

---

Article

## Corruption control and economic performance in Bosnia and Herzegovina and other Western Balkan countries

Amra Babajić,<sup>1,\*</sup> Amra Gadžo,<sup>1</sup> Mirnesa Baraković Nurikić<sup>1</sup>

<sup>1</sup> Faculty of Economics, University of Tuzla, Bosnia and Herzegovina

\*Correspondence: amra.babajic@untz.ba

**Abstract.** This paper aims to contribute to a more comprehensive understanding of entrenched corruption in Bosnia and Herzegovina, through a comparative analysis with other Western Balkan countries. It is essential to determine whether corruption acts as a stimulus or deterrent to economic performance, considering empirical evidence suggesting that corruption may have a positive effect under certain conditions. The study utilizes indicators from the World Bank's Worldwide Governance Indicators (WGI) database, along with gross domestic product per capita (GDP per capita) figures. The analysis employs both descriptive and regression methods applied to the aforementioned indicators over the period from 2010 to 2022. The effect of Corruption control on economic performance varies considerably across the observed countries. In Bosnia and Herzegovina, a significant negative relationship is observed. The results can help the authorities in the creation of policies and strategies that focus on the improvement of institutional quality and economic performance. This research fulfils an identified need to investigate the phenomenon of corruption in Bosnia and Herzegovina and neighbour countries in detail in recent time.

**Keywords:** corruption, corruption control, economic performance, gross domestic product, institutions

**JEL classification :** A1; E02; F43; O11

---

### 1. Introduction

Corruption remains one of the most persistent obstacles to economic performance worldwide. According to Transparency International (2025), Bosnia and Herzegovina scored only 33 points on the Corruption Perceptions Index (its lowest score to date), ranking 114th out of 180 countries and placing it in the second-lowest position in Europe. This score falls below the critical threshold of 40, indicating significant risk of instability, conflict, and violence. The Western Balkan region as a whole demonstrates limited progress, with Bosnia and Herzegovina positioned at the very bottom.

Corruption manifests in various forms that must be understood to enable identification and accountability. These include public servants demanding money or favours in exchange for services, politicians misusing public funds, and corporations bribing officials for lucrative contracts (Nieto-Morales et al., 2024). Rose-Ackerman (1996) distinguishes between grand corruption, which

involves high-ranking officials and erodes public trust, and petty corruption, which occurs at the street level when citizens interact with low- to mid-level public officials. Both forms are prevalent in public and private sectors across all countries, though their impacts are most acutely felt in less developed nations.

Economic performance, broadly defined through macroeconomic indicators, provides a measurable framework for assessing institutional quality impacts. The World Bank (2025) defines economic performance as encompassing "measures of macroeconomic performance (gross domestic product [GDP], consumption, investment, and international trade) and stability (central government budgets, prices, the money supply, and the balance of payments)". Understanding how corruption control influences GDP per capita is essential for evidence-based policymaking.

Western Balkan countries face substantial macroeconomic challenges: low GDP growth rates compared to EU member states, high unemployment, significant public debt, and political instability. Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia hold EU candidate status, while Kosovo remains a potential candidate. Croatia, having joined the European Union in 2013, serves as a regional benchmark. Institutional quality, frequently analysed through indicators published by the World Bank Group (Kaufmann & Kraay, 2024; Buchanan et al., 2012), represents a critical factor for EU accession and economic development.

The research question guiding this study is: Is there a relationship between corruption control and economic performance in Bosnia and Herzegovina and other Western Balkan countries? While Kelić et al. (2024) examined perceived corruption's impact in Western Balkans using the GLS model, comparing non-EU Western Balkan countries with neighbouring EU member states, the current study provides a more detailed country-by-country analysis using both linear and nonlinear regression models.

This research contributes to the existing literature in three significant ways. First, it provides a comprehensive comparative analysis of corruption's economic effects across all seven Western Balkan countries over the period 2010–2022, addressing the gap identified by Kelić et al. (2024). Second, it employs both linear and polynomial/Fourier regression models to capture the complex, potentially non-monotonic relationship between corruption control and economic growth. Third, it examines whether corruption functions differently in countries with weak institutional frameworks, such as Bosnia and Herzegovina, compared to those with stronger institutions, testing hypotheses proposed by Acemoglu & Verdier (2000) and Pluskota (2020) in the specific Western Balkan context.

## 2. Literature review

The relationship between corruption and economic performance has been extensively examined in academic literature, yielding two contrasting theoretical perspectives. The first, commonly referred to as the "sand in the wheels" hypothesis, posits that corruption impedes economic growth by distorting resource allocation, reducing investment, undermining institutional quality, and increasing transaction costs (Mauro, 1995; Tanzi & Davoodi, 1998; Hodge et al., 2011). According to this view, corruption diverts public resources away from

productive uses, discourages foreign direct investment, and creates an unpredictable business environment that hampers entrepreneurial activity and innovation.

The second perspective, known as the "grease the wheels" hypothesis, suggests that under certain conditions and inefficient regulations, corruption may actually facilitate economic activity by enabling firms and individuals to circumvent administrative obstacles (Leff, 1964; Huntington, 1968; Lui, 1985). Proponents of this view argue that bribery can serve as a mechanism to expedite bureaucratic processes and reduce waiting times, thereby promoting efficiency in otherwise dysfunctional systems (Bayley, 1966; Acemoglu & Verdier, 2000).

