INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN MULTIDISCIPLINARY EDUCATION
ISSN(print): 2833-4515, ISSN(online): 2833-4531
Volume 03 Issue 06 June 2024
DOI: 10.58806/ijirme.2024.v3i6n06, Impact factor- 5.138
Page No. 953 - 963

Public Debt and Economic Growth in MENA Countries. An Analysis by Panel Co-Integration Techniques

Kaouther AMIRI
The Higher Institute of Management of Tunis University of Tunis 41 Avenue de la Liberté, Tunis 2000 Research Laboratories in Macroeconomics

ABSTRACT: This study analyzes the dynamic relationship between public debt and economic growth in the economies of the MENA region during 1996 -2020. To do this, two econometric tools were applied. The first method presents panel cointegration techniques and Granger causality tests to verify the existence of a long-term relationship and examine the direction of causality between the different variables chosen. The FMOLS and DOLS panel techniques were used to estimate the long-term parameters. Thus, we show that the long-term impact of public debt on economic growth is both positive and significant.
The second method describes the link using a linear growth model and another dynamic model. The latter two were estimated using the generalized moments method with dynamic panel data. The results show a close relationship between the exogenous variable debt and endogenous variable economic growth, and that debt positively affects growth up to a certain threshold. Beyond this threshold, the effect becomes negative and significant. Nevertheless, we have concluded that from a certain threshold, debt can exceed the repayment capacities and, therefore, disadvantage growth, which will in turn discourage domestic investments and savings.

KEYWORDS: Public debt, GDP growth, threshold effect, dynamic panel, co-integration technique.
Jel Classification : C33 – C51 – E69.

1. INTRODUCTION

Public debt is an important tool for mobilizing public revenue or private investment to cope with the limited means of developing countries whose main purpose is to achieve the objectives of sustainable development. However, the overall debt levels have increased remarkably in many developing countries over the past three decades. As a result, concerns have grown over fiscal sustainability, fear that debt overhang is hurting public and private investment, and economic growth is heightened. High levels of debt increase public sector spending because they increase sovereign risk premiums and, therefore, future interest payments. A dditionally, excessive public debt contributes to the crowding-out of private investments. This stimulates forecasts of future tax increases, which,in turn, reduce incentives to work.
During the past two decades, an economic context marked by a high debt crisis has remained a major obstacle to catching up with the objectives of each country. These countries have taken advantage of high loans to enable their development by increasing investments to accelerate sustainable growth. In contrast, most of these countries found in the early 1980s that debt ratios reached unsustainable levels and that debt repayment was virtually unachievable.
Empirically, we not only conducted a descriptive analysis and a study based on the system GMM(Generalized method of moments) estimator to deal with the problem of endogeneity, but we also calculated the threshold from which the effect of debt on the growth economy is reversed.
This paper is structured as follows; Section 2 describes the impact of debt on economic growth by presenting various literature reviews. Section 3 discusses preliminary information on debt and the economic outlook in the MENA region. Section 4 presents the estimation methodology and empirical results. Section 5 presents the theoretical and empirical results.

2. LITERATURE REVIEW

2.1 Borrowing theories: public debt

Neoclassical and Keynesian schools are opposed to the role that the state must play in the market and in economic activities. This reproduction of the state's role generates two intuitions about the budgetary discipline problem. According to the classic tradition of the 19th century, as represented by Adam Smith, David Ricardo and John Stuart Mill, the State plays a limited role and must be kept away from private economic activities. It should not intervene in the market; because imbalances are automatically resolved by the market forces.

Therefore, the State has only one role: to preserve the stability of the economic environment and to guarantee respect for property rights to ensure the framework conditions necessary for the functioning of the market. Borrowing should be confined to the classics because it allows the state to spend more than it needs to fulfill its function (Novaresi, 2001). Thus, no budget deficit is justifiable; and public borrowing is not an option.

