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Granger Causality Between Economic Growth And Governance In The MENA Region: A Panel Data Approach

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Abstract :
This study examines the causal relationship between institutions and economic development using a panel Granger causality test. The empirical results based on 24 countries show that there is a bi-directional causality between institutions and economic development. The findings also suggest that causality patterns between institutions and economic performance vary at different stages of income level. Better institutional quality fosters economic development in higher income countries, whereas economic development tends to enhance institutional quality in lower income countries.
Determining cointgration is essential to understand the long-term equilibrium between economic variables. The purpose of this paper is to determine the nature of the relationship between economic growth and governance quality (corruption, democracy and political stability) in the MENA region during the 1984-2019 period. The results point to a two-way relationship between governance quality and economic growth.

Keywords : Growth; Granger causality; Corruption; Democracy; Political stability.

1 – Introduction

The concept of good governance has been widely discussed in the literature (Agere, 2000; Graham et al., 2003a; Armstrong et al., 2005; Andrews, 2008; Bovaird et Löffler, 2009). Good governance is one of the models thatthe public sector should aspire to (Armstrong et al., 2005). It is a process by which companies and organizations make important decisions, select key participants and hold them accountable for their actions. The process is difficult to observe. Agreements, procedures, conventions and policies are drafted to delegate authority, describe decision-making and enforce accountability (Graham et al., 2003a) . In some cases, good

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governance refers only to the effective implementation of policies, not to outcomeslike democratic accountability or civil liberties. Generally, good governance distinguishes three dimensions: political, administrative and judicial, where the first denotes access to authority and the last two relate to the exercise of authority (Kaufmann et al., 2010). Etsy Daniel (2006) indicates that good governance is the process by which public institutions conduct public affairs, manage public resources and guarantee the preservation of human rights in a manner that is essentially free from abuse and corruption, while respecting rule of law. Good governance means moving away from corruption, inefficiency, maladministration, secrecy and red tape to promote accountability, transparency and governance, efficiency, inclusiveness, fairness and responsiveness (Stoker, 1998; Graham et al., 2003a,b; UNESCAP, 2008). Good governance should be approached at the national level (Devaney, 2016), but it can also be assessed at company, municipal or continental levels. Principles that promote good governance are governance policies, infrastructure and actions that support the implementation of good governance measures (Gross and Źróbe, 2015). In general; good governance indicates that citizens and their security are ensured by law, which is guaranteed, inter alia, by the independence of the judiciary, referred to as "rule of law". Moreover, public expenditure should be properly and fairly managed by public authorities and that information should be accessible to all citizens. There are three different dimensions of good governance from a citizens' perspective. First, good governance requires control of political and bureaucratic structures and functions to limit arbitrary actions and corruption. Second, it protects freedom of political affiliation and participation. Third, it monitors the exercise of authority in managing economic and social resources for the formulation of policies. These dimensions are widely accepted, but good governance indicators may vary depending on the environment, society, size of economy, tradition, religion, etc.In addition, in recent years citizens' trust in government and political organizations has seen a set backin both developing and developed countries (Cheema and Popovski, 2010).

Decrease in public trustand its adverse effects on government and society have been a major concern for politicians, journalists and citizens (Bok, 2001). Due to lack of political trust, citizens have become dissatisfied with the public system, which fulled their doubts about the usefulness of the political process as a whole, leaving behind a fragile State that may be unabletopursue its duties of promoting sustainable development objectives (Diamond, 2007). Anello (2006) indicated that corruption as a major form of unethical practices and as "the greatest obstacle to economic and social development." Corruption puts a limit on social and economic capital, preventing governance mechnaismsto function effectively, thus offsetting citizens' trust. A State withsound governance mechanisms can restore public trust and economic efficiency by implementing social protection programmes. The strength of the relationship between good governance and citizens' trust can easily be destroyed by corruption. Therefore, corruption can restrict the development of domestic politics, economies and societies.

Then, this paper is structured as follows: section 2 reviews the relevant literature and develops the hypotheses to be tested. Section 3 briefly describespanel stationarity, cointegration and causality tests. Section 4 reports the empirical findings. Finally, section 5 concludes the paper.

2 – Literature review and hypotheses development

The first models on the causes of corruption, which emerged in the early 1970s, have examined the market for corruption using microeconomic assumptions. These models have traditionally relied on inputs from information economy and agency models. This section provides a brief overview of the literature on the economics of corruption. Initially, it presents the concept of corruption while distinguishing it from similar concepts. In a second stage, it examines the concept within the public sphere focusing on the decision-making process duringstate budget preparation. The economics literature has long sought to define corruption, to explain its specificities compared to other forms of informalprofit seeking and to distinguish different types of corruption. The definition of corruption raises the issue of identifying a construct, secret in essence, and its different manifestations and borders.There is fairly a broad consensus that corruption is understood to be the misappropriation of resources to the benefit of a third party, who offers reward for it[3].It may thus be corrupt if an agent misuses a delegated authority to derive personal benefit.[4] As a result, corruption is a particular form of informal-profit seeking whereby some agents take ownership of collective wealth by manipulating the rules of economic activity; the corrupter seeks annuity when they pay bribes and the corrupt when theyexploit resources which they should not legally benefit from (Krueger, 1974; Tollison, 1982).[5]

As a result, corruption primarily relates to the exercise of discretion that feeds on information asymmetry. It is a "real black market of property rights" (Benson, 1981) which is essentially of interest to the public sector in which officials use the civil service to receive bribes in exchange for preferential treatment to a private actor (Rose-Ackerman, 2004).[6] The first models of corruption bear on the different microeconomic assumptions about corruption.[7]

These models have traditionally relied on inputs from information economy and agency models. These are models in which an agent (public servant) uses the authority delegated to them by the principal (community) to derive a personal benefit from the sale of public goods or services. The agent is corruptible to the extent that they can conceal their corruption from the principal a priori (Becker et Stigler, 1974; Banfield, 1975; Rose-Ackerman, 1975 et 1978; Klitgaard, 1988).

Motivation of the agent to be corrupt is based on a cost-benefit analysis. There is thus a corruption market where public goods are illegally exchanged for bribes. If the value of illegality is greater than the value of honesty, the agent will tend to engage in an illegal conduct

[3]For a discussion of definitions, see Amundsen (2000) and Michael Polner (2008).

[4]In order to be classified as corrupt, an act must be prohibited by law (legality criterion), contrary to public interest (even if legal), and viewed as such by public opinion (Pertes and Welch, 1978). For reasons of simplicity, but also to facilitate the transposition of several pre-existing theories of crime and deterrence, the economics literature generally uses the legality criterion to qualify an act as corrupt or not (Dallavanddeeee).