Empirical evidence on the corruption-growth nexus remains mixed. Studies examining developed economies generally confirm the negative impact of corruption on economic performance (Gründler & Potrafke, 2019; Borlea et al., 2017; Pluskota, 2020). However, research focusing on developing countries and transition economies reveals more nuanced findings. Spyromitros and Panagiotidis (2022) found that while corruption hinders growth in most developing countries, it exhibits a positive effect in Latin American and MENA regions. Similarly, Kelić et al. (2024) demonstrated that corruption negatively affects growth in EU countries with strong institutions, while its impact is less pronounced in Western Balkan countries.

Recent studies have increasingly emphasised the nonlinear nature of the corruption-growth relationship. Trabelsi (2024) identified an inverted U-shaped relationship, suggesting that moderate levels of corruption may benefit growth up to a certain threshold, beyond which the effects become detrimental. Lucarelli, Muço, and Valentini (2024) distinguished between short-run and long-run effects, finding that while corruption may facilitate economic activity in the short term by accelerating bureaucratic processes, it negatively affects growth in the long run due to accumulated social costs and institutional deterioration.

Table 1 provides a comprehensive summary of the empirical literature examining the relationship between corruption and economic performance, organised by the direction of the identified relationship.

**Table 1.** Literature review: corruption and economic performance.

<b>Author(s)</b>	<b>Relationship</b>	<b>Key Findings</b>
Acemoglu & Verdier (2000)	<b>Positive</b>	Government intervention with partial corruption optimal when corruption is relatively rare
Bayley (1966)	<b>Positive</b>	Corruption can reallocate resources from consumption to investment in developing countries
Huntington (1968)	<b>Positive</b>	Corruption may expedite processes and reduce waiting times in bureaucratic systems
Lui (1985)	<b>Positive</b>	Bribing officials may expedite processes and reduce waiting times
Leys (1965)	<b>Positive</b>	Corruption can have beneficial effects in certain developmental contexts
Pluskota (2020)	<b>Positive</b>	Corruption supports growth when state does not work properly; developed European countries 1996-2017
Lučić et al. (2016)	<b>Positive</b>	Causality between corruption and GDP level under specific conditions

<b>Author(s)</b>	<b>Relationship</b>	<b>Key Findings</b>
Spyromitros & Panagiotidis (2022)	<b>Positive (regional)</b>	Positive impact in Latin American countries; 83 developing countries, 2012-2018
Uddin et al. (2023)	<b>Negative</b>	Enhancing institutional quality boosts economic development in developing nations
Gründler & Potrafke (2019)	<b>Negative</b>	GDP per capita decreased 17% in long-run; 175 countries, 2012-2018
Spyromitros & Panagiotidis (2022)	<b>Negative</b>	Corruption hinders growth in developing countries with varying regional effects
Hodge et al. (2011)	<b>Negative</b>	Corruption slows growth through negative effects on physical and human capital investments
Bitterhout & Simo-Kengne (2020)	<b>Negative</b>	Corruption negatively affects economic growth in BRICS economies
Shera et al. (2014)	<b>Negative</b>	Significant negative relationship; 22 developing countries, 2001-2012
Appiah et al. (2019)	<b>Negative</b>	Negative effects on growth and sustainability in Africa, 2002-2017
Chang & Hao (2017)	<b>Negative</b>	Significant negative impact in autocracies through reduced FDI and increased inflation
Borlea et al. (2017)	<b>Negative</b>	Corruption and shadow economy decrease growth; 28 EU states, 2005-2014
Tsanana et al. (2016)	<b>Negative</b>	Bureaucracy and corruption negatively affect growth in enlarged EU
Bermúdez, Verástegui, Nolazco & Urbina (2024)	<b>Negative</b>	3SLS-GMM analysis of Latin America and OECD; corruption reduces growth and productivity.
Husna & Nasir (2024)	<b>Negative</b>	Panel analysis ASEAN-5 countries 2012-2022; CPI positively affects GDP.
Densumite (2024)	<b>Negative</b>	Panel DOLS and VECM analysis of 12 countries; causality from CPI to GDP confirmed.
Kelić et al. (2024)	<b>Mixed</b>	Negative in EU countries; less pronounced in Western Balkans; 2012-2021
Lucarelli, Muço & Valentini (2024)	<b>Mixed</b>	ARDL analysis of 8 Balkan countries; short-run positive, long-run negative effect on growth.
Rose-Ackerman (1996)	<b>Conceptual</b>	Distinguished grand corruption from petty corruption
Nieto-Morales et al. (2024)	<b>Conceptual</b>	Analysis of petty corruption in citizen-bureaucrat interactions
Buchanan et al. (2012)	<b>Indirect</b>	Institutional quality affects FDI inflows which impact economic performance
Trabelsi (2024)	<b>Nonlinear</b>	Panel data 65 countries, 1987-2021; inverted U-shape with threshold 0.2228. Moderate corruption may positively affect growth

Source: Authors' compilation based on literature review

### 3. Methodology

This paper examines the impact of corruption on the economic performance of the Western Balkan countries. In this context, indicators of corruption control and GDP per capita were utilized during the period 2010–2022. The central research hypothesis presented in the paper states: There is a

positive relationship between corruption control and GDP per capita in Western Balkan countries. The term “Western Balkan countries” refers to nations that are geographically part of this region: Albania, Bosnia and Herzegovina, Montenegro, Croatia, North Macedonia, Serbia, and Kosovo.