The classic doctrine was called into question in 1936 by the publication of Keynes's work "The General Theory of Employment, Interest and Money", which announced a break in the role of the state. According to Keynes, because the market is not always able to achieve full employment, it is up to the state to intervene to remedy market failures, reduce economic fluctuations, and promote balanced growth.

The public budget has become a cyclical stabilizer in the national economy, making it possible to intervene in demand. If effective demand is insufficient to ensure full employment and we find ourselves in a recession, the state will have to stimulate this demand by increasing its expenditure and/or levying less tax. Conversely, if the economy is in a phase of overheating, the state will have to reduce its expenditures and/or increase taxes to curb effective demand. In this section, we discuss countercyclical policies. For Keynesians, the only thing that counts is macroeconomic balance; budget balance is no longer an end. Debt is an instrument that makes it possible to achieve the main goal of, macroeconomic balance (Dafflon, 1998). In this approach, public debt promotes the revival of demand, which, through its accelerating effect, leads to a more than proportional increase in investment, and consequently, in economic growth.

The theoretical literature highlights a negative link between public debt/GDP ratios and the growth rate of GDP/h (see Saint-Paul, 1992 and Aizenman et al., 2007). Some endogenous growth models show that a positive impact may be possible in the transition to the equilibrium state, depending on the type of public goods financed by debt (Aizenman et al, 2007) or up to certain limits when debt is used to finance productive public capital (Aschauer, 2000).

The negative effect of indebtedness on growth was also explained by the hypothesis of the virtual debt burden "overhang debt" (Krugman, 1988; Sachs, 1984).

According to this hypothesis, when both domestic and foreign investors assume that the level of debt exceeds the repayment capacity of the debtor country, they envisage a reduction in their investment, thus anticipating an increase in the tax rate on the part of the state to cope with the servicing of the debt that is increasing.

Indeed, a high level of debt means that the state is forced to increase taxes to pay for the service. The anticipation of a tax increase discourages the private sector, reducing its investments. This decline in investments affects the economic growth rate.

2.2. Review of the empirical literature

The empirical literature on this link is sparse and interesting, but the findings are ambiguous. The studies varied according to their objectives. Some have focused on the study of the linearity between debt and economic growth, others on the search for the threshold, or even on the causal relationship. Schclarek (2004) examined the role of external debt in emerging and advanced economies in a sample of 24 countries and a period ranging from to 1970-2002. He finds no strong evidence of a statistically significant relationship. Kumar and Woo (2010) studied linearity using a sample of emerging and developed economies. They find some evidence of nonlinearity: only high levels of debt that exceed 90% of GDP have a negative and significant impact on economic growth. Checherita et al., (2012) examine the average impact of public debt on the per capita GDP growth rate in twelve-euro area countries over a period of approximately 40 years. They find a nonlinear impact of debt on economic growth, with a turning point beyond which the public debt/GDP ratio exerts a negative effect on long-term growth. They also studied the channels through which public debt exerts a nonlinear effect on the growth rate. These are generally private savings, public investments, and total factor productivity. Reinhart and Rogoff (2010) analyzed changes in public debt and the long-term real GDP growth rate over a sample of 20 advanced economies for the period 1790-2009. They find that the relationship between public debt and growth term is not robust for debt/GDP ratios below the threshold of 90% of GDP. Beyond this threshold, they find that the median growth rate decreases by 1 percentage point and the average by approximately 4 percentage points.

Baum et al., (2013) examine the nonlinear effect of public debt on GDP growth in 12-euro area countries from 1990 to 2010. Their results show that the short-term effect of debt on GDP growth is positive and statistically significant, but declines and loses importance beyond public debt-to-GDP ratios of approximately 67%. They add that for high debt-to-GDP ratios (above 95%), the additional debt exerts a negative impact on economic activity.

Interested by the causality between our two basic variables, Ferreira (2009) applied a panel data approach to 20 OECD countries and found a two-way causal relationship between growth and public debt. Panizza and Presbitero (2014) confirm this finding. Adopting an instrumental variable approach, we conclude that public debt does not have a causal influence on economic growth.

