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The impact of corruption, natural resources on economic growth: An applied study of Algeria

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Abstract

The study aims to test the relationship between corruption, natural resources on economic growth in Algeria. Using the descriptive and quantitative approach according to the Autoregressive Distributed Lag (ARDL) methodology. using quarterly data from (2003Q1 to 2021Q4). The results of this study showed that the variables: fixed capital index (FCF), general government spending (G), index of economic freedom (IEF) and Trade Openness (TO) positively and significant affects on economic growth in the short and long run, but with small values. On the other hand, the corruption index (CPI) and natural resources (NR) had a negative effect on Algerian economic growth in the short and long term.

1. Introduction

The relationship between corruption, natural resources, and economic growth is a subject of significant importance and interest in both academic research. Understanding the intricate relationship between corruption, natural resources, and economic growth requires multidisciplinary analysis, incorporating economics, political science. It involves assessing the specific contextual factors, policy frameworks, and governance mechanisms that shape the outcomes in different countries and regions.

Corruption has long been recognized as a major hindrance to economic development and stability worldwide. Its detrimental effects permeate various sectors of society, and one area significantly affected is the management and exploitation of natural resources. As nations seek to leverage their abundant resources to foster economic growth, corruption acts as a formidable roadblock, impeding progress and exacerbating the challenges associated with sustainable development.

Natural resources, encompassing minerals, oil, gas, forests, and fisheries, have the potential to be tremendous assets for countries blessed with abundant reserves. However, the mismanagement, exploitation, and illicit practices surrounding these resources can lead to adverse consequences that hinder economic growth. Corruption exacerbates these negative outcomes, perpetuating a cycle of economic stagnation, inequality, and environmental degradation.

One of the primary channels through which corruption infiltrates the natural resource sector is through rent-seeking behavior. When public officials exploit their positions of power for personal gain, they create an environment that fosters rent-seeking activities, such as bribery, embezzlement, and kickbacks. This erodes the integrity of resource management systems, distorts market mechanisms, and undermines the rule of law.

Furthermore, corruption breeds a lack of transparency and accountability, enabling illicit practices such as illegal logging, poaching, and unauthorized mining. These activities not only deplete valuable resources but also perpetuate environmental degradation, leading to irreversible damage to ecosystems and biodiversity. The consequences of such actions ripple through society, affecting livelihoods, exacerbating poverty, and compromising the long-term sustainability of resource-dependent economies.

In addition to environmental repercussions, corruption also stifles investment and hampers economic growth. Foreign investors are often deterred by the prevalence of corruption, as it increases the uncertainty and risks associated with resource extraction projects. The diversion of funds and resources into the pockets of corrupt individuals hinders public investment in infrastructure, education, and healthcare, all of which are vital for sustained economic development.

To delve deeper into this subject and obtain recent research insights, many academic journals, and publications analyzed this scientific field by studying and examining from .It was carried out by reputable researchers and international institutions such as the World Bank, International Monetary Fund (IMF), United Nations Development Programme (UNDP), or Transparency International. These sources often provide in-depth analysis and empirical evidence on the dynamics of corruption, natural resources, and economic growth.

Several literature have been developed about corruption and its impact on economic growth. Much literature looks at corruption as big obstacle for economic growth like (Erum & Shahzad, 2019; A. Urbina & Rodríguez, 2021; Beatrice D & Siphiwo , 2023) ; These researchers believe that corruption stifles economic growth and development by worsening poverty and income inequality, undermining democratization, lowering investment rates, and undermining representation.

This article delves into the intricate relationship between corruption, natural resources, and economic growth. By examining the mechanisms through which corruption infiltrates the resource sector, Understanding these dynamics is crucial for policymakers, investors, and citizens alike, as it provides the impetus to combat corruption and unlock the true potential of natural resources as catalysts for economic development. In our research, we stress the need to underscore the urgency of addressing corruption in the context of natural resource management. By highlighting the hidden costs and negative impacts of corruption, we advocate for transparent and accountable governance frameworks, robust anti-corruption measures, and international cooperation to combat this pervasive issue. Only through concerted efforts to eradicate corruption and promote responsible resource management can countries harness the potential of their natural resources to foster sustainable economic growth.

2. Literature Review

The intricate relationship between corruption, natural resources, and economic growth has been a subject of extensive research and analysis in the fields of economics, political science, and development studies. This literature review aims to provide an overview of key findings and insights from scholarly work exploring the impact of corruption and natural resources on economic growth. By examining a range of studies conducted

across various countries and regions, we aim to identify common themes, challenges, and potential policy implications.