One of the widely accepted indicators of corruption is the "Control of Corruption" measure, which is part of the Institutional Quality indicators developed by the World Bank. Institutional quality is frequently analyzed through indicators of institutional quality (Institutional Quality Index - IQI), published annually by the World Bank Group since 1996. These indicators are widely recognized tools, e.g., studies by (Uddin *et al.*, 2023; Islam & Montenegro, 2002; Buchanan *et al.*, 2012) used to assess institutional quality, based on hundreds of individual variables derived from dozens of different data sources. This research focuses on the "Control of Corruption" indicator. This measure encompasses various elements such as: corruption indices (overall), corruption indices (specific) in judiciary, parliament, ministries, public administration, police, tax authorities, etc., transparency in the functioning of the public sector, the frequency of bribery in education, healthcare, judiciary, police, parliament, public services, etc. (The World Bank, 2025; Kaufmann & Kraay, 2024). Regarding economic performance, this paper analyses the GDP per capita of Bosnia and Herzegovina and other Western Balkan countries. The data were retrieved from the World Bank Online Database.

For the purpose of conducting empirical research, data normalization was first performed. Data normalization was carried out using the Min-Max normalization method and was necessary for analysing the relationship between the level of corruption ("Control of Corruption") and GDP per capita due to the different ranges of values of the independent and dependent variables (the "Control of Corruption" indicator has values in the range of -2.5 to +2.5, while GDP per capita has significantly higher numerical values. Without data normalization, GDP per capita would dominate the analysis and could cause modelling issues). This normalization process also aimed to reduce the model's sensitivity to extreme values and improve the interpretability of the model.

Min-Max normalization scales data to a defined range, typically [0,1] or [-1,1], and is particularly useful when aiming to ensure uniformity in the scale of all variables.

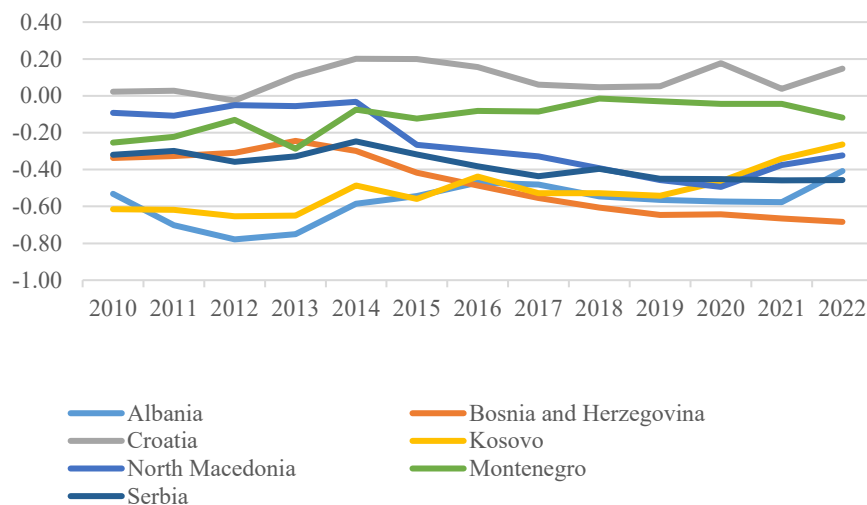
$$X' = \frac{X - \min(X)}{\max(X) - \min(X)} \quad (1)$$

The correlation calculation was performed using Spearman's correlation, which is based on ranks rather than actual values, as the independent and dependent variable data are not necessarily linearly related. Additionally, in the interpretation of research results, Pearson's correlation was also calculated, but only after data normalization. Ultimately, for each country, regression models were presented, including one linear model and one nonlinear model, either polynomial or Fourier, selected based on the best fit to the observed data, enabling a more precise interpretation of the impact of the corruption control indicator on GDP per capita.

## 4. Findings and discussion

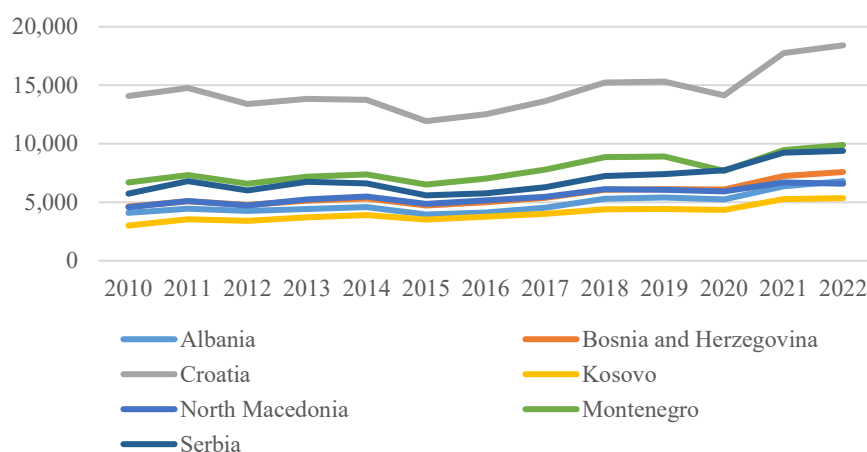
The following Figure 1 illustrates the control of corruption in the Western Balkan countries during the period from 2010 to 2022. Higher values on the Y-axis represent better corruption control, while

lower values indicate its deterioration.