3. THE INDEBTEDNESS OF MENA COUNTRIES

The development of commercial exchanges and the growth of the interdependence of economies have been accompanied by significant growth in capital movements. A lack of any external imbalance in the balance of payments of the MENA countries would

register coherent flows in return in terms of bank credits and foreign investments, which developed the possibilities of external financing.

MENA countries were present in various markets, particularly in the markets for the supply of bank loans, for a few countries. In the 1970s, the appearance of oil surpluses changed the distribution of countries between lenders and borrowers while encouraging a considerable increase in bank credit and international financial markets.

Several countries in the MENA region, particularly those seeking to benefit from a modern industrial sector, have imposed the demand for international credit, supporting their recourse to external debt, to the point of forming more than half of the demand for credit banks in 1979, to the amount of the second oil shock.

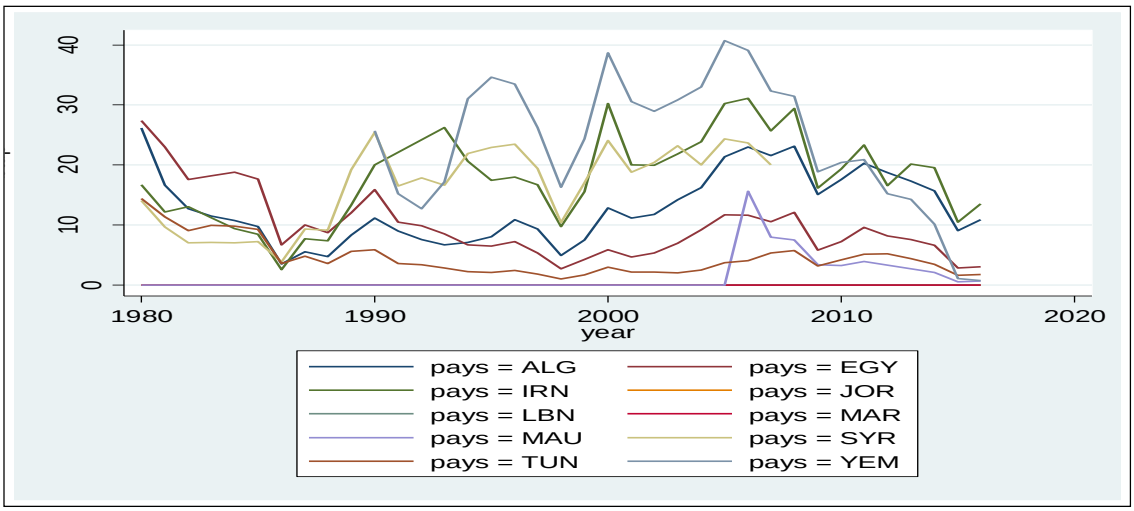
Many changes in supply and demand in domestic and foreign markets significantly increased the availability of capital in the 1990s. Debt securities could be issued thanks to the deepening of domestic markets, new information technologies, and new sophisticated financial instruments. Other factors may explain the inflows of international loans, including the decline in interest rates in global markets, which caused investors to favor emerging markets with a high rate of return on their investments; the advantage of credit ratings, thanks to the modification of external debt, deregulation, and macro-economic structural reform; the "stability" resulting from fixed exchange rate regimes; and the internationalization of financial institutions. All these factors have led to increased private capital inflows (especially in the form of short-term loans in foreign currencies) to emerging and developing economies, owing to the perceived low risk combined with a high return. In 1996, the stock of debt issued by developing or emerging economies was valued at $1.5 trillion of their total GNP and foreign exchange reserves (Cassard, Folkerts-Landay, 1997). This remarkable volume of capital has caused economic booms and made it possible to finance large current account deficits. Capital market sensitivity can cause economic instability.