[5]informal-profit seeking is the extraction of pre-existing resources without producing value in return. Informal-profit seekers exploit a gap that may, for example, come from barriers to entry into a market or from a competitive advantage (Cartier-Bresson, 1997). The most classic example of informal-profit seeking is that of lobbying or influencing in order to obtain implementation of tariffs, for example. Monopoly privileges are also forms of informal-profit seeking (Dallavande, 2007).

[6] Delegation can take place within the framework of private law, giving rise to forms of private corruption: collusion between companies and misuse of responsibility for one's own benefit. See Argandoña (2003) and Svensson (2005) for further analysis of private corruption.

[7] A second stream of economic analysis of corruption presents, within the macroeconomic assumptions of endogenous growth models, comparative empirical studies on the causes and effects of corruption.

(Becker, 1968).[8] On the other hand, the corrupt could incur moral (reputable) costs and incur financial penalties if detected. Moreover, the corruption pact that structures the corruption market creates new forms of incentives geared towards the misuse of discretion. In the presence of sanctions, the higher the risk of detection, the lower the tendency to be corrupt (Irlenbuschand Renner, 2002).

However, to the extent that information asymmetry protects officers and judicial evidence is scarce, the likelihood of sanctions becomes relatively low. Similarly, the passive attitude of victims towards agents who profit from corruption is also an additional factor that promotes corruption. Lack of sense of responsibility of agents and lack of moral stigmatization of acts by social norms can only amplify this phenomenon (Klitgaard, 1988). One way to reduce the opportunistic behaviour of the agent would then be to offer them a non-corruption salary in the form of a bonus equal to the expectation of gain associated with corruption (Becker et Stigler, 1974; Besley et McLaren, 1993).

Corruption in the civil service creates dysfunctions in public decision-making and limits the ability of the State to perform its functions.[9]

Corruption, for example in public procurement, often involves both politicians and public officials (Bradhan, 2006). Economic studies of bureaucracy and public decision-making (Rose-Ackerman, 1978) show how corruption develops by bringing political, bureaucratic and economic markets together. Thus, although corruption is often understood as transactional in nature, it can also manifest itself in powerful networks between business and government that can effectively translate into the privatization of public policy.

The literaturehas introduced a distinction between the "capture of the state" denoting the seizure of power by businessmen - for example, through the hidden financing of parties - and the appropriation of the legal system and wealth by political power - through corruption in public procurement (Jonston, 2002; IMF, 2016). Corruption leads to adverse effects on the process of social and economic development and on the prospects for achieving sustainable development and investment (Mauro,1995).Ghalwash (2014) showed that corruption impacts economic development negatively in Egypt. Ibrahim et al (2015) also supported the conclusion of Mauro (1995). Similarly, Yun et al. (2015) presented a negative relationship between the two variables in the long run.

In countries where governance systems are inefficient, corruption compensates for institutional weaknesses and the effects of heavy bureaucracy by providing an opportunity for companies to reduce administrative barriers to entry and transaction costs that require them to comply with excessive regulations (Méon and Sekkat, 2005; Houston, 2007; Méon and Weill, 2008; Dreher, 2012). Apart from these few references, there is a broad consensus in the economics literature on the negative effects of corruption on growth and economic development. Many empirical

[8] Shleifer and Vishny (1993) distinguish between "corruption without theft" in which the benefit to the public official does not come from public resources but from private resources (bribes) and "corruption with theft" in which there is a detour of public funds insofar as the commission paid by a company to the public official is included in the amount of the public contract.

[9] In Musgrave's typology (1959), the state intervenes in the economy to fulfill three main functions: a resource allocation function (optimal use of scarce resources), a redistribution function (distribution of wealth with a view to achieve a certain equity) and a function of stabilizing economic activity (full employment and price stability).

studies have shown that countries with high levels of corruption consistently show poor economic performance.

This is particularly relevant for developing countries where governance criteria are generally poorer than in industrialized countries (Tanzi, 2002; Gyimah-Brempong, 2002; Svensson, 2005; Ndikumana, 2007; Rothstein et Holmberg, 2011; Ugur et Dasgupta, 2011).Corruption also has an indirect effect on growth and economic development. Studies have long identified a number of channels through which this impact goes (Mauro, 1995; Tanzi, 1997; Gupta, 2000; Gyimah-Brempong, 2001).

Corruption undermines tax collection capacity and thus has negative budgetary consequences. Indeed, several empirical studies have shown that corruption reduces the tax-to-GDP ratio and weakens tax structure and undermines the morals of taxpayers, leading to an increase in the share of the informal economy and reduces the income base of a country (Dreher et Herzfeld, 2005; Attila, 2008; Nawaz, 2010). Similarly, Tanzi and Davoodi (2000) have shown that corruption negatively and statistically correlates with income tax, VAT, sales taxes and turnover taxes. Studying a panel of Asian companies, Fuest and ali. (2010) found that corruption in the public sector has a significant negative impact on corporate tax payoffs. This conclusion is particularly relevant for small and medium-sized enterprises that succeed in reducing their taxes in corrupt environments. Large multinational companies respond to corruption in the public sector by choosing to invest in other countries thus showing the opportunity costs of corruption.Song et al (2020) found that there is a causal relationship between long-term economic growth and corruption in developing countries (sample from 2002 to 2016). Moreover, Ahmadov and Guliyev (2016) suggest a mechanism to explain why democracy can be detrimental to growth.They argue that in young democracies there are more opportunities for informal-profit seeking and corrupt activities than in autocracies because they involve a larger number of stakeholders. Indeed, while in established democracies there are institutional "barriers" against misallocation of resources, these safeguards are lacking in young democracies. As a result, these informal-profit seeking activities, by wasting public and private resources, impede growth. Empirically, the literature has poited to a significant correlation between governance quality and economic growth. For instance, according to Olson et al. (2000), governance quality is the core foundation of economic growth. Liu et al. (2018) found that higher governance quality brings high-speed economic growth.

Studies have shown significant positive correlations between economic development and political stability (Al Mamun M, Sohag K, Hassan MK (2017), Kaufmann D, Kraay A (2002), Rothstein B, Teorell J (2008)). Scholars such as Zhou(2007) found significant correlations between rapid economic growth and political centralization. Haggard et al. (2008) and several others have emphasized the logical association of the rules of law with economic growth, which is then fueled by property rights, trade, investment support, and integrity of contracts (see also, (2011)). Allen et al. (2005), Rothstein (2015), and Wilson (2016) offer a counterexample of Chinese rapid economic growth and its causal link with governance quality. Hajj Fraj et al. (2018) argue that economic growth is accelerated by good governance only if the country applies standard exchange rate regimes. However, some studies have found no causal relationship between governance quality and economic growth. For example, Huang and Ho(2017) found no causality effect between political stability and economic growth in “free”

Asian countries, except South Korea, while "partly free" countries, except Indonesia and Thailand, as well as "not free" countries, show causal effects from political stability to economic advancement. According to Dzhumashev(2014), efficiency of public spending is shaped by an interaction between governance and corruption. The author also emphasizes that corruption diminishes with an increase in economic growth. Accordingly, we formulate the following hypotheses:

Hypothesis 1. Institutional quality promotes economic growth in the MENA region.