**Figure 1.** Control of corruption in Western Balkan countries. *Source:* Authors, based on World Bank (2025) data

Figure 1 depicts the level of corruption control in the Western Balkans. Croatia is the only country with a consistently positive score, while all others remain in negative territory throughout the observed period. The data for Montenegro hovers around zero, with a slight decline observed between 2014 and 2019. Albania shows improvement since 2015 but remains within the negative range. Serbia and Bosnia and Herzegovina exhibit a pronounced negative trend, particularly after 2015. North Macedonia also displays a decline. Kosovo stands out as the only country with significant improvement in recent times, albeit still within the negative range. Overall, corruption control across the region shows a slight decline or stagnation, potentially pointing to systemic challenges in all countries.



**Figure 2.** GDP per capita in Western Balkan countries. *Source:* Authors, based on World Bank (2025) data

Figure 2 shows that Croatia has the highest GDP per capita in all observed years, particularly in 2022, significantly surpassing the GDP per capita of other countries. Kosovo has the lowest GDP

## Corruption control and economic performance

per capita throughout the entire observed period. Bosnia and Herzegovina exhibits the greatest growth in GDP per capita, increasing from \$4,635.51 USD in 2010 to \$7,585.38 USD in 2022. Serbia also demonstrates a significant rise in this indicator, moving from \$5,735.42 USD in 2010 to \$9,393.63 USD in 2022. The impact of the COVID-19 pandemic on GDP per capita is evident across the observed countries after 2020. Nonetheless, most countries (Albania, Montenegro, and Serbia) show substantial progress despite the challenges posed by the pandemic.

To examine the relationship between corruption control and economic performance, regression analysis was conducted for each Western Balkan country individually. The results are organised into two tables. Table 2 presents the linear regression results, which serve as a baseline for understanding the direct relationship between the variables. For each country, the table reports the slope coefficient (p1), intercept (p2), sum of squared errors (SSE), coefficient of determination ( $R^2$ ), adjusted  $R^2$ , root mean square error (RMSE), and both Pearson and Spearman correlation coefficients. Table 3 extends this analysis by presenting nonlinear regression models. These models were chosen based on their ability to most accurately capture the underlying relationship between corruption control and economic performance, as evidenced by the highest  $R^2$  values and lowest RMSE. In cases where the linear model provided sufficient explanatory power, as with Kosovo, nonlinear alternatives were not applied.

**Table 2.** Linear Regression Results: Control of Corruption and GDP per capita (2010-2022)

Country	p1 (slope)	p2 (intercept)	SSE	$R^2$	Adj. $R^2$	RMSE	Pearson r	Spearman r
Albania	0.3905	0.1131	1.024	0.132	0.05313	0.3051	0.3634	0.0495
Bosnia and Herzegovina	-0.698	0.6631	0.4233	0.6536	0.6221	0.1962	-0.8085	-0.7473
Croatia	-0.1926	0.5001	0.9235	0.05092	-0.03536	0.2897	-0.2257	-0.2802
Kosovo	0.8429	0.1424	0.2861	0.7282	0.7035	0.1613	0.8533 p < 0.001	0.7582 p = 0.0027
North Macedonia	-0.6177	0.7775	0.691	0.4546	0.405	0.2506	-0.6742	-0.6429
Montenegro	0.5244	0.04871	0.9924	0.256	0.1883	0.3004	0.5059	0.6099
Serbia	-0.6159	0.6003	0.7533	0.4037	0.3494	0.2617	-0.6353	-0.6923

Source: Authors' calculations based on World Bank (2025) data.

**Table 3.** Nonlinear Regression Results: Control of Corruption and GDP per capita (2010-2022).

Country	Model Type	Key Coefficients	R <sup>2</sup>	Adj. R <sup>2</sup>	RMSE	R <sup>2</sup> Improvement
Albania	Fourier1	a0=0.4342, a1=-0.2227, b1=-0.3553, w=9.895	0.5873	0.4497	0.2326	13.2% → 58.73%
Bosnia and Herzegovina	Poly2 (Quadratic)	p1=1.995, p2=-2.606, p3=0.8674	0.9046	0.8856	0.108	65.36% → 90.46%
Croatia	Fourier2	a0=0.3477, a1=0.08405, b1=-0.06933, a2=-0.1581, b2=-0.3415, w=7.453	0.4815	0.1111	0.2685	5.09% → 48.15%
Kosovo	Linear (best fit)	p1=0.8429, p2=0.1424	0.7282	0.7035	0.1613	(linear model sufficient)
North Macedonia	Fourier1	a0=0.3703, a1=0.2386, b1=0.4088, w=5.819	0.6959	0.5945	0.2069	45.46% → 69.59%
Montenegro	Poly2 (Quadratic)	p1=0.993, p2=-0.4742, p3=0.1895	0.322	0.1864	0.3007	25.6% → 32.2%
Serbia	Poly2 (Quadratic)	p1=1.731, p2=-2.105, p3=0.7384	0.647	0.5764	0.2112	40.37% → 64.7%

**Notes:** Poly2 = Quadratic polynomial model; Fourier1 = First-order Fourier model; Fourier2 = Second-order Fourier model. R<sup>2</sup> Improvement shows the increase from linear to nonlinear model.