Thus, poor debt and risk management, including insufficient reporting and weak oversight functions in the financial services sector, can increase a government's financial vulnerability and sensitivity to economic shocks. For example, huge volumes of public and private external debt, especially short-term foreign currency debt, that are unhedged, can expose governments to significant financial risks. Several MENA countries have resorted to capital inflows to finance their economic growth, large current account deficits, public expenditure, and massive public debt. However, recent financial crises have shown that this form of financing has sometimes taken place in countries where financial and monetary conditions are deficient, and where the banking sector suffers from deficiencies. Large external public and private debts that are not adequately covered are likely to skyrocket debt service costs and make it difficult to access international financial markets (Calvo, 2000).

Economic growth in the MENA region is expected to increase by 2% on average in 2018, from 1.4% on average in 2017. The slight increase in growth reflects the positive impact of reforms and corporate stabilization policies in many countries, as well as the recent increase in oil production and prices, and rising external demand.

Oil exporters benefit from higher prices, increased oil production, reforms, and increased external demand. Similarly, oil importers benefit from reforms, increased trade with Europe and China, and financial inflows from MENA oil exporters.

Figure 1: Profits from oil (% of GDP)



Note: World development indicators (2022)

Based on Figure 1, the overall growth of oil-importing countries benefits from the sharp jump recorded by Egypt. Stabilization policies, reforms, and the expansion of revenue from abroad will reduce fiscal and external imbalances in 2018 and beyond. In the short term, the outlook remains positive for this region. Growth is expected to continue over the next two years, standing at 3.3%

and 3.2% in 2019 and 2020, respectively. However, geopolitical efforts, problems related to the forced displacement of populations, and an increase in debt could lock these favorable prospects in mind.

In recent years, stabilization policies have necessarily contributed to the process of economic adjustment, but the reforms must enter a new phase and have transformative action so that the region can show its full potential. The growth trajectory is, in fact, well below this power and insufficient to absorb hundreds of millions of young people who will enter the labor market in the decades to come. The World Bank report examines the role that public-private partnerships can play not only in bringing in new sources of financing but also in ensuring that the state retains its role as the main employer to encourage private sector activity.

Studies show that the gap between MENA countries and high-growth economies lies in service efficiency. However, rapid technological change offers new technologies to stimulate private sector-led growth through the development of highly experienced jobs in the service sector. The combination of resources could allow the emergence of a digital sector that is likely to attract jobs for many young people over the next decade. Several MENA countries have developed strategies to transform their economies; however, much remains to be done to take advantage of this potential.

Nautet and Meensel (2011) show two main channels through which an increase in external debt can negatively affect long-term economic growth. An increase in badly exploited foreign debt leads to a drop in the volume of net savings at the national level and, consequently, an increase in interest rates. This leads to a decrease in investment and a slowdown in capital stock growth. The non-accumulation of capital translates into less innovation, and consequently, a drop in labor productivity. Simultaneously, an increase in external debt can affect growth by increasing expected inflation, uncertainty, and macroeconomic volatility.

Table 1: The variation of the external debt on the level of economic growth

PAYS	Average annual growth of real GDP per capita 1994 to 2020	External debt (as % of GDP) on average between 1994 and 2020
JORDAN	4,49844371	7,49979027
Syrian Arab Republic	4,33073998	1,34769929
IRAN	3,13807841	1,68127546
TUNISIA	3,67079394	6,64098043
ALGERIA	3,35080983	5,2397629
MOROCCO	4,20908916	5,89604377
MAURITANIA	4,0637412	4,78863981
LEBANON	4,21434337	16,7495324
YEMEN	1,62782854	1,54015399
EGYPT	4,48663334	2,29416715

Note: calculation made by the author using the Economic Development Indicators database

We note from table 1 that the external debt on GDP is lower in percentages of the average annual growth of real GDP by about 2 percentage points per year in the case of the Syrian Arab Republic, Iran, and Egypt, with a more muted impact in the other economies. Only high levels of debt, above 50% of GDP) have a significantly weak effect on growth in Tunisia, Algeria, and Jordan. The adverse effect is mainly explained by a slowdown in labor productivity growth due to lower investment and capital stock growth. This is explained by the fact that these countries will find financing difficulties on the international markets. It should be noted that in some countries, such as Lebanon and Jordan, foreign debt is a consequence of slowing economic growth. The question that must be asked must be framed on the real effects of external debt on economic growth.