2.1. Corruption and Economic Growth

Numerous studies have established a negative correlation between corruption and economic growth Corruption distorts market mechanisms, deters investment, hampers the efficiency of public institutions, and undermines the rule of law, thereby hindering economic development. (Svensson, 2005) found that corruption lowers investment rates and reduces economic growth rates in developing countries. Similarly, (Mauro, 1995) indicat that corruption negatively affects per capita income growth. And this is confirmed by (Eatzaz , Aman ullah, & Arfeen , 2012) using An analysis based on the generalized method of moments estimation shows that a decrease in corruption raises the economic growth rate in an inverted U-shaped way. This result is robust with respect to alternative specifications of the econometric relationship. In the same direction (Gründler & Potrafke, 2019) showed that the cumulative long-run effect of corruption on growth is that real per capita GDP decreased by around 17% using new data for 175 countries over the period 2012–2018.

Several new recent studies in the field has consistently reported a negative correlation between economic growth and the level of corruption like (Erum & Shahzad, 2019; A. Urbina & Rodríguez, 2021; Beatrice D & Siphiwo , 2023), and the evidence for beneficial effects on growth has been scarce at best.

2.2. Natural Resources and Economic Growth

Natural resources are one of the most important factors encouraging a country's economic growth and development. Numerous studies have been conducted on the the relationship between resource availability and economic growth, is a topic of considerable debate and the results have been conflicting. The "resource curse" hypothesis suggests that countries rich in natural resources tend to experience slower economic growth, increased income inequality, and political instability. Studies such as (Warner & Sachs, 1995) and (Auty, 2001) have found evidence supporting this hypothesis, attributing the negative effects to factors such as Dutch disease, rent-seeking behavior, and institutional weaknesses. And this is confirmed by (Adebayo, Akadir, Radmehr, & Awosusi , 2023) According to a study on a number of emerging economies, such as the MINT (Mexico, Indonesia, Nigeria, and Turkey), natural resources have a positive impact on economic growth in those nations while having a negative effect in Indonesia and Turkey.

But from another point of view, numerous researchers believe that efficient utilization of resources helps to realize economic objectives, such as economic growth and access to economic well-being such as the study of (Tabash , Mesagan, & Farooq, 2022) who provided solutions to counteract the negative effects of resources on economic growth, by calling for more focus by policy officials on economic complexity to harvest the advantages from available natural resources.

2.3. The Interaction between Corruption, Natural Resources, and Economic Growth

The interaction between corruption, natural resources, and economic growth presents a complex dynamic. Various studies have explored this relationship, highlighting both the direct and indirect effects of corruption on resource-rich economies. Leite and Weidmann (1999) found that corruption magnifies the negative impact of natural resources on economic growth, exacerbating income inequality and impeding institutional development.

Rent-seeking behavior is a key mechanism through which corruption infiltrates the natural resource sector. Tanzi and Davoodi (1997) emphasized the role of corruption in misappropriating resource revenues, leading to the misallocation of funds and hindering economic diversification. Additionally, De Soysa and Fjelde (2010) argued that corruption hampers the efficient management of natural resources, resulting in reduced productivity and long-term economic growth.

However, a few studies have also presented contrasting perspectives. Mehlum et al. (2006) proposed that corruption could have a positive effect on economic growth in resource-rich countries, as it can facilitate resource extraction and attract foreign direct investment. Similarly, Habib and Zurawicki (2002) argued that the resource curse may not be universal and that well-managed resource wealth can lead to economic growth.

3. Theoretical Framework of corruption- economic growth / natural resource- economic growth

3.1. The relationship between corruption and economic growth

Corruption is a pervasive and complex social, economic, and political issue that has plagued societies throughout history. The precise definition of corruption is "the misuse of public power for private gain." (Erum & Shahzad, 2019)**.** Often involving bribery, fraud, embezzlement, nepotism, and other illicit practices. Corruption undermines the principles of fairness, transparency, and accountability, leading to significant economic and social consequences.

Corruption often flourishes in political systems where power is concentrated and accountability is weak. Politicians and public officials may engage in corrupt practices, such as bribery or favoritism, to gain political advantages or secure financial support. This undermines democracy, erodes public trust, and distorts policy-making processes.Corruption is not limited to the public sector; it also permeates the corporate world. Unethical business practices, such as bribery, fraud, and insider trading, undermine fair competition and distort markets. Corporate corruption scandals have highlighted the need for stricter regulations, enforcement, and corporate governance reforms. International organizations, governments, civil society, and individuals have recognized the need to combat corruption. Initiatives such as the United Nations Convention against Corruption, transparency measures, whistleblower protections, and increased public awareness have been crucial in the fight against corruption. However, progress remains uneven across countries.

Many studies have examined the impact of corruption on economic growth from theoretical perspectives of the relationship (for better detailed discussion see (Khan. M, 2002)). **Figure 1** represents the realistic relationship between the level of corruption and the progression of economic growth in many models of countries around the world.