*Source:* Authors' calculations based on World Bank (2025) data

The linear regression analysis (Table 2) reveals heterogeneous relationships between corruption control and GDP per capita across the Western Balkans, which can be grouped into three categories. Countries with positive relationship: Kosovo demonstrates the strongest and most statistically significant positive relationship between corruption control and GDP per capita among all observed countries; Montenegro exhibits a moderate positive relationship, suggesting that corruption control improvements tend to coincide with GDP per capita growth, though this relationship lacks statistical significance; Albania shows a weak positive relationship that is not statistically significant.

Countries with negative relationship: Bosnia and Herzegovina presents the most striking finding of this analysis: a strong, statistically significant negative relationship between corruption control and GDP per capita. This finding resonates with the theoretical arguments advanced by Lui (1985), Leys (1965), and Bayley (1966), who posited that corruption may serve a functional role in countries with inefficient institutions by enabling economic actors to circumvent bureaucratic obstacles; Serbia exhibits a pattern similar to Bosnia and Herzegovina, with a significant negative

slope coefficient and moderate explanatory power; North Macedonia also demonstrates a statistically significant negative relationship, though with lower magnitude. Both correlation measures indicate a significant inverse relationship.

Countries with weak or insignificant relationship: Croatia exhibits the weakest relationship among all countries, with an essentially negligible slope and extremely low explanatory power. This suggests that in Croatia, as an EU member state with more developed institutions, corruption control is not a primary determinant of economic performance.

The results partially support both the 'sand in the wheels' hypothesis (Kosovo) and the 'grease the wheels' hypothesis (Bosnia and Herzegovina, Serbia, North Macedonia). Countries with stronger positive relationships tend to be those where anti-corruption efforts have been more consistently implemented alongside broader institutional reforms. Conversely, countries exhibiting negative relationships may be experiencing the short-term disruptions associated with combating entrenched corruption networks, or may lack the complementary institutional improvements necessary for anti-corruption measures to translate into economic gains.

These findings highlight the need for country-specific analyses and tailored policy approaches that account for local institutional conditions and development trajectories.

The application of nonlinear regression models (Table 3) reveals that the relationship between corruption control and economic performance in Western Balkan countries is considerably more complex than simple linear associations suggest. The substantial improvements in explanatory power ( $R^2$ ) achieved through polynomial and Fourier transformations indicate the presence of threshold effects, cyclical patterns, and nonlinear dynamics that fundamentally alter our understanding of the corruption-growth nexus in this region.

Based on nonlinear regression results all countries can be divided into three groups:

### *1. Countries with Quadratic (U-shaped) Relationships*

Bosnia and Herzegovina exhibits the most dramatic improvement when transitioning from linear to nonlinear modelling. The quadratic model ( $R^2 = 0.9046$ ) explains over 90% of the variation in GDP per capita, compared to 65.4% in the linear specification. This nonlinear pattern indicates that the impact of corruption control is more pronounced at extreme values: GDP per capita tends to be higher when corruption control is either very low or very high, while intermediate levels of corruption control are associated with reduced economic performance.

The economic interpretation of this U-shaped relationship is particularly significant for policy formulation. In the initial stages of anti-corruption efforts, the economic effects may be disruptive as established (albeit corrupt) business networks are dismantled. However, the model suggests that sustained and comprehensive corruption control eventually yields positive economic returns once a critical threshold is surpassed. This finding supports the argument advanced by Lucarelli, Muço, and Valentini (2024), who distinguished between short-run negative effects and long-run positive effects of corruption control in Balkan countries. The very low RMSE (0.108) confirms the model's precision in capturing this complex relationship.

Serbia demonstrates a similar quadratic pattern, with the nonlinear model explaining 64.7% of variation compared to 40.4% in the linear specification. The positive quadratic coefficient ( $p1 =$

1.731) and negative linear coefficient ( $p_2 = -2.105$ ) indicate the existence of a corruption control threshold. Below this threshold, economic growth tends to decrease with improved corruption control; above it, the relationship reverses, and further improvements in corruption control are associated with economic gains. The statistically significant coefficients (confidence intervals excluding zero) confirm the reliability of this nonlinear relationship.

The practical implication for Serbia is that partial or inconsistent anti-corruption measures may be economically counterproductive, generating the costs of reform without reaching the threshold where benefits materialize. This supports the theoretical proposition that 'grease the wheels' effects may dominate in transition economies until institutional reforms reach sufficient depth and comprehensiveness to fundamentally alter the business environment.

Montenegro shows only modest improvement with the quadratic model ( $R^2 = 0.322$  versus 0.256 for linear), and the wide confidence intervals for all coefficients indicate substantial uncertainty in the estimates. The positive  $p_1$  (0.993) and negative  $p_2$  (-0.4742) suggest a similar U-shaped pattern to Bosnia and Herzegovina and Serbia, but the relationship is not statistically robust. The low adjusted  $R^2$  (0.1864) indicates that corruption control explains only a small fraction of economic performance variation in Montenegro, with other factors, such as tourism dependency, foreign direct investment patterns, and geopolitical positioning, likely playing more dominant roles.