4. THE EMPIRICAL STRATEGY

The empirical strategy of this study was to examine the impact of public debt on economic growth. Otherwise, should the growth of external debt be supported by macroeconomic regulation? Is it necessary to reduce debt to restore confidence, which will consequently revive economic growth by increasing factor productivity and investment?

To achieve this objective, we analyze the situation of nine countries (Algeria, Egypt, Jordan, Lebanon, Morocco, Mauritania, Oman, Tunisia, and Yemen) distinguished by their variables: public debt (the chosen variable: public debt service and guarantee by the State (% of GNI): SDGE), GFCF: gross fixed capital formation (expressed in log LFBCF); TRE: total reserves expressed in log; LTRE, domestic credit provided to the private sector by banks (% of GDP), expressed in log LCIFB; CGC, claims on the

government; stocks of external debt (% of GNI) expressed in log LSDE; money supply growth (annual %) expressed in log LCMM, Public debt service and guaranteed by the State SDGE; and gross national expenditure (% of GDP) expressed in log LDNB. These data cover the period from 1996 to 2020. These are all MENA countries, some of which were characterized by the 2011 revolution. Our study is based on a model from the empirical literature. Thus, our objective was to study the effect of public debt on economic growth. The endogenous variable is the annual GDP growth rate. The specified econometric model was a dynamic panel-data model. A dynamic model is one in which one or more lags of the dependent variable are explanatory variables (Sevestre, 2002). Panel data econometrics have many advantages, the most important of which is controlling for unobserved country heterogeneity.

In this context, our work is divided into two parts: the first focuses on determining the number of cointegrating relationships between the GDP growth variable and the other exogenous variables. The second part deals with the estimation method using panel data by integrating two lagged endogenous variables with the presence of other institutional variables.

Our study is based on a model from the empirical literature. Thus, our objective was to study the effect of public debt on economic growth. The endogenous variable is the annual GDP growth rate. The specified econometric model was a dynamic panel-data model. A dynamic model is one in which one or more lags of the dependent variable are explanatory variables (Sevestre, 2002). Panel data econometrics have many advantages, the most important of which is controlling for unobserved country heterogeneity.

4.1 Relationships between the GDP growth variable and the other exogenous variables

• Panel unit root tests

Four stationarity tests on panel data are applied: Levin Lin and Chu LLC (2002) and Im Pesaran and Shin (2003). We notice that almost all the variables are stationary in the first difference. They are integrated of order one (I (1)) for the different kinds of models with trend and constant, or with constant, or neither constant nor trend.

• Co-integration test

The tests for the absence of cointegration on panel data presented by Pedroni (1995, 1997, 1999, 2004), Kao (1999), and Bai and Ng (2001) are residual tests analogous to those offered by Engle and Granger (1987) in the time series.

In our study, almost all the variables of the model are stationary in first difference, this leads us to study the existence of a long-term relationship between these different variables, that is to say the study of the determination of a cointegration relationship, by making use of Kao's cointegration tests.

Table 2 Kao Residual Cointegration Test

Series: PIB INF LFBCF LTRE LCIFB CGC LSDE LCMM LSDGE LDNB				
			t-Statistic	Prob.
ADF			-11.28083	0.0000
Residual variance			9.300528	
HAC variance			8.836079	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-1.005020	0.073851	-13.60874	0.0000
R-squared	0.594569	Mean dependent var		-0.110740
Adjusted R-squared	0.594569	S.D. dependent var		3.034006
S.E. of regression	1.931856	Akaike info criterion		4.162683
Sum squared resid	470.2406	Schwarz criterion		4.185078

Source: estimate made by eviews 12

The results of Kao's cointegration tests, as shown in table 2, reveal that the residual series is significant. Moreover, this test rejected the null hypothesis of no cointegration (the probabilities were less than 1%, 5%, and 10%). Thus, according to this test, long-term cointegration exists between the variables.