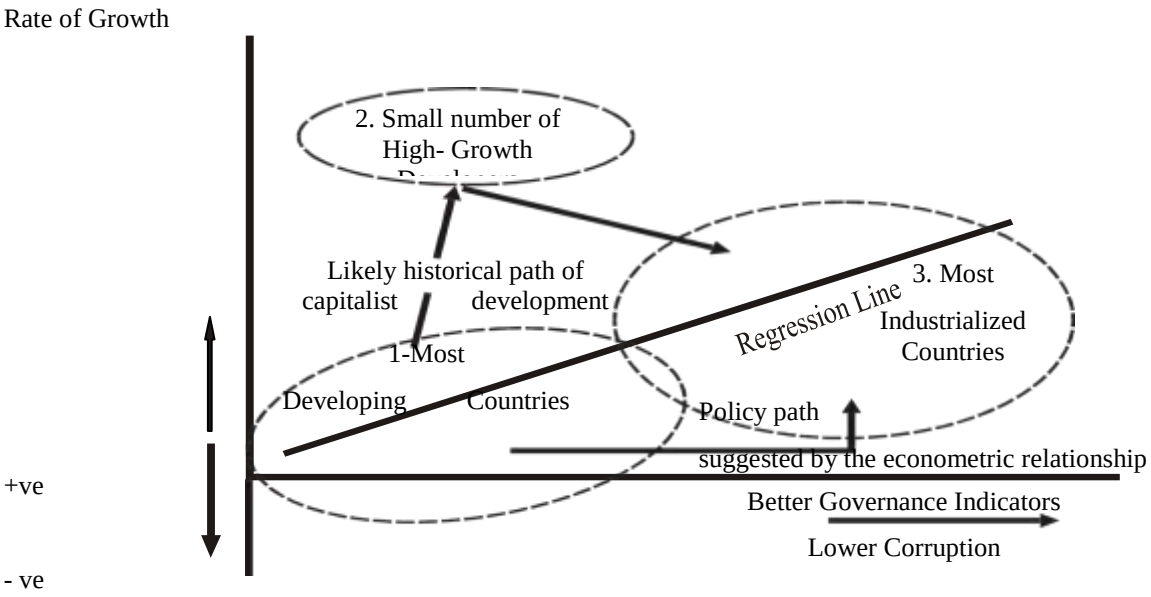


Figure 1. The dynamic relationship between corruption and economic growth

Source : (Khan. M, 2002)

This vision indicates the relationship between corruption, economic growth, and governance observed during the last two decades, Where it is noted that the majority of developing countries fall under Group 1, with low growth, poor governance, and corruption indicators. The majority of developed countries are in Group 3, with moderate growth and better indicators of governance and corruption. Since most countries are grouped in Group 1 or Group 3,

With a more precise vision, (Eatzaz , Aman ullah, & Arfeen , 2012) According to an analysis based on the generalized method of moments estimation, shows that a decrease in corruption raises the economic growth rate in an inverted U-shaped way. **Figure 2**

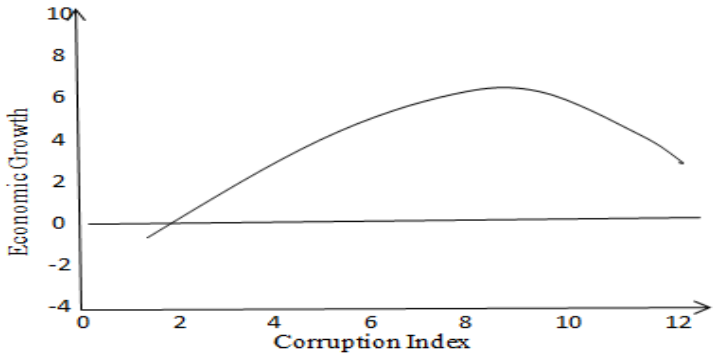


Figure 2. Relationship between corruption and economic growth

Source : (Eatzaz , Aman ullah, & Arfeen , 2012)

As a result, economic growth rates continue to increase, but they eventually reach a point where corruption indicators reach high values, which is considered a negative for them. In other words, the indicator of corruption has a negative impact on the rate of economic growth.

3.2. The relationship between natural resources and economic growth

The relationship between natural resources and economic growth can be complex and multifaceted. On one hand, natural resources can serve as a significant driver of economic growth, providing inputs for various industries and contributing to export revenues (Balassa, 1980; Christa & Brunnschweiler, 2008; Tiago, Kamiar , & Mehdi , 2011; Hasanov, Ruslan , Taskin , & Elchin , 2023). On the other hand, an overreliance on natural resources can create challenges such as resource curse (Richard & Auty, 2007; Chang , Irfan, Asif , & Vishal , 2022; Shiyan & Zhijie , 2022; Bello Ajide, 2022). In the same context,also (Edward. B, 2019) contributed an important study, which included a curve that precisely reflects the relationship between resources and economic growth. **Figure 3** represents the impact on economic growth caused as a result of natural resource booms.