Hypothesis 2. There is a bidirectional causal relationship between institutional variables (democracy, corruption and political stability) and economic growth.

3 –Research methodology

The study focuses on determining the short and long term relationship between corruption, political stability, democratic accountability and economic growth. Like Mehrara et al. (2011), Rajeshkumar et al. (2014) and Kurt (2015), we developed an econometric model based on standard Cobb Douglas production function with constant incomes and the aggregate time series output function, expressed as follows:

$$Y_t = AK_t^{\alpha} L_t^{\beta} e^{u} \qquad (3.1)$$

where denotes GDP per capita, $e^{u}$is error term thenα and$\beta \in [0,1]$ indicate constant returns to scale and represent output elasticities. Empirically, to study the relationship between economic growth, corruption and political stability, we estimate the following model:

$$LGDP_t = \beta_0 + \beta_1 SG_t + \beta_2 CORR_t + \beta_3 DA + \upsilon_t \quad (3.2)$$

Where, LGPD is the logarithm of GDP per capita growth, CORR is corruption, DA is democratic accountability and SG is political stability.

Unit root and cointegration tests on time series panel data are indeed more powerful than their analogues on individual time series in small samples. However, one of the difficulties lies in the form of the necessary heterogeneity to be taken when developing the hypotheses to be tested. The most frequently used tests (first generation tests),are Levin and Lin (2002), Im, Pesaran and Shin (IPS, 2003) and Maddala, Wu(1999).

3.1.1. Test of Levin Lin et Chu (LL ,2002)

This test is based on two main assumptions: homogeneity of the autoregressive root but also independence between individuals. The authors' approach is directly similar to the unit root tests in time series of Dickey and Fuller. The authors consider three models to test the presence of unit root.

$$\text{Model 1 : } \Delta y_{i,t} = \rho y_{i,t-1} + \sum_{s=1}^{\rho_i} y_{i,s} \Delta y_{i,t-s} + \varepsilon_{i,t} \quad 3.1$$

$$\text{Model 2 :} \Delta y_{i,t} = \alpha_i + \rho y_{i,t-1} + \sum_{s=1}^{\rho_i} y_{i,s} \Delta y_{i,t-s} + \varepsilon_{i,t} \quad 3.2$$

$$\text{Model 3 :} \Delta y_{i,t} = \alpha_i + \beta_i t + \rho y_{i,t-1} + \sum_{s=1}^{\rho_i} y_{i,s} \Delta y_{i,t-s} + \varepsilon_{i,t} \quad 3.3$$

With i=1,…, N et t=1,…, T and/or error term $\varepsilon_{i,t}$ are independently distributed across individuals i and follow a stationary and invertible ARMA process admitting an AR (∞) representation of the type :

$e_{i,t} = \sum_{k=1}^{\infty} \theta_{i,k}\varepsilon_{i,t-k} + u_{i,t}$ 3.4

3.1.2. Test of Im, Pesaran and Shin (IPS, 1997):

These authors were the first to develop a test admitting, under the alternative hypothesis, not only heterogeneity of the autoregressive root ($\rho_j \neq \rho_i$), but also heterogeneity in the presence of a unit root in the panel. They examine a model with individual effects and no deterministic trend. In the absence of autocorrelation of residuals, this model is written:

Model 1 :$\Delta y_{i,t} = \alpha_i + \rho y_{i,t-1} + \varepsilon_{i,t}$ 3.5

The individual effect α_i is defined by $\alpha_i = -\rho_i y_i$ with $y_i \epsilon R$, $E_{i,t} \rightarrow N(0, \sigma_{i,t}^2)$. The IPS test is a joint test of the null hypothesis of unit root ($\rho_i = 0$) and the absence of individual effects because under the null hypothesis$\alpha_i = 0$.

The statistic is as follows:

$Z_{tbar} = \frac{\sqrt{N}(t_{N,T} - E(t_{N,T}))}{\sqrt{var(t_{N,T})}}$ 3.6

With$t_{N,T} = \frac{1}{N}\sum_{i=1}^{N} t_{it}$an average of the individual t-stats obtained during the implementation of a usual ADF test on time series. The moments $E(t_{N,T})$ and $var(t_{N,T})$ denote the expectation and variance of asymptotic ADF distribution under the null hypothesis of unit root ($\rho_i = 0$) with a model with a constant.

3.1.3. Test of Maddala, Wu (1999)

The principle of this test is based on a combination of the significance levels (i.e. p-values p_i) of N individual independent unit root tests. The Maddala, Wu (1999) test statistic is given by:

$P_{MW} = -2\sum_{i=1}^{N} \ln(p_i) \rightarrow \varkappa^2(n)$ 3.7

If the value of $P_{MW}$is greater than the threshold of one $\varkappa^2(n)$, we reject the null hypothesis of unit root for the individuals in the panel whatever sample size N.

3.2. Panel cointegration tests

Determining cointegration is essential to understand long-run equilibrium relationships between time series economic variables. This notion appeared with Granger(1981), Engel and Granger (1987)and Stock and Watson (1988). Finally, the error correction model (ECM) is only possible when the combination of these variables is stationary.

Several cointegration tests on panel data have been developed. The absence tests on panel data proposed by Pedroni (1995, 1997, 1999, 2003) are residual tests similar to the tests proposed by Engel and Granger (1987). The author developed a Phillips-Perron type cointegration test that admits strong heterogeneity. This test is contrary to the Pedroni tests where cointegration vectors are assumed to be homogeneous between individuals.

