamalı*. Ekin Yayınevi, Bursa

Thach, N. N., Duong, M. B., & Oanh, T. T. K. (2017). Effects of corruption on economic growth-empirical study of Asia countries. *Imperial Journal of Interdisciplinary Research*, *7*(3), 791-804.

Tomaszewski, M. (2018). Corruption - a dark side of entrepreneurship. Corruption and innovations. *Prague Economic Papers*, *27*(3), 251-269. https://doi.org/10.18267/j.pep.647

Trabelsi, M. A., & Trabelsi, H. (2021). At what level of corruption does economic growth decrease?. *Journal of Financial Crime*, *28*(4), 1317-1324. https://doi.org/10.1108/jfc-12-2019-0171

Uberti, L. J. (2022). Corruption and growth: Historical evidence, 1790–2010. *Journal of Comparative Economics*, *50*(2), 321-349. https://doi.org/10.1016/j.jce.2021.10.002

Wei, S. J. (2000). How taxing is corruption on international investors?. *Review of Economics and Statistics*, *82*(1), 1-11. https://doi.org/10.1162/003465300558533

Yalçınkaya, Ö., & Yazgan, Ş. (2016). Kurumsal yapının ekonomik büyüme üzerindeki etkileri: G-20 ülkeleri üzerinde bir uygulama (1996-2014). *Business & Economics Research Journal*, *7*(4), 31-50. https://doi.org/10.20409/berj.2016422337

Yaprakli, S. (2008). Kurumsal yapının ekonomik büyümeye etkisi: üst orta gelir düzeyindeki ülkeler üzerine bir uygulama. *Ege Akademik Bakış Dergisi*, *8*(1).

Zywicki, T. J. (2003). The rule of law, freedom, and prosperity. *Supreme Court Economic Review*, *10*, 1-26. https://doi.org/10.1086/scer.10.1147136

Appendix 1: countries in the study

Albania	Botswana	Cote d'Ivoire	Greece	Kazakhstan	Mongolia	Senegal
Algeria	Brazil	Croatia	Guatemala	Kenya	Morocco	Serbia
Argentina	Brunei Darussalam	Cuba	Guinea	Korea, Rep.	Mozambique	Seychelles
Armenia	Bulgaria	Cyprus	Guyana	Kuwait	Namibia	Sierra Leone
Aruba	Burkina Faso	Czechia	Haiti	Kyrgyz Rep.	Netherlands	Singapore
Australia	Burundi	Denmark	Honduras	Lao PDR	New Zealand	Slovak Rep.
Austria	Cabo Verde	Dominica	Hong Kong SAR, China	Latvia	Norway	Slovenia
Azerbaijan	Cambodia	Dominican Rep.	Hungary	Lebanon	Oman	Solomon Islands
Bahamas	Cameroon	Ecuador	Iceland	Lesotho	Pakistan	Spain
Bahrain	Canada	Egypt, Arab Rep.	India	Libya	Panama	Sri Lanka
Bangladesh	Central African Rep.	El Salvador	Indonesia	Luxembourg	Peru	Thailand
Barbados	Chad	Estonia	Iran, Islamic Rep.	Macao SAR, China	Philippines	Uruguay
Belarus	Chile	Eswatini	Iraq	Madagascar	Poland	Uzbekistan
Belgium	China	Fiji	Ireland	Malaysia	Portugal	Vanuatu
Belize	Colombia	Finland	Israel	Mali	Romania	Venezuela
Benin	Comoros	France	Italy	Malta	Russian Federation	Vietnam
Bhutan	Congo, Dem. Rep.	Georgia	Jamaica	Mauritania	Rwanda	West Bank and Gaza
Bolivia	Congo, Rep.	Germany	Japan	Mauritius	Samoa	Yemen, Rep.
Bosnia and Herzegovina	Costa Rica	Ghana	Jordan	Mexico	Saudi Arabia	Zambia
						Zimbabwe