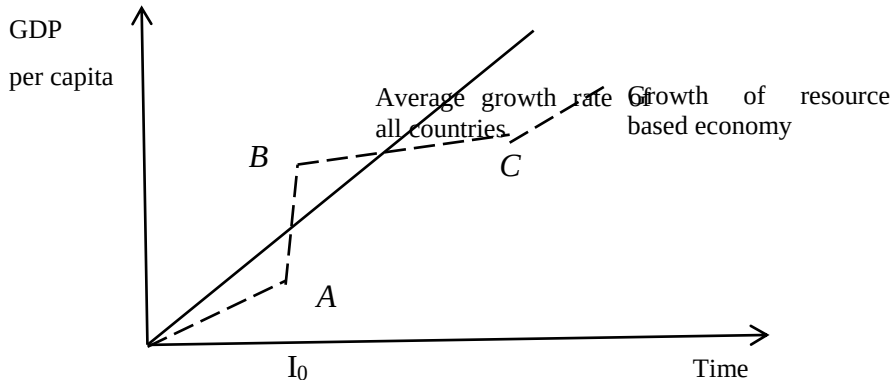


Figure 3. The dynamic relationship between natural resource and economic growth

Source : (Edward. B, 2019)

The resource-based economy is growing at a slower rate than the global average. However, the natural resource-based economy may experience a commodity price boom or the discovery of additional lucrative resource reserves in the future. As a result, there is a one-time windfall gain and an instantaneous increase in GDP per capita (line AB). However, this gain will result in even more scarce economic resources being shifted to the natural resource sector, slowing growth (line BC). The natural resource-based economy may eventually return to its pre-boom growth rate, but its GDP per capita will be even lower than the global average, and its lower growth rate will generate further divergence from other economies' per capita incomes.

4. An econometric analysis of the relationship between corruption, natural resources and economic growth

In this part, we perform an econometric analysis of the dynamic relationship between corruption, economic growth, and natural resources in Algeria during 2003 to 2021, which is highlighted by the government's adoption of a new development policy in contrast to what had previously occurred. Implementing comprehensive development projects in light of available financial resources, mostly through oil income.

4.1. Data, model and methodology

4.1.1. Data description and Model specification

The study focused on the descriptive and quantitative approaches for estimate. The study's data includes some variables has been taken from various sources like: the World Bank database, Transparency International, the Algerian Ministry of Finance, Unctad, the National Bureau of Statistics (NBS), Statista web site; and other sources.. We tested using the Eviews 12 program and used quarterly data from ($2003Q_1$ to $2021Q_4$). The choice of the period is purely determined by data availability.

Moreover, our empirical analyses require dataset involves seven independent macroeconomic variables and an dependent variable. The description of the variables is given in Table 1

Table 1. Summary of study data and sources

Variable	Description	Source
GDPC	GDP Per Capita (Coonstant)	World Bank https://data.worldbank.org/indicator
CPI	Corruption Perception Index	Transparency International https://www.transparency.org /
IEF	The Index of Economic Freedom	Statista https://www.statista.com/
FCF	Fixed capital formation	
NR	Total Natural Resoures Rents (% of GDP)	World Bank https://data.worldbank.org/indicator
G	General government spending	Algerian Ministry of Finance https://www.mf.gov.dz/
TO	Trade Openness	Unctad https://hbs.unctad.org/trade-indicators/

Source: Summarized by the authors.

The following equation represents the econometric expression of the interdependence of the relationship between corruption, natural resources, and economic growth

$$GDP = \beta_{0+} \beta_1 CPI_{+}\beta_2 IEF + \beta_3 FCF + \beta_4 NR + \beta_5 To + \beta_6 G + \beta_7 G + \beta_8 TO + \varepsilon$$

4.1.2. Methodology

The authors of the paper examines the dynamic relationship between corruption, natural resources and the performance of economic growth in Algeria during $2003Q_1$ to $2021Q_4$ using The Autoregressive Distributed Lag (ARDL) model. But in other studies, have preferred to adopt many approaches that are less precise like the method of simple OLS estimation.:

We employ the Autoregressive Distributed Lag (ARDL) model to perform empirical analysis. Overall, The ARDL model developed **by** (Pesaran & Shin, 1995) is a seminal work that introduced the model and its estimation procedures. It has significantly contributed to the field of econometrics and remains widely cited and utilized in empirical research.