3.2.1. Pedroni test

The tests of absence of cointegration on panel data proposed by Pedroni (1995, 1997, 1999, 2003) are residual tests similar to the tests proposed by Granger and Engel (1987). The author developed a Phillips-Perron type cointegration test that admits strong heterogeneity. These tests

are based on the null hypothesis that there is no intra-individual cointegration. The implementation of the tests requires first estimating the long-run relationship:

$$y_{i,t} = \alpha_i + \delta_i t + \beta_{1i} x_{1,it} + \cdots + \beta_{Mi} x_{M,it} + \varepsilon_{it} \quad 3.8$$

wherei=1 ,…,N ;t=1,…,T et M=1,…,M, respectively, where N is the number of individuals, T is the number of observations, and M is the number of independent variables. Of the seven tests proposed by Pedroni, three are based on the Between dimension (inter-individual) and four on the Within dimension (intra-individual). Both categories are based on the null hypothesis of no cointegration :$\rho_i = 1 \; \forall$ i, ρ_i denotes the autoregressive term of the estimated residuals under the alternative hypothesis such that:

$$\hat{\varepsilon}_{i,t} = \rho_i \hat{\varepsilon}_{i,t-1} + \mu_{i,t} \quad 3.9$$

- For tests based on the inter-individual dimension, the alternative hypothesis :$\rho_i < 1 \; \forall$ i.
- For tests based on the within-individual dimension, the alternative hypothes is:$\rho_i = \rho < 1 \; \forall$ i.
- Thus, the test based on the inter-individual dimension is more general since it allows for the presence of heterogeneity between individuals under the alternative hypothesis.
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3.2.2. Test of Kao (1999)

This test does not allow for considering heterogeneity under the alternative hypothesis. It considers the following model with individual effects:

$$y_{it} = \alpha_i + \beta x_{it} + \varepsilon_{it} \quad 3.10$$

The first proposed test is a Dickey-Fuller type test applied to the estimated residuals $\hat{\varepsilon}_{it}$, which consists in testing the null hypothesis $\rho = 1$. In addition, the author proposed four Dickey-Fuller type statistics ($\hat{\varepsilon}_{it} = \rho \hat{\varepsilon}_{it-1} + \mu_{it}$). The second test proposed by Kao (1999) is an ADF test based on the following regression:

$$\hat{\varepsilon}_{it} = \rho \hat{\varepsilon}_{it-1} + \sum_{j=1}^{p} \varphi_j \Delta \hat{\varepsilon}_{it-j} \quad 3.11$$

3.3. Vector error correction modeling (VECM) and causality test (Granger test)

The concept of causality allows fordetermining the nature of the causal relationship between a pair of variables as well as its direction. In Granger's terms, a series y_{1t} causes another series y_{2t} , when present and past values of y_{1t} provide useful information that improves forecasting y_{2t} and y_{2t+h} at time t. Several tests are presented to test causality in time series and panel data. In the latter case, the Granger causality test is used provided that the pair of variables is cointegrated. The variables x_t and $y_t$should be cointegrated and admit error correction models (ECM). The Granger representation is as follows for each linear regression:

$$\Delta y_{it} = \mu_{yx} + \sum_{j=1}^{T_{11}} \alpha_{1j} \Delta y_{it-j} + \sum_{j=1}^{T_{12}} \beta_{1j} \Delta x_{it-j} + \eta_{yx} CE_{t-1} + \mu_{1it} \quad 3.12$$

$$\Delta x_{it} = \mu_{xy} + \sum_{j=1}^{T_{21}} \beta_{2j} \Delta y_{it-j} + \sum_{j=1}^{T_{12}} \alpha_{2j} \Delta x_{it-j} + \eta_{xy} CE_{t-1} + \mu_{2it} \quad 3.13$$

With :

Δ is the difference operator. The optimal number of lagsΔy_i and Δx_i is determined by the Akaike information criterion (AIC) or the Bayesian criterion of Schwartz. $\mu, \sigma, \beta et \eta$ are the regression parameters, μ_{1it} (i=1,2) are the error terms.$CE = y_{it} - \hat{\theta}_0 - \hat{\theta}_1 x_{it} = x_{it} - \hat{\theta}'_0 - \hat{\theta}'_1 y_{it}$ is the error correction term that measures the deviation of $y_{it}(x_{it})and x_{it}(y_{it})$ from the value of the long term equilibrium,η_{yx} and η_{xy} are the adjustment parameters that should be negative. This test's statistics is that of a classic Fischer statistics:

$$F_c = \frac{\frac{(SCR_c - SCR_{nc})}{p}}{\frac{SCR_{nc}}{(T-k-1)}} \rightarrow F_\alpha(p, T-K-1) \quad 3.14$$

with :

SCR_c : Sum of squares of constrained residuals.

SCR_{nc} : Sum of squares of unconstrained residuals.

P : the number of constraints.

K : the number of independent variables.

4 – Research and discussion of the Results

The sample used consists of 18 developing countries (Appendix 1) in the MENA region (Middle East and North Africa). The study period runs from 1984 to 2019. We used data collected from the World Bank database (2019) and ICRG (International Country Risk Guide; 2019). Tables 1 and 2 below report the descriptive statistics and correlation of the variables. The correlation coefficients show a strong negative relationship between corruption, democratic accountability and economic growth. In contrast, they show a positive correlation with political stability. All these correlation coefficients are significant at the 5% threshold. Moreover, the correlation coefficients between these variables and economic growth all have the expected signs.

Table 1 : Descriptive statistics of variables

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
LGDP	648	3.731929	0.5473008	2.452668	4.971805
CORR	648	2.560002	0.8763281	1	6
DA	648	2.692063	1.415551	0	6
SG	648	8.041818	2.18781	1.08333	11.5

Source: estimate made by the author using Stata 14

Table 2: Correlation between growth rate and explanatory variables

Variables	Coefficient	P-value
CORR	-0.182	0.000*
DA	-0.124	0.003
SG	0.286	0.000*

Source: Author's estimate using Stata 14: * Significant at 5% threshold.

4.1.Unit root test results

This section examines stationarity of the studied variables.In order to test for the presence of a unit root on panel data, we use three unit root tests.The tests most frequently used are based on the null hypothesis of the presence of a unit root: the test of Levin, Lin and Chu (2002[10]) is based on a common unit root process. A limitation of this test is the homogeneity of the autoregressive root under the alternative hypothesis. On the other hand, the tests of Im, Pesaran and Shin (IPS, 1997)[11] and that of Maddala and Wu (1999) [12]are based on an individual unit root process. Not only do these tests allow for the alternative hypothesis of the heterogeneity of the unit root but alsoheterogeneity as to the presence of a unit root. In a first step, we start with the second model with a constant and deterministic trend. For the latter, if we find that the variables are nonstationary, we opt for the difference, if not we choose a model with a deterministic tendency and without constant. The test results are summarized in the following table:

Table 3. Unit root panel tests

Variables	Levin Lin and Chu (LL, 2002)	Im, Pesaran and Shin (IPS,1997)	Maddala and Wu (1999)
LPIB	-3.164	-1.951	40.949
Δ(LPIB)	(0.000*)	(0.025*)	(0.262)
			202.369
			(0.000*)
SG	-0.654	2.720	9.500
	(0.256)	(0.996)	(1.000)
Δ(SG)	-10.155	-10.529	357.430
	(0.000*)	(0.000*)	(0.000*)
DA	-0.871	-0.314	24.172
	(0.191)	(0.376)	(0.933)
Δ(DA)	-8.624	-7.511	244.612
	(0.000*)	(0.000*)	(0.000*)
CORR	-0.377	0.939	20.377
	(0.352)	(0.826)	(0.983)
Δ(CORR)	-11.472	-7.937	290.512
	(0.000*)	(0.000*)	(0.000*)

Source: Author's estimate using Eviews 9.