- Estimation of the long-term relationship using FMOLS and DOLS methods

In this step, we used the FMOLS and DOLS techniques proposed by Pedroni (2001, 2004). They are more efficient than the classical ordinary least squares (OLS) technique.

Table 3: Long-term estimate, the two estimation methods

Method 1 Panel Dynamic Least Squares (DOLS)			Method 2 Panel Fully Modified Least Squares (FMOLS)	
Variable	Coefficient	Prob.	Coefficient	Prob.
INF	0.156396	0.1761	0.240583	0.0537
LFBCF	-11.56812	0.0020	5.029592	0.0000
LTRE	5.477289	0.0002	0.673093	0.0000
LCIFB	3.589470	0.0466	-1.551127	0.0000
CGC	0.033459	0.3726	0.100292	0.0355
LSDE	5.852180	0.0031	0.889151	0.0000
LCMM	0.174371	0.6766	0.516026	0.0000
LSDGE	-2.680012	0.0442	0.738627	0.0000
LDNB	49.44122	0.0000	0.998676	0.0000

Source: estimate made by Eviews 12

This table describes the estimated long-term impact of all explanatory variables on the level of GDP growth for the MENA countries. The results of the panel FMOLS estimator do not resemble those of the DOLS estimators.

The results obtained indicate that a 1% increase in the variables INF, LFBCF, LTRE, LCIFB, CGC, LSDE, LCMM, LSDGE, LDNB, HTE, CO2, POP, and EPI increases the level of GDP growth, respectively by 0.24 %, 5.02%, 0.67%, -1.15%, 0.10%;0.88%;0.516%;0.73%, and 0.98%. These results highlight the economic and financial roles of different variables in describing the evolution of the GDP growth rate.

According to this table and the FMLOS method, we have shown that the long-term impact of domestic credit provided by banks to the private sector on economic growth is negative and significant in MENA countries. The coefficient (elasticity) tells us that, in the long term, a 1% increase in bank credit to the private sector leads to a 1.55% drop in GDP. However, this variable was positive and significant. The same interpretations apply to the variables public and publicly guaranteed debt service (% of GNI) and gross fixed capital formation. These two estimation methods are remarkable in terms of the significance of their coefficients. Bank loans increase through an increase in private sector demand and a decrease in investment, depending on the inflationary situation and the general economic situation for MENA countries. Faced with the health crisis, some countries (Yemen, Oman, and Mauritania) have not achieved a level of growth that would allow them to achieve considerable economic development even if bank loans are granted in the short term and linked to trade financing.

In these MENA regions, economic and financial policies focus on reducing stocks of external debt to achieve an improvement in total reserves and lower gross national expenditure to achieve economic growth and institutional development strategies.

- Causality Granger Panel Test

Table 4 presents the results of the Causality Granger Panel tests. These results clearly show the direction of the causal relationships between the different variables at the critical threshold of 10% in the short term and in the long term.

Thus, the long-term cointegration relationship is verified for the dependent variable D(SDGE) and the other independent variables, as well as for the variable D(LDNB) and its explanatory variables. As, The corresponding error correction term (ECT) being between -1 and 0 is statistically significant at the 1% level. In the short term, the results indicate that unidirectional causality exists from PIB to LSDE, from INF to LCMM, from INF to LDNB, and another relationship from LFBCF to INF, from CIFB to TRE. from TRE to LCMM, from CIFB to CGC, and from LSDE to CMM. Indeed, LSDE describes four unidirectional relations for LFBCF, LTRE, and SDGE; the same applies to the variable LCMM, which presents four relations with INF, LFBCF, CGC, and LCIFB. There is also another causality between SDGE and LCIFB, and from SDGE to LDNB. In parallel, there is bidirectional causality between GDP and LFBCF, and from LFBCF to TRE. Moreover, there is a stronger relationship between TRE and CIFB.

4.2 An estimation of a panel data model

The specified econometric model was a panel-data model. We focus on a dynamic model in which there is an estimation of a linear model and an estimation of a quadratic model (Sevestre, 2002).