The ARDL approach is a time series econometric technique that allows for both short-run and long-run relationships between variables. It is a generalization of the autoregressive model (AR) and the distributed lag model (DL).. The ARDL model is one of the most widely used and accepted econometric methods of analysis.The variables must be stable at different levels. The model has many characteristics, with the exception

of the second difference. With little samples, it works well. When the underlying variables are included in the equation (1) and (2). The general ARDL model can be represented as follows:

$$y_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{p} \varphi_t \, y_{t-i} + \beta' x_t + \sum_{i=0}^{q-1} \beta_i^{*\prime} \Delta x_{t-i} + u_t, \quad (1)$$

$$\Delta x_t = P_1 \Delta x_{t-1} + P_2 \Delta x_{t-2} + \ldots + P_s \Delta x_{t-s} + \varepsilon_t \quad (2)$$

Where x_t is the *k*-dimensional of (1) variables that are not cointegrated among themselves, u_t, and ε_t are serially uncorrelated disturbances with zero means and constant variance-covariances, and P_i are $k \times k$ coefficint matrices such that the vector autoregressive process in Δx_t is stable. We also assume that the roots of $1 - \sum_{i=1}^{p} \varphi_i z^i = 0$ all fall outside the unit circle and there exists a stable unique long-run relationship between y_t and x_t.

The previous equations captures the relationship between the current value of the dependent variable (Yt) and its lagged values, as well as the lagged values of the independent variable(s) (Xt). The lagged terms allow for the analysis of both short-run and long-run effects, capturing the dynamics and persistence in the relationship between the variables.

(Pesaran & Shin, 1995) introduced the Bound Test, which is a new method for testing the co-integration between the variables of the research in the unrestricted error correction model, , which is formulated as follows:

$$\Delta P_{it} = \beta_0 + \beta_1 P_{it-1} + \beta_2 S_{it-1} + \beta_3 FL_{it-1} + \beta_4 M_{it-1} + \sum_{j=0}^{n} \gamma_j \Delta(p_i)_{t-j} + \sum_{k=0}^{m} \delta_k \Delta(S_i)_{t-k}$$

$$+ \sum_{i=0}^{o} \theta_i \Delta(FL)_{t-1} + \sum_{r=0}^{n} \varphi_r \Delta(M)_{t-r} + \mu_{it} \quad (3)$$

The Bounds test determining the the possibility of existence of simultaneous integration between the variables of the study by computing the F statistic through the following cases below:

if:

- F-statistic > I(1) In this case we assume that there is a cointegration relationship
- F-statistic < I(0) In this case we assume that there is no cointegration relationship
- F-statistic > I(0) < I1 The situation is confused, unclear or inconclusive.

Here are some of the advantages of using ARDL models:

- This model is very popular in macroeconomic analysis because it allows researchers to study the relationship between any quantitative variables
- They can be used in policy analysis and forecasting, as it provides insights into the dynamic behavior of variables over time.
- They can be used to analyze relationships between variables that are non-stationary, or that have different orders of integration.
- allowing for the analysis of both immediate and lagged effects of the independent variable(s) on the dependent variable. This makes it particularly useful in capturing both short-term and long-term dynamics of the relationship.
- They are relatively easy to estimate.

4.2. Econometric results and discussions

4.2.1. Description statistics

Table 2 indicates that the variables showed significant volality over the course of the study period. Following is an explanation of the results.

Table 2. Descriptive statistics for the study variables

	CPI	FCF	G	GDPC	IEF	NR	TO
Mean	32.00	33.47	36.64	427.74	51.92	23.83	63.02
Median	32.54	35.57	37.53	427.01	51.19	24.40	63.58
Maximum	36.31	43.15	46.16	459.27	58.77	34.35	77.07
Minimum	25.62	21.84	26.84	377.03	44.57	12.62	44.80
Std. Dev.	3.36	6.85	5.18	21.92	4.22	6.59	8.19

Source: The author calculations based on Eviews12 program

The variables in the study show distinct fluctuations between minimum and maximum values. The most important of these fluctuations are represented in Figure 2 as follows:

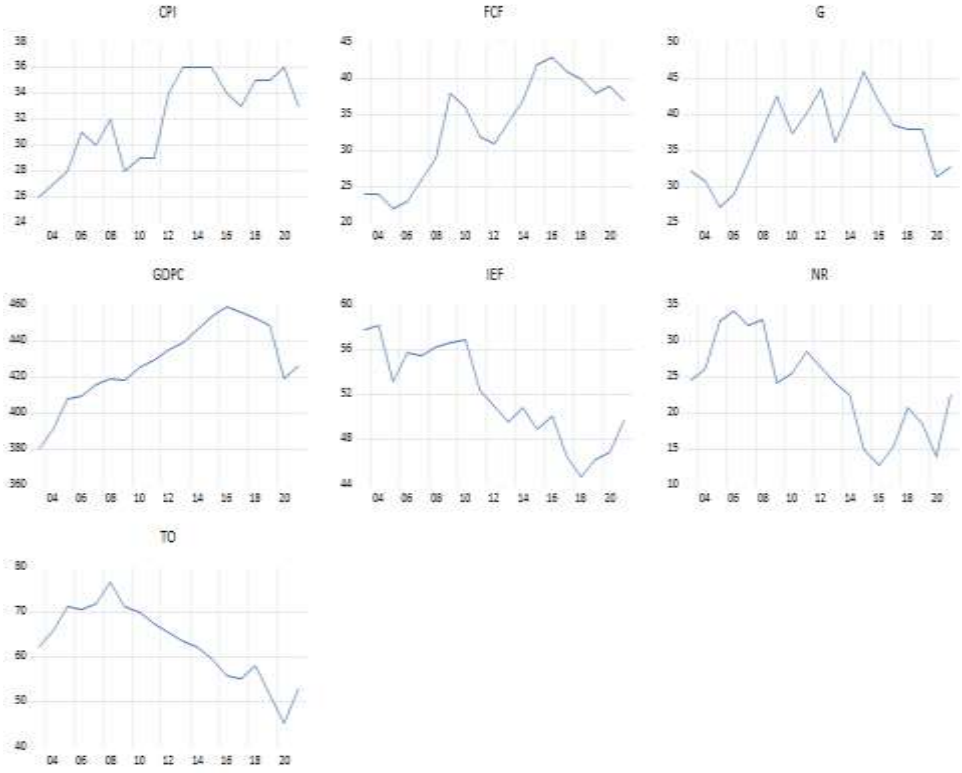


Figure 4. The study's variable graph.

Source: Summarized by the authors.

4.2.2. Time series stability test

Unit root tests in time series analysis are the tests that determine whether the variables have unit root (Aytekin, 2022). The variables employed in the study shouldn't contain a unit root in order to prevent the emergence of fake regression in time series analysis (Gujarati, 2011).

For testing the stationarity, we use the Augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1981) and Phillips Perron (PP) tests (Phillips & Perron , 1988) on the time series presented in our study. The results of the ADF Test Level are shown in **Table 3**, and the PP Test results are shown in **Table 4** as follows:

Table 3 shows the ADF Test results.

	Level			First Differences		
Variable	**ADF test statistic**	**Prob**	**Result**	**ADF test statistic**	**Prob**	**Result**
GDPC	-2.23224	0.196	No	3.31622-	0.017	I(1)
CPI	-2.25741	0.188	No	3.72822-	0.012	I(1)
IEF	1.84531-	0.356	No	2.95377-	0.044	I(1)
FCF	1.75790-	0.394	No	3.59422-	0.008	I(1)
NR	2.05807-	0.262	No	3.00692-	0.038	I(1)
G	2.28147-	0.180	No	3.40843-	0.043	I(1)
TO	2.01137-	0.281	No	3.61391-	0.044	I(1)

***Source**:* The author calculations based on Eviews 12 program

Table 4. presents the results of PP Test

	Level			First Differences		
Variable	**PP test statistic**	**Prob**	**Result**	**PP test statistic**	**Prob**	**Result**
GDPC	-2.34322	0.1615	No	3.45791-	0.012	I(1)
CPI	-2.02522	0.2757	No	4.22839-	0.001	I(1)
IEF	1.39494-	0.5804	No	4.72514-	0.002	I(1)
FCF	1.54049-	0.5078	No	3.66274-	0.007	I(1)
NR	1.59116-	0.4821	No	3.17394-	0.025	I(1)
G	1.86743-	0.3458	No	4.53365-	0.004	I(1)
TO	1.19755-	0.6717	No	2.80083-	0.030	I(1)

Source*:* The author calculations based on Eviews 12 program

The results of the unit root tests indicate that the study variables are integrated at the first differences. Given these results, the appropriate cointegration test is the bounds cointegration test proposed and developed by (Pesaran & Shin, 1995).

4.2.3. Optimal lag selection for a model

The results of optimal lag selection for a model can be represented through the **figure 5** below :

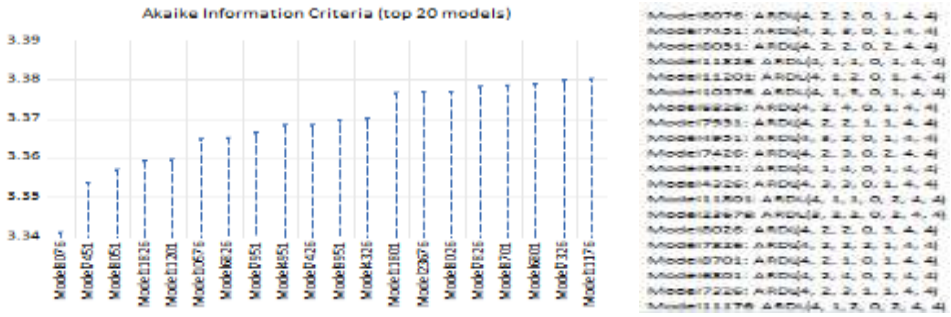


Figure 5. Optimal lag selection for a model

Source*:* The author calculations based on Eviews12 program

From the above graph it is clear that the lowest value of Akaike Criteria represents the result of optimal lag selection as follows: **(4, 2, 2, 0, 1, 4, 4)**

4.2.4. The bounds test for ARDL model

After determining the of optimal lag selection for a model, we determine whether or not there is an integration relationship between the variables, over the period studying. The results of The bounds test for ARDL model are given in the table below:

Table 5. presents the results of The bounds test for ARDL model

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.500670	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Source*:* The author calculations based on Eviews12 program

Through the above results, we compare the value of **F-statistic = 8.50** with the upper bound I(1) and the lower bound I(0).