Notes: Values in parentheses represent the probability * Significant at 5%, ** Significant at 10%.

[10]Levin,A.,Lin,C.-F.,James Chu,C.-S.,2002.Unit root tests in panel data: Asymptotic and finite-sampleproperties.Journal of Econometrics.108(1),1-24.

[11]Im, K.S., Pesaran, M.H. et Shin, Y. (1997), ìTesting for Unit Roots in Heterogenous Panelsî, DAE, Working Paper 9526, University of Cambridge.

[12]Maddala,G.S.,Wu,S.,1999."A comparative study of unit root tests with panel data and a new simple test".Oxford Bulletin of Economics and Statistics.61(S1),631-652.

The results of the table above prove that the series are stationary with the tests of Levin Lin and Chu (2002), Im, Pesaran and Shin (1997) and Maddala and Wu (1999), but with different orders of integration (I (0) or I (1)). However, the test of Levin Lin and Chu (2002) would lead us to accept the null hypothesis of nonstationary for all the variables in level at the 5% threshold, except for the variable GDP which is stationary in level. The hypothesis of stationarity in level is accepted by the Im, Pesaran and Shin (1997) test for the LGDP variable (at the 5% threshold) while it is rejected for all the other variables. For the results for the last Maddala and Wu test (1999), probabilities in parentheses (with constants and with trend) are strictly greater than the 5% threshold, whereas in difference they are strictly lower. This points to the presence of unit roots forLPIB, DA, SG, and CORR. Indeed, according to Maddala, G.S and Wu, S[13] , the Maddala, Wu (1999) test outperforms the Im, Pesaran, Shin (1997) test in terms of potency. We then base ourselves on this test, and we conclude that the panel series are all order 1integrated. The stationarity results (Maddala and Wu (1999) tests) lead us to test the presence of a long-term relationship between these series. Consequently, there is a risk of cointegration and we seek to estimate an error correction model of order (p) (VECM (p)). For this reason, we estimated different VAR processes for lag orders p ranging from 1 to 3. In the table below, lag 1 is that which minimizes the SC (Schwarz)criterion. We then conclude that the optimization lag is p = 1. The optimal lag that we have just identified is the one that we will use to perform the cointegration test. We will thus be able to proceed to the Johansen test on a VAR model (1).

Table 4. Number of delays to remember

Retard	LogL	AIC	SC
1	-637.3902	3.295189	**3.495137***
2	-592.1327	3.148535	3.508441
3	-566.8984	3.102248	3.622112

Notes: LogL: Log Likelihood, AIC: Akaike Info Criterion, SC: Schwarz Info Criterion

4.2.Results of the cointegration tests

Cointegration is essential to understand the long-term equilibrium relationships between time series economic variables. The most famous cointegration test is that of Pedroni[14] (1999) and Kao[15] (1999) which are based on the null hypothesis of absence of cointegration. Pedroni (1999) presented a series of seven statistics, and distinguished two categories of tests. The first category includes four tests based on the Within dimension (intra-individuals). The second category

[13]Maddala, G.S et Wu,S.(1999),. A comparative Study of Unit Root Tests with Panel Data and a New Simple Test., Oxford Bulletin Of Economics and Statistics, special issue, 631-652.

[14]Pedroni,P.,1999.Critical values for cointegration tests in heterogenous panels with multipleregressors. Oxford Bulletin of Economics and Statistics.61,653-670.

[15]Kao,C.,1999.Spurious Regression and Residual Based Tests for Cointegration in Panel Data.Journal of Econometrics.90,1-44.

includes three tests based on the Between dimension (inter-individual). These latter tests are more general in that they allow for the presence of heterogeneity between individuals under the alternative hypothesis.

However, Kao test (1999) studies the absence of cointegration in homogeneous panels. The results of cointegration tests are shown in the table above. We note that for the entire sample, the seven tests (intra and inter-individual) of Pedroni (1999) allow to conclude to the presence of a cointegration relationship. Indeed, the four statistics (Panel ADF-Statistics, Panel PP-Statistics, Group PP-Statistics and Group ADF-Statistics) accept a cointegration relationship at the 5% level. Since Pedroni (1999,2004) proved that these four statistics are the best for small samples,this seems to confirm the presence of a cointegration relationship between economic growth and institutional variables. Moreover, these results arechecked by Kao test (1999), asits probability is less than 5%. Therefore, the results of these tests support the presence of a long-run equilibrium cointegrating relationship between institutional variables and economic growth.

Pedroni test (1999)				
Alternative hypothesis : Common AR coefs (Within-dimension)				
	Statistics	Probability	Statistics	Probability
Panel V-Statistical	7.739	**0.000***	0.742	0.208
Panel Rho- Statistical	-4.628	**0.000***	1.319	0.906
Panel PP- Statistical	-11.279	**0.000***	-1.719	**0.042***
Panel ADF-Statistical	-4.170	**0.000***	-1.837	**0.033***
Alternative hypothesis : individuel AR coefs (Between-dimension)				
	Statistics		Probability	
Groupe Rho- Statistical	2.328		0.990	
Groupe PP- Statistical	-2.017		**0.021***	
Groupe ADF- Statistical	-2.759		**0.002***	
Test de kao (1999)				
t-Stat			2.073	
Probability			**0.019***	

Table 5. Panel cointegration test
Source: Author's estimate using Eviews 9. * 5% significant.

At this stage, the cointegration hypothesis is suitable.It would be important to determine the number of cointegration equations. For the latter, we use the Johansen trace test. Analysis of the trace and the maximum eigenvalue reveals two cointegrating relationships within the 5% confidence interval of the likelihood test.

Table 6. Trace tests (Johansen)

Hypothesized no.Of CE(s)	Fisher Stat.* (from trace test)	Prob
None *	119.4659	**0.0000***
At most 1 *	43.75896	**0.0007***
At most 2 *	14.69545	0.0657
At most 3 *	2.117216	0.1456
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level		
* denotes rejection of the hypothesis at the 0.05 level		
**MacKinnon-Haug-Michelis (1999) p-values		
None *	75.70694	**0.0000***
At most 1 *	29.06351	**0.0031***
At most 2 *	12.57824	0.0908
At most 3 *	2.117216	0.1456
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level		
* denotes rejection of the hypothesis at the 0.05 level		
**MacKinnon-Haug-Michelis (1999) p-values		

Source: Author's estimate using Interviews 9. * Significant at 5%.

4.3. Estimation of Error Correction Models and Causality Testing

Checking the cointegration relationship between economic growth and institutional variables for the studied MENA countries, confirms the presence of a long-term relationship between these variables.According to cointegration theory, there are different levels of imbalances (Engle and Granger[16], 1987).This can be captured by the inclusion of an error correction term (ECM) in the cointegration relationship. ECMs are important components of vector error correction models (VECMs). Creating a VECM can help estimate the level of imbalance hidden in a long-term relationship and capture temporal dynamic changes in the independent variables. Then, VECM is used to assess co-circulation between economic growth and institutional variables. The usual unit root tests on series prove that all the series used in our study are non-stationary and that they are all order 1 integrated (I (1)). For the short-term dynamics of economic growth, it was examined by estimating a (VECM)model. The results of the error correction model are presented as follows:

Table 7. Estimation of the short-term and long-term relationship

Variables	$\Delta(\mathbf{LPIB})$	$\Delta(\mathbf{CORR})$	$\Delta(\mathbf{SG})$	$\Delta(\mathbf{DA})$
ECT_{t-1}	**-0.019 [-2.289]***			
ECT_{t-2}		-0.081	-0.177	-0.038

[16]Engle, R.F., Granger, C.W.J., 1987. Cointegration and error correction: representation, estimation, and testing. Econometrica 55, 251–276.

$\Delta(\text{LPIB}(-1))$		**[-5.578]*** -0.057 **(0.040)***	**[-3.622]*** 0.037 **(0.043)***	**[-3.530]*** -0.232 **(0.057)****
$\Delta(\text{SG}(-1))$	0.030 **(0.015)***	-0.025 **(0.013)***		0.016 **(0.019)***
$\Delta(\text{DA}(-1))$	-0.010 **(0.034)***	-0.031 **(0.030)***	-0.191 **(0.084)****	
$\Delta(\text{CORR}(-1))$	-0.062 **(0.047)***		-0.163 **(0.043)***	-0.017 **(0.060)****

Notes: Numbers in parentheses are p-values, while those in square brackets are statistics for students

*** Coefficient significant at 5%, ** Coefficient significant at 10%.**

To examine causality between governance and economic growth, North (1990) uses democracy, political stability and corruption as qualities of governance. For this author and others like Hall and Jones (1999); Rodrick et al (2002), if an increase in the quantities of capital and labor has a positive impact on growth, this increase will be much greater if the studied economy has good governance. In this regard, Fosu (1992) and De-Haan (2007) point out that the effect of political instability goes through investment and capital accumulation to negatively affect economic performance. For this reason, we use the same institutional variable to estimate a VECM. Our results point to the presence of bidirectional causality. This reflects the presence of a short and long-term bidirectional dynamics ranging from institutional variables (political stability, democratic accountability and corruption) towards economic growth, on the one hand, and economic growth towards institutional variables, on the one hand. In other words, any variation in economic growth affects short-term institutional variables in MENA countries, while variation in political stability, democracy and corruption affects economic growth.

Indeed, in the first column of the system, corruption, political stability and democratic accountability have a significant impact on long-term economic growth. For this case, the error correction term is negative and significant, as expected, implying that the system is stable and converges towards the equilibrium trace after a certain disturbance (speed of convergence is of the order of 2.5%).The second column of the system proves that democracy, political stability and economic growth affect corruption in the long run. Indeed, the error correction term is negative and significant at the 5% level and the long-term equilibrium adjustment speed is 8.1%. We notice the presence of long-term causal relationship between growth, democracy, corruption and political stability and also the presence of long-term causal relationship between growth, corruption, political stability and democracy.

Then, we can conclude that the relationship between economic growth and institutional variables (political stability, democracy and corruption) is bidirectional from economic growth towards long term institutional variables and vice versa, in the MENA region. These results are consistent with those of Apergis et al (2007), who found that causality of governance quality on economic growth is stronger than the opposite. Other authors have argued that the causal relationship between political instability and economic growth works both ways (Zablotsky,

1996; Gyimah-Brempong and Traynor, 1999). In contrast, Alesina et al. (1996) found a unidirectional causality of political instability towards economic growth.Indeed, the relationship between democracy and economic growth is two-way. In the short term, the costs of democracy would translate into lower growth rates, stemming from higher inflation and political instability. In the long term, the benefits of democracy will most likely lead to increased economic growth by improving the business environment (respect for private property rights). Several studies have shown that the link between democracy and political stability is positive (Rodrik, 2000; Tavers and Wacziarg, 2001), which implies a double causality, because if democracy is undoubtedly a political environment likely to reassure both policy makers and potential investors, political stability can itself lead to the adoption of democratic regimes in countries where it is absent.

Table 8.Granger causality test

Nullhypothesis	Observations	F-Statistics	Probability
CORR does not cause in the sense of Granger LPIB	493	2.715	**0.067****
LPIB does not cause in the sense of Granger CORR		4.155	**0.016***
SG does not cause in the sense of Granger LPIB	493	6.137	**0.013***
LPIB does not cause in the sense of Granger SG		10.926	**0.001***
DA does not cause in the sense of Granger LPIB	493	3.203	**0.041***
LPIB does not cause in the sense of Granger DA		5.428	**0.004***

Source: Author's estimate using Interviews 9. * 5% significant, ** 10% significant.

Finally, the results presented in the table check the nature and direction of causality between institutional variables and economic growth. We assume that variable y Granger causes variable X if only knowledge of the past of Y improves the forecast of X at any time horizon. Under H_0: X causes Y against H_1: X does not cause Y. We accept the null hypothesis, if probability is less than 5% (or 10%). Indeed, the Fischer test confirms the acceptance of the two-way causal relationship between institutional variables and economic growth. Now, to better determine the dynamic relationship between economic growth and institutional variables, we examine impulse response functions which will allow for identifying the effect of a shock on observed volatility as well as the reaction time that economic growth takes before dampening the effect of the random shock.

Impulse response function results

The impulse response function is a function which examines a shock on the present and future values of variables. By convention, this shock is equal to one standard deviation of the variable residuals. In this case, the system will therefore deviate from equilibrium and then return to

stationarity. Impulse response functionsare widely used to describe the response of a variable (in this case, economic growth, political stability, democratic accountability, and corruption) over time in response to an SD external shock. To this end, we calculated the impulse response functions based on the estimate of a VCEM. The horizon is set at 14 periods. This horizon indicates the time required for the variables to recover their long-term level. The results are those obtained by cholesky decomposition. The central curve represents the average of the simulations, the two outer curves represent error bands. Figure 1 traces the impulse responsefunctions:

- It proves that the path response of economic growth to a shock of a standard deviation on corruption will have a positive effect from the first period following the shock until the second period when the effect becomes negative and increases continuously over time (Figure 1.1). Conversely, the response of corruption to a standard deviation shock to economic growth will have a negative effect over 10 periods (Figure 1.2). Then it continuously increases over time. This implies that corruption has a direct negative effect on negative growth in thestudied MENAcountries. In addition to the direct effect, there are indirect effects coming from accumulation of physical and human capital. It affects economic growth through the low level of domestic and foreign investment (Mauro, 1997; Wei, 1997), poor distribution of public expenditure and investment, deterioration of infrastructure (Tanzi and Davoodi, 1997), poor use of stakeholders in society such as women (Murphy et al, 1991) and the emergence of an informal economy due to distorted business development (Johnson et al, 1998). In addition, the MENA region remains one of the least integrated regions in the world; it seems to have failed to take advantage of the globalization of trade and foreign direct investments. Degree of integration into international capital markets is low. A limited access to capital can be explained by insufficient development of their internal markets (Liman, 2004).
- The path response of economic growth to a shock of one standard deviation on political stability (Figure 1.3) decreases from the first period (period 4) then increases in the following period. This result justifies the degree of rapid transmission of shocks affecting economic activity. Political instability affects economic growth as it increases political uncertainty, which in turn negatively affects key decisions of economic agents such as investment. A high probability of government change means uncertainty about future public policies. In authoritarian states, low economic growth increases popular dissatisfaction, creating incentives for anti-government activities making the possibilities of a coup more plausible. In addition, this graph (Figure 1.4) shows that in the short term, the effect of a political stability shock (SG) translates into a significant deterioration in economic activity (LPIB). It shows that the levers of economic growth in the MENA region are mainly based on physical capital and that the latter is the most sensitive channel to the effects of political instability compared to other determinants of growth. However, political instability and upheavals in the MENA region are slowing the transition of these countries to more liberalized and open economies.
- - A shock to democracy is transmitted to economic growth through a positive effect over the entire period (Figure 1.5). Conversely, a shock to economic growth has negative effects that diminish into little fluctuation in the short and long term (Figure 1.6). Indeed, democracy stimulates economic growth at low levels of economic freedom, but it is reduced when a certain level of freedom is achieved. Improved living standards, life expectancy and education increase

the chances of a country adopting a democratic regime. This is confirmed by Barro (1996). The latter proves that democracy has a slight negative effect on economic growth. Acemoglu et al (2014) prove that democracy does not reduce inequalities, yet it stimulates economic growth. They found that in less developed countries, democracy is not an obstacle to economic growth.

Figure 1. Impulse-responsefunction (period = 14)

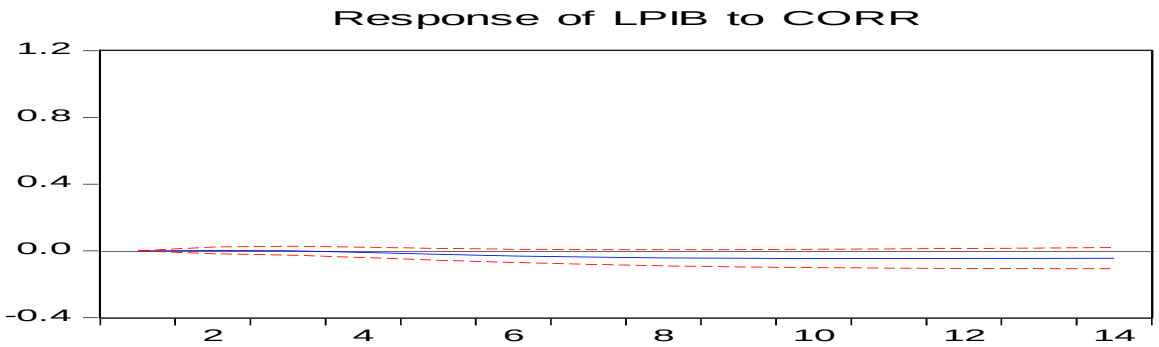

Figure 1.1. Impulse response of CORR on LPIB

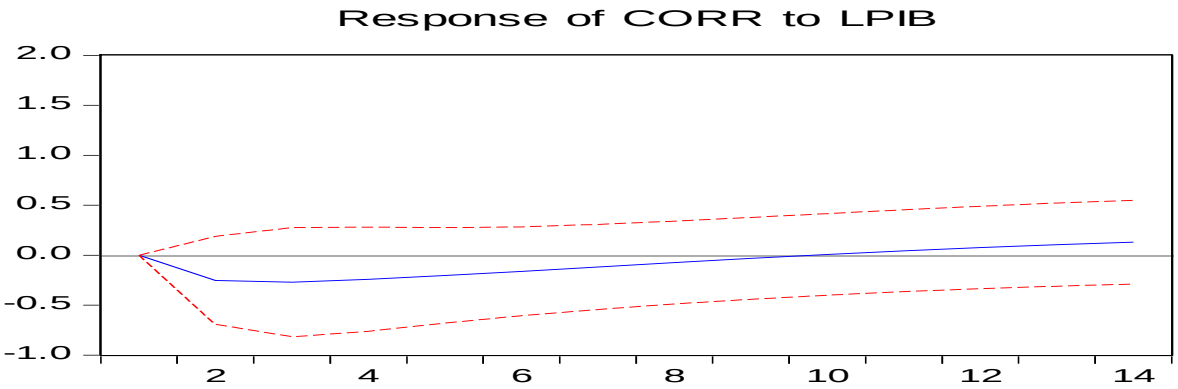

Figure 1.2. Impulse response of LPIB on CORR

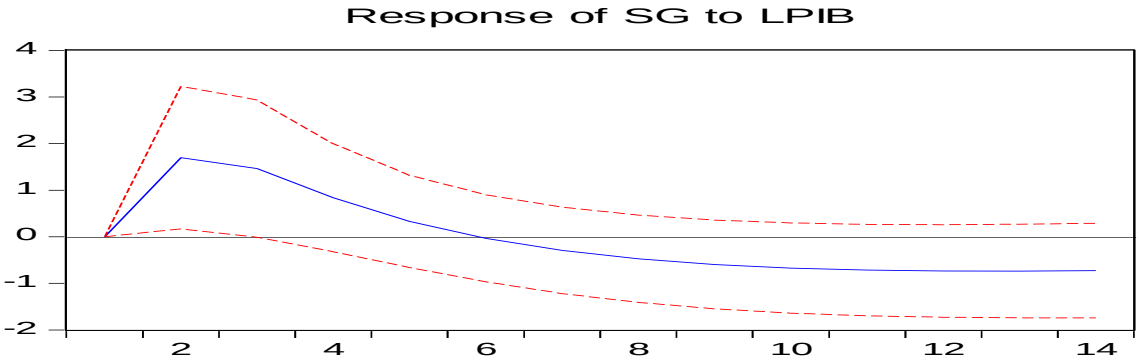

Figure 1.3. Impulse response of SG on LPIB

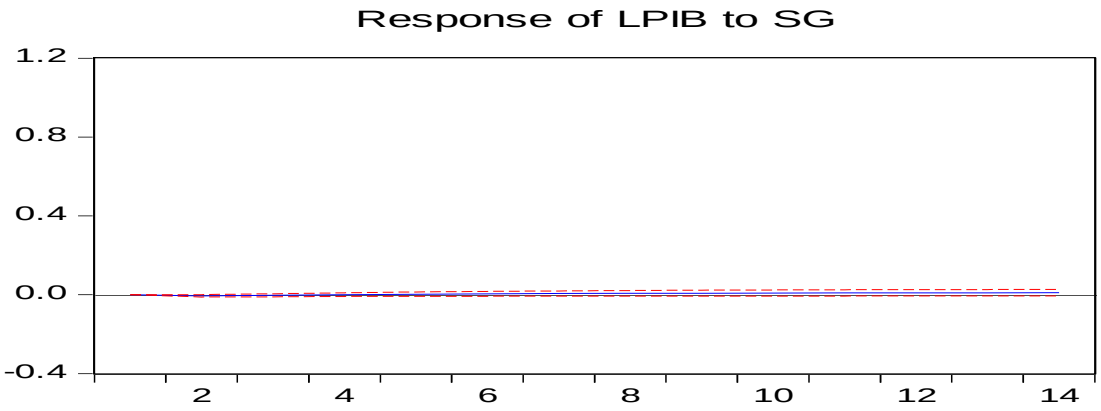

Figure 1.4. Impulse response of LPIB on SG

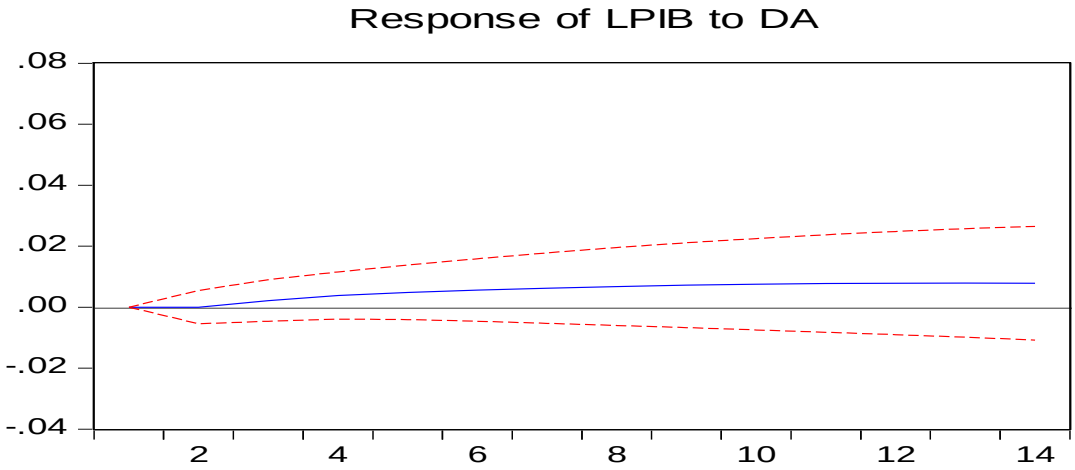

Figure 1.5. Impulse response of DA on LPIB

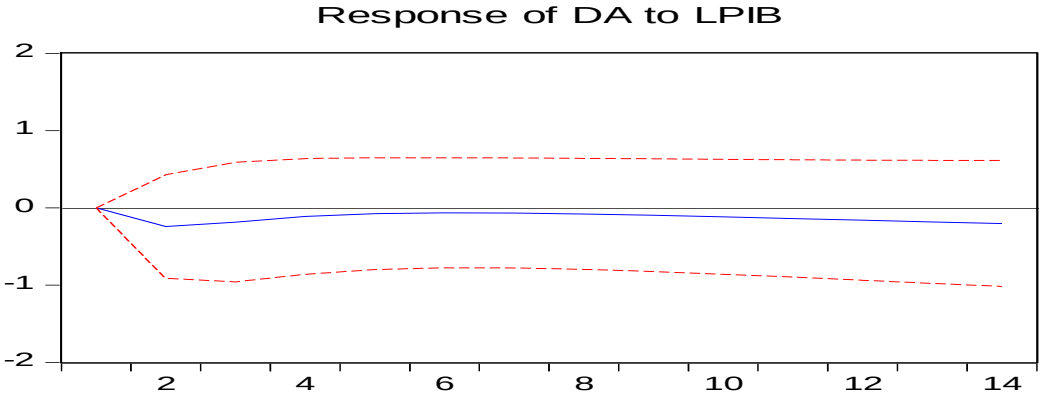

Figure 1.6. Impulse response of LPIB on DA

5 – Conclusion

We examined cointegration and causality between LPIB, CORR,SG and DA by adopting the panel cointegration test on a sample data from the MENA region (18 countries) from 1984 to 2019.

The results show that causality is two-way between corruption, democracy and political stability and economic growth. However, the relationship between corruption, democracy and political stability and economic growth is more dominant than the other way around. Similarly, Apergis et al. (2007) empirically showed that causality of governance quality on economic growth is stronger than the opposite. These results could be explained by political events in the MENA region. We recommend then that the developing countries in our sample need to initiate some projects that have an effect on and help promote economic growth in order to accelerate financial development.

Generally, democracy stimulates economic growth by encouraging investment, increasing education, pushing the government to institute economic reforms, improving the provision of public goods, and stimulating public services in the field of health and the reduction of social disorder. Indeed, the MENA region is known by economic disparities. It includes countries which are rich in natural resources (oil, Gulf countries) but are importers of labor. it includes also countries with few natural resources and an abundant labor force (Jordan, Egypt, Morocco and Tunisia) and countries rich in labor and natural resources (Syria and Algeria).

The results of this study can offer some opportunities for future research. Our model only examines three institutional variables (i.e. democratization, corruption,political stability). Future research could consider other factors such as order and law.It may be interesting to test whether our results are robust to other measures of institutional quality and control variables. Finally, yet importantly, as soon as data availability allows for examining long- run relationships between growth, democracy, political stability and growth in a sample of MENA countries and with a sufficiently long period, using a panel ARDL approach may be a valuable contribution to the literature.

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Annex 1: List of countries in the MENA region

Algeria; Yemen; Bahrain; Egypt; Iran; Iraq; Israel; Jordan; Kuwait; Lebanon; Libya; Morocco; Oman; Qatar; Saudia Arabia ; Syria; Tunis; United Arab Emirates.