Both models can take the following forms:

Linear model estimation Quadratic model estimation (Debt = $SDGE^2$)

$$Y_{it} = \alpha_1 Y_{i\,t-1} + \beta SDGE_{it} + \delta X_{it} + \varepsilon_{it} \quad (1)$$

Variables	Model estimates with a lagged endogenous variable (GDP(-1)) Model (2)				Model estimates with a lagged endogenous variable (GDP(-1)) and a quadratic variable (Debt) Model(3)			
Equations	(2)	(3)	(4)		(6)	(7)	(8)	(9)
PIB(-1)	0.087162	0.114998	0.133644	-0.112715	0.164348	0.068630	0.035539	-0.111770
	(0.6955)	(0.0126)*	(0.0574)*	(0.3377)	(0.4093)	(0.2352)	(0.6237)	(0.4551)
INF	0.701948	0.832942	0.692658	0.922801	0.653822	0.842890	0.685911	0.839685
	(0.0104)*	(0.0000)*	(0.0000)*	(0.0000)*	(0.0037)*	(0.0001)*	(0.0000)*	(0.0003)*
LTRE	-0.781070	-0.903792	-0.914904	-0.345045	-0.329810	-0.497837	-0.224761	-0.058878
	(0.0474)*	(0.0000)*	(0.0002)*	(0.1265)	(0.2897)	(0.0462)*	(0.4946)	(0.8765)
LCIFB	0.950261	1.007345	1.149212	0.584379	-0.180290	-0.054297	-0.279471	-0.296187
	(0.0429)*	(0.0000)*	(0.0002)*	(0.0219)*	(0.7904)	(0.8804)	(0.6063)	(0.5930)
SDGE	0.301731	0.202991	0.214648	0.267842	1.672629	1.586851	1.781295	1.519314
	0.1059	(0.0033)*	(0.0370)*	(0.0136)*	(0.0624)*	(0.0041)*	(0.0210)*	(0.0239)*
DETTE					**-0.155697**	**-0.146858**	**-0.155284**	**-0.128913**
					(0.0948)*	**(0.0241)***	**(0.0768)***	**(0.0870)***
CC		2.32E-06				2.52E-06		
		(0.0001)*				(0.0161)*		
SP			0.017687				0.543635	
			(0.9610)				(0.2243)	
QR				2.284146				1.758445
				(0.0046)*				(0.0556)*

$$Y_{it} = \alpha_1 Y_{it-1} + \beta SDGE_{it} + \delta X_{it} + \alpha_3 SDGE^2_{\ it} + \alpha_4 INS_{it} + \varepsilon_{it} \quad (2)$$

Y_{it} was an endogenous explanatory variable. It describes GDP growth for country i at time $t-1$. The variable SDGE (service of public and publicly guaranteed debt (% of GNI)) is an indicator for measuring debt for the country i at time . X_{it} is a vector of control variables, the institutional variable INS grouping (corruption control, political stability and absence of violence and regulatory quality). The subscripts i and t denote country and time respectively. ε_{it} the error term.

Our study demonstrates the relationship between the effect of a very high debt service and the level of growth of a country. Thus, the lag of each endogenous variable must verify the notion of conditional convergence, in which there is a negative and significant effect between public debt and GDP growth. The relationship between these two variables has been used in several empirical studies (Checherita and Rother, 2010; Kumar and Woo, 2010; Presbitero, 2010, and Baum et al., 2013).

The estimation method applied is the generalized moments GMM (general method of moments) on dynamic panel data. The estimator of this model by the OLS method leads to biased and nonconvergent estimators especially when the lagged dependent variable is correlated with the individual effects μ . The generalized moments estimator presented by Arellano and Bond (1991) is based on the orthogonality conditions between the lagged endogenous variable and the error term. This estimation method makes it possible to correct the endogeneity of the explanatory variables of the model. The provided estimator refers to the first difference GMM method to eliminate specific individual effects and the use of lagged values of the dependent variable as instruments.