In our case, **F-statistic = 8.50** (greater than the values of the upper bound I(1) at 10% = 2.94, and also greater at 5% = 3.28) , which means there is a cointegration relationship.

4.2.5. Estimating Short-Run and Long-Run relationship

The results are summarised in the **Table 6** below

Table 6. Estimation results for the Short and Long-Run relationship:

Selected Model: ARDL(4, 2, 2, 4, 1, 4, 4)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**P-Values**
ARDL Short-run Form Analysis				
D(GDPC(-1))	0.217299	0.066994	3.243549	0.0023
D(GDPC(-2))	0.150298	0.070853	2.121265	0.0396

D(GDPC(-3))	0.110958	0.065821	1.685748	0.0989
D(CPI)	-2.549279	0.233342	-10.92507	0.0000
D(CPI(-1))	0.577283	0.299198	1.929436	0.0596
D(FCF)	0.945916	0.333571	-8.831441	0.0000
D(FCF(-1))	0.801016	0.365464	2.191781	0.0333
D(G)	0.549178	0.112199	4.894675	0.0000
D(G(-1))	-0.370990	0.120962	-3.066986	0.0037
D(G(-2))	-0.324985	0.123418	-2.633205	0.0116
D(G(-3))	-0.279271	0.117293	-2.380978	0.0217
D(IEF)	0.692088	0.175725	3.938463	0.0003
D(NR)	-2.533173	0.335774	-7.544272	0.0000
D(NR(-1))	1.317818	0.340230	3.873320	0.0003
D(NR(-2))	0.780167	0.261367	2.984945	0.0045
D(NR(-3))	0.831348	0.233166	3.565475	0.0008
D(TO)	3.568905	0.303433	11.76177	0.0000
D(TO(-1))	-1.557376	0.343187	-4.537973	0.0000
D(TO(-2))	-0.962746	0.315672	-3.049827	0.0037
D(TO(-3))	-0.913554	0.287834	-3.173890	0.0026
CointEq(-1)*	-0.224227	0.025401	-8.827390	0.0000
R2	0.919935			
Adjusted R2	0.896643			
D-W	1.964783			
ARDL Long Run Form Analysis				
CPI	0.562665	0.513443	4.991135	0.0000
FCF	0.025062	0.517827	-1.979545	0.0535
G	0.267224	0.336626	3.764486	0.0005
IEF	0.857528	0.507876	-7.595416	0.0000
NR	4.712286	0.610518	-5.656482	0.0000
TO	3.606787	0.476878	7.563340	0.0000

C	39.2383	35.56986	11.02727	0.0000

Source*:* The author calculations based on Eviews12 program

- **Short-run Form Analysis**

The above results show that the error correction coefficient (CointEq(-1)*= -0.22), is significant with a negative sign. That is, 22% of short-term errors can be corrected in the first year of returning to equilibrium. The rest of the results are as follows:

- The Corruption Perception Index (CPI) is negative and significant, demonstrating an inverse relationship with economic growth in the short-term. According to the results shown in the preceding table, a one-unit increase in (CPI) corresponds to a 2.54 decrease in economic growth.
- The fixed capital index (FCF), which measures the volume of investment, has a positive and significant impact on economic growth. Where the results indicate that an increase of (01) unit of (FCF) to an increase of (0.94) in economic growth in the short run.
- General government spending (G) positively and significant affects on economic growth. Where the results indicate that an increase of (01) unit of (G) to an increase of (0.54) in economic growth in the short run.
- The index of economic freedom (IEF) positively and significant affects on economic growth. Where the results indicate that an increase of (01) unit of (IEF) to an increase of (0.69) in economic growth in the short run.
- The natural resources (NR) is negative and significant, demonstrating an inverse relationship with economic growth in the short-term. According to the results shown in the preceding table, a one-unit increase in (NR) corresponds to a 2.53 decrease in economic growth.
- The Trade Openness (TO) positively and significant affects on economic growth. Where the results indicate that an increase of (01) unit of (TO) to an increase of (3.56) in economic growth in the short run.

- **Long Run Form Analysis**

Based on the results provided in the preceding table, the equation shows the long-term relationship between the study variables as follows:

$$GDP = 39.23\_ 0.56\, CPI + 0.85\, IEF + 0.02\, FCF - 0.45\, NR + 3.60\, To + 0.26\ \mathrm{G}$$

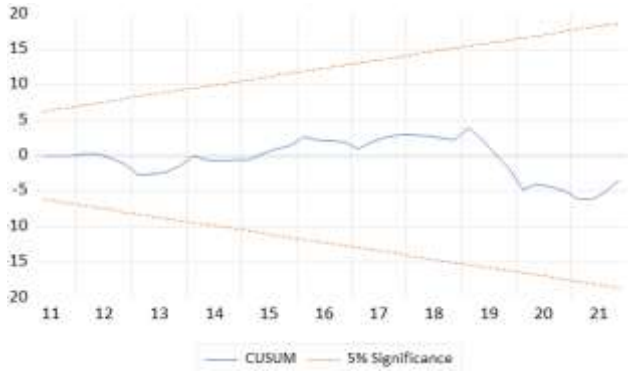
The Corruption Perception Index (CPI) and economic growth have an inverse relationship in the long run These outcomes agree with the results of the majority of previous research, which found that corruption slows economic progress in a number of developed countries. On the other hand, there is a direct relationship between indicators: The index of economic freedom (IEF), the fixed capital index (FCF), the Trade Openness (TO) and economic growth in the long term. This is because these variables contribute to advancing economic growth.

While the natural resources (NR) variable has a negative effect on economic growth in the long-term. The reason is that the Algerian economy is highly dependent on the oil and gas sector, which fluctuates from time to time.

4.2.6. Diagnostic test

4.2.6.1. Test of "CUSUM"

The results of test **"CUSUM"** can be represented through The **figure 6** below :



Source: The author calculations based on Eviews12 program

The above graph shows that the statistic of "CUSUM" Test is located within the critical limits, at a significant level of 5%, which confirms the existence of stability among the study variables.

4.2.6.2. Tests for constant error variance

The results are summarised in the Table 7 below

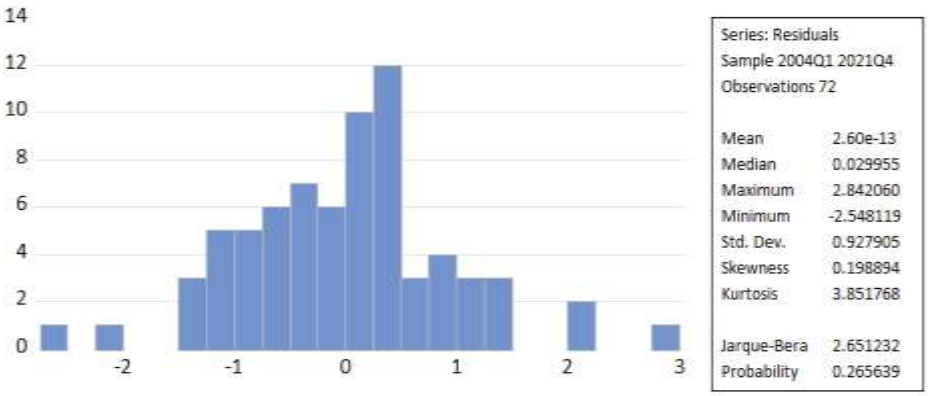
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	0.929751	Prob. F(23,48)	0.5629
Obs*R-squared	22.19044	Prob. Chi-Square(23)	0.5088

Source*:* The author calculations based on Eviews12 program

The above graph shows that the Obs*R-squared value = 22.19, with a probability of 0.50, is greater than 5%. This shows that the null hypothesis, indicating that the variance of the residuals is constant.

4.2.6.3. Residual Normality Test

The results of « **Residual Normality Test »** can be represented through The **figure 3** below :



Source*:* The author calculations based on Eviews12 program

The above graph shows that the Jarque-Bera value = 2.65, with a probability of 0.26, is greater than 5%. This shows that the null hypothesis, indicating that the model's residuals follow a normal distribution, is accepted.

5. Conclusions

The authors of the paper examines the dynamic relationship between corruption, natural resources and the performance of economic growth in Algeria, using The Autoregressive Distributed Lag (ARDL) model, during $2003Q_1$ to $2021Q_4$. The ARDL approach is a time series econometric technique that allows for both short-run and long-run relationships between variables. It is a generalization of the autoregressive model (AR) and the distributed lag model (DL). The ARDL model is one of the most widely used and accepted econometric methods of analysis. The results of this study showed that the variables: fixed capital index (FCF), general government spending (G), index of economic freedom (IEF) and Trade Openness (TO) positively and significant affects on economic growth in the short and long run, but with small values. On the other hand, the study concluded that the corruption index and natural resources had a negative effect on Algerian economic growth in the short and long term. These results are important because they show that variables such as FCF, G, IEF, and TO have a positive effect on Algeria's economic growth. While signs with a negative influence, such as an indicator of corruption, must be minimized and eliminated by the government. On the other hand, there is a need to diversify the economy's resources and change from dependence on the oil and gas sector and toward the development of the agricultural and tourism sectors in order to accelerate economic growth rates.

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