## 2. Countries with Oscillatory (Cyclical) Relationships

Albania presents the most striking case for oscillatory dynamics, with the Fourier model increasing explanatory power from a mere 13.2% to 58.7%. The high frequency parameter ( $w = 9.895$ ) indicates rapid oscillations in the corruption-growth relationship over time. The negative sine coefficient ( $b_1 = -0.3553$ ) with a confidence interval excluding zero confirms the statistical significance of these cyclical patterns.

The oscillatory nature of the Albania model suggests that the relationship between corruption control and economic performance is not stable but fluctuates with political and institutional cycles. Periods of reform may be followed by periods of backsliding, with corresponding effects on economic performance. This pattern likely reflects Albania's volatile political environment, where anti-corruption initiatives have been inconsistently implemented across different government administrations. The finding underscores that reforms and institutional changes are essential to maintain a positive trend, and that sustainability of anti-corruption efforts is as important as their initial implementation.

North Macedonia also exhibits significant cyclical patterns, with the Fourier model explaining 69.6% of variation compared to 45.5% in the linear specification. The frequency parameter ( $w = 5.819$ ) indicates somewhat slower oscillations than Albania. The positive coefficients for both  $a_1$  (0.2386) and  $b_1$  (0.4088) suggest complex wave patterns in the corruption-growth relationship, with  $b_1$  being statistically significant (confidence interval 0.067 to 0.751).

The oscillatory nature of the model indicates that certain political, economic, or institutional factors drive periodic changes in the level of corruption and its impact on economic growth. In North Macedonia's context, this likely reflects the country's turbulent political history during the observed period, including significant governmental changes and varying commitment to EU integration

reforms. The strong negative correlations (Pearson  $r = -0.6742$ , Spearman  $r = -0.6429$ , both significant) confirm that despite oscillations, the overall trend shows higher corruption control associated with lower GDP per capita during this period—though this may represent short-term disruptions rather than long-term equilibrium.

Croatia required the most complex specification—a second-order Fourier model—to achieve meaningful explanatory power ( $R^2 = 0.4815$  versus 0.051 for linear). The presence of two harmonic components ( $a_1, b_1, a_2, b_2$ ) indicates multiple overlapping cycles in the corruption-growth relationship. However, the very low adjusted  $R^2$  (0.1111) suggests that despite the improved fit, the model may be overfitting the data, and the added complexity does not generalize well.

Croatia's unique position as an EU member state since 2013 fundamentally distinguishes it from other Western Balkan countries. The weak corruption-growth relationship, even with nonlinear modeling, suggests that in more developed institutional environments, corruption control is not a primary driver of economic performance. Access to EU structural funds, trade integration within the single market, and broader macroeconomic policies likely dominate economic outcomes. The oscillatory patterns may reflect periodic effects of EU fund absorption cycles, political business cycles, and external economic shocks (such as the Eurozone crisis aftermath) rather than direct corruption control impacts.

### *3. Countries Where Linear Relationships Suffice*

Kosovo stands out as the only country where the linear model provides sufficiently high explanatory power ( $R^2 = 0.7282$ ), making nonlinear alternatives unnecessary. The strong positive slope ( $\beta_1 = 0.8429$ ) with tight confidence intervals (0.501 to 1.185) indicates a robust, consistent positive relationship between corruption control and economic performance. The high Pearson correlation ( $r = 0.8533$ ,  $p < 0.001$ ) confirms that improvements in corruption control have been directly and proportionally associated with GDP per capita growth throughout the observed period.

Kosovo's linear relationship may reflect its unique developmental trajectory as the youngest state in the region, where institution-building and anti-corruption efforts have proceeded in parallel with economic development from a low base. The absence of entrenched corrupt networks that characterize older state structures may explain why anti-corruption measures translate more directly into economic gains without the threshold effects observed in Bosnia and Herzegovina or Serbia. Additionally, substantial international oversight and technical assistance may have facilitated more effective implementation of governance reforms.

These findings have significant implications for both theory and policy. Theoretically, they support the growing consensus that the corruption-growth relationship is context-dependent and inherently nonlinear, as argued by Trabelsi (2024) and partially validating both the 'sand in the wheels' and 'grease the wheels' hypotheses under different conditions. The substantial variation in optimal model specifications across countries underscores that universal prescriptions are inadequate; rather, anti-corruption strategies must be tailored to specific institutional contexts, recognizing that different countries may be at different points along their corruption-growth curves.

For Bosnia and Herzegovina and Serbia, the U-shaped relationship implies that half-measures in corruption control may be economically counterproductive. Policymakers should either

commit to comprehensive, sustained anti-corruption reforms that surpass the threshold where positive returns emerge, or recognize that partial efforts may generate transitional costs without commensurate benefits. The high  $R^2$  values (90.5% and 64.7% respectively) provide strong empirical support for this strategic choice.

For Albania and North Macedonia, the oscillatory patterns highlight the importance of institutional consistency. Anti-corruption efforts that fluctuate with political cycles are unlikely to generate sustainable economic benefits. Investment in depoliticized, institutionally embedded anti-corruption mechanisms may be necessary to break the cycle of reform and backsliding that characterizes these countries' trajectories.

For Kosovo, the linear positive relationship suggests that continued investment in corruption control should yield proportional economic returns, though sustainability will depend on maintaining reform momentum as the state matures and potentially develops the entrenched interests that complicate anti-corruption efforts elsewhere in the region.

For Croatia, the weak relationship between corruption control and economic performance suggests that while maintaining governance standards is important for EU compliance and broader institutional quality, economic policy should focus on other drivers of growth. The country's developmental priorities may appropriately shift toward competitiveness, innovation, and human capital rather than anti-corruption as the primary economic lever.

## 5. Concluding remarks

The empirical findings reveal substantial heterogeneity in the control corruption and economic performance relationship, challenging simplistic theoretical frameworks and universal policy prescriptions. The central research hypothesis, that there is a positive relationship between corruption control and GDP per capita, was confirmed for Kosovo, partially supported for Montenegro and Albania, and refuted for Bosnia and Herzegovina, Serbia, and North Macedonia. The analysis demonstrates that the corruption-growth nexus in Western Balkans is fundamentally nonlinear.

This research contributes to the ongoing theoretical debate between the 'sand in the wheels' and 'grease the wheels' hypotheses by demonstrating that both may hold validity under different conditions and at different stages of institutional development. The findings align with Trabelsi's (2024) identification of nonlinear, inverted U-shaped relationships in cross-country studies, while extending this framework to reveal country-specific patterns within a single region.

For Bosnia and Herzegovina specifically, the findings suggest that half-measures in corruption control are economically counterproductive. The country faces a strategic choice: either commit to comprehensive, sustained anti-corruption reforms that surpass the threshold where positive returns emerge, or accept that partial efforts will continue to generate transitional costs without commensurate benefits. Given the EU integration aspirations and the long-term developmental imperatives, the former path appears more advisable despite short-term economic disruptions.

For the Western Balkans region more broadly, the findings emphasise the need for country-specific approaches rather than one-size-fits-all policy prescriptions. Kosovo's success with linear positive returns, Albania and North Macedonia's oscillatory patterns, and Bosnia and Herzegovina's and Serbia's threshold effects all require distinct policy responses calibrated to local institutional contexts.

This study acknowledges several limitations that suggest avenues for future research. The 13-year observation period, while sufficient for detecting patterns, may be too short to capture long-term equilibrium relationships, particularly given the U-shaped dynamics identified. The reliance on a single corruption indicator (Control of Corruption from WGI) may not capture all dimensions of corruption relevant to economic performance. Additionally, the country-by-country analysis, while revealing important heterogeneity, does not exploit panel data methods that could control for unobserved country-specific effects.

Future research should extend the temporal scope to test whether the identified nonlinear relationships persist over longer horizons; incorporate additional corruption and institutional quality indicators; employ panel regression techniques with appropriate controls for endogeneity; and investigate the specific channels through which corruption affects economic performance, including foreign direct investment, entrepreneurship, and human capital accumulation. Comparative analysis with other transition economies outside the Western Balkan could also illuminate whether the observed patterns are region-specific or generalisable to broader contexts.

## References

- Acemoglu, D., & Verdier, T. (2000). The choice between market failures and corruption. *American Economic Review*, 90(1), 194–211. <https://doi.org/10.1257/aer.90.1.194>
- Appiah, M., Frowne, D. Y. I., & Frowne, A. I. (2019). Corruption and its effects on sustainable economic performance. *Scholedge International Journal of Business Policy & Governance*, 6(2), 12–24. <https://doi.org/10.19085/journal.sjibpg060201>
- Bayley, D. H. (1966). The effects of corruption in a developing nation. *Western Political Quarterly*, 19(4), 719–732. <https://doi.org/10.1177/106591296601900410>
- Bermúdez, P., Verástegui, L., Nolzco, J. L., & Urbina, D. A. (2024). Effects of corruption and informality on economic growth through productivity. *Economies*, 12(10), Article 268. <https://doi.org/10.3390/economies12100268>
- Bitterhout, S., & Simo-Kengne, B. D. (2020). The effect of corruption on economic growth in the BRICS countries: A panel data analysis. *EDWRG Working Paper No. 03-2020*. Economic and Well-Being Research Group.
- Borlea, S. N., Achim, M. V., & Miron, M. G. A. (2017). Corruption, shadow economy and economic growth: An empirical survey across the European Union countries. *Studia Universitatis "Vasile Goldis" Arad – Economics Series*, 27(2), 19–32. <https://doi.org/10.1515/sues-2017-0006>
- Buchanan, B. G., Le, Q. V., & Rishi, M. (2012). Foreign direct investment and institutional quality: Some empirical evidence. *International Review of Financial Analysis*, 21, 81–89. <https://doi.org/10.1016/j.irfa.2011.10.001>
- Chang, C.-P., & Hao, Y. (2017). Environmental performance, corruption and economic growth: Global evidence using a new data set. *Applied Economics*, 49(5), 498–514. <https://doi.org/10.1080/00036846.2016.1200186>
- Densumite, S. (2024). Corruption and economic growth: An empirical study in 12 countries. *Asia Social Issues*, 17(2), e262107. <https://doi.org/10.48048/asi.2024.262107>
- Gründler, K., & Potrafke, N. (2019). Corruption and economic growth: New empirical evidence. *European Journal of Political Economy*, 60, Article 101810. <https://doi.org/10.1016/j.ejpoleco.2019.08.001>

- Hodge, A., Shankar, S., Rao, D. S. P., & Duhs, A. (2011). Exploring the links between corruption and growth. *Review of Development Economics*, 15(3), 474–490. <https://doi.org/10.1111/j.1467-9361.2011.00621.x>
- Huntington, S. P. (1968). *Political order in changing societies*. Yale University Press.
- Husna, P. A., & Nasir, M. (2024). The Role of Corruption, FDI, and Unemployment in ASEAN-5 Economic Growth. *Grimsa Journal of Business and Economics Studies*, 1(2), 75–85. <https://doi.org/10.61975/gjbes.v1i2.28>
- Islam, R., & Montenegro, C. (2002). What determines the quality of institutions? *Policy Research Working Paper No. 2764*. World Bank. <https://doi.org/10.1596/1813-9450-2764>
- Kaufmann, D., & Kraay, A. (2024). The Worldwide Governance Indicators: Methodology and 2024 update. *Policy Research Working Paper No. 10952*. World Bank. <https://doi.org/10.1596/1813-9450-10952>
- Kelić, V., Ostojić, I., & Jovanović, P. (2024). Assessment of the impact of perceived corruption on economic growth using the GLS model. *Acta Economica*, 22(41), 91–114. <https://doi.org/10.7251/ACE2441091K>
- Leff, N. H. (1964). Economic development through bureaucratic corruption. *American Behavioral Scientist*, 8(3), 8–14. <https://doi.org/10.1177/000276426400800303>
- Leys, C. (1965). What is the problem about corruption? *The Journal of Modern African Studies*, 3(2), 215–230. <https://doi.org/10.1017/S0022278X00023636>
- Lucarelli, S., Muço, K., & Valentini, E. (2024). Short run and long run effects of corruption on economic growth: Evidence from Balkan countries. *Economies*, 12(4), Article 86. <https://doi.org/10.3390/economies12040086>
- Lučić, D., Radišić, M., & Dobromirov, D. (2016). Causality between corruption and the level of GDP. *Economic Research-Ekonomska Istraživanja*, 29(1), 360–379. <https://doi.org/10.1080/1331677X.2016.1169701>
- Lui, F. T. (1985). An equilibrium queuing model of bribery. *Journal of Political Economy*, 93(4), 760–781. <https://doi.org/10.1086/261329>
- Mauro, P. (1995). Corruption and growth. *The Quarterly Journal of Economics*, 110(3), 681–712. <https://doi.org/10.2307/2946696>
- Nieto-Morales, F., Peeters, R., & Lotta, G. (2024). Burdens, bribes, and bureaucrats: The political economy of petty corruption and administrative burdens. *Journal of Public Administration Research and Theory*, 34(4), 481–497. <https://doi.org/10.1093/jopart/muae010>
- Pluskota, A. (2020). The impact of corruption on economic growth and innovation in an economy in developed European countries. *Annales Universitatis Mariae Curie-Skłodowska, Sectio H Oeconomia*, 54(2), 77–87. <https://doi.org/10.17951/h.2020.54.2.77-87>
- Rose-Ackerman, S. (1996). Democracy and 'grand' corruption. *International Social Science Journal*, 48(149), 365–380. <https://doi.org/10.1111/1468-2451.00038>
- Shera, A., Dosti, B., & Grabova, P. (2014). Corruption impact on economic growth: An empirical analysis. *Journal of Economic Development, Management, IT, Finance and Marketing*, 6(2), 57–77.
- 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), Article 2129368. <https://doi.org/10.1080/23322039.2022.2129368>
- Tanzi, V., & Davoodi, H. (1998). *Corruption, public investment, and growth*. In H. Shibata & T. Ihori (Eds.), *The welfare state, public investment, and growth* (pp. 41–60). Springer. [https://doi.org/10.1007/978-4-431-67939-4\\_4](https://doi.org/10.1007/978-4-431-67939-4_4)
- Trabelsi, M. A. (2024). *The impact of corruption on economic growth: A nonlinear evidence*. In J. Fahed-Sreih (Ed.), *Corruption: New insights* (Chap. 5). IntechOpen. <https://doi.org/10.5772/intechopen.108876>
- Transparency International. (2025, March 4). *Corruption Perceptions Index 2024*. <https://www.transparency.org/cpi2024>
- Tsanana, E., Chapsa, X., & Katrakilidis, C. (2016). Is growth corrupted or bureaucratic? Panel evidence from the enlarged EU. *Applied Economics*, 48(33), 3131–3147. <https://doi.org/10.1080/00036846.2015.1136395>
- Uddin, I., Ahmad, M., Ismailov, D., Balbaa, M. E., Akhmedov, A., Khasanov, S., & Haq, M. U. (2023). Enhancing institutional quality to boost economic development in developing nations: New insights from CS-ARDL approach. *Research in Globalization*, 7, Article 100137. <https://doi.org/10.1016/j.resglo.2023.100137>
- World Bank. (2025). *World Development Indicators*. Retrieved March 5, 2025, from <https://databank.worldbank.org/source/world-development-indicators>