Subsequently, Blundell and Bond (1998) proposed a system-GMM estimator. They classified the equations into first differences with the equations at the level in which the variables are instrumented by their first differences. Through Monte Carlo simulations, Blundell and Bond (1998) prove that the GMM estimator in the system is more efficient than that in the first differences. Indeed, when the instruments are weak, the GMM estimator in the first differences yields biased results in finite samples.

The results of the system GMM estimation are presented in the following table considering the following exogenous variables:

Inflation (INF), total reserves (% of total external debt) expressed in log (LTRE), domestic credit provided to the private sector by banks (% of GDP) expressed in log (LCIFB), service of the public debt and guaranteed by the State (of GNI) (SDGE), the variable Debt = SDGE * SDGE, and the institutional variables control of corruption (government effectiveness)(CC), political stability and absence of violence (SP), and regulatory quality (QR).

Table 5 the results of the different estimates for the two models
Numbers in brackets are p-values.* significant at 10%.

In table 5, the estimation results of the two models show the following:

- The coefficient linked to the lagged GDPt variable is negative and insignificant for equations (4) and (9); that is, the conditional convergence hypothesis is not accepted. This result is interpreted as a lack of long-term catch-up for each MENA country in terms of economic growth due to the presence of a single institutional variable, regulatory quality. For equations (1), (6), (7), and (8), the coefficients of this lagged GDP variable are all positive and insignificant; in other words, there is no acceleration in growth, which confirms Barro's idea thatthe observed divergence of economies can be explained by the fact that convergence processes depend on a limited number of independent explanatory variables. However, this interpretation was noticed by Durlauf and Johnson (1995), who showed that a standard Barro growth regression has significantly different coefficients in countries with low and higher levels of development. This demonstrates that the notion of conditional convergence does not prevent the existence of long-term equilibrium conditions for different growth regimes in the presence of thresholds that separate countries into groups. “Durlauf and Johnson successfully identified two potential thresholds defined either by the initial level of education or by the initial level of per capita income. Each of these thresholds separates countries into two groups by defining convergence clubs. Hansen (2000) provides a means of estimating the confidence interval for such thresholds. Berthélemy and Varoudakis (1996) suggest that at least one other factor, initial financial development, may be responsible for the existence of multiple equilibria.
Certainly, our interpretation must depend on the institutional quality applied for each country and by the level of indebtedness imposed (the variable DEBT is characterized by a negative and significant coefficient for equations (6), (7), (8), and (9)), and it is important to note that the economies of MENA countries are trying to pay particular attention to debt services, domestic credits, and stocks of external debt in recent years (the years of COVID). Thus, other work presented by Schclarek (2004) states that there is no statistically significant relationship between debt and growth. Similarly, the reflections of Checherita and Rother (2010) show that economic growth is harmful above a threshold of 90 to 100% of GDP relative to public debt.

- We note that inflation positively and significantly affects economic growth in these countries, and for each equation of the estimate, this is related to the positive and significant impact of SDGE, apart from equation (1). Indeed, all other things being equal, an increase in consumer prices is accompanied by a decrease in debt owing to the presence of institutional variables. This increase is likely to negatively influence total reserves (for models (2) and (3)) because of the negative relationship between banks’ domestic credit provided to the private sector and economic growth. Many theoretical arguments lead to the conclusion that an increase in debt would have harmful effects on growth due to a crowding-out effect on productive investments and in parallel to the inefficiency of the state in the allocation of these resources. The problem is supposed to be to achieve economic growth in the economies of MENA countries depending on the combination of the good use of external debt stocks and the service of public debt guaranteed by the state. Reinhart and Rogoff (2009b) state that emerging countries, when moving from a low to a high debt ratio, experience an increase in inflation from 6% per year to 16.5% per year. Similarly, they note that countries have great difficulty in getting out of the range of debt ratios. “In fact, highly indebted countries engineer bankruptcy through a combination of high inflation and direct debt repudiation (2009b). Moreover, the road to recovery from bankruptcy is very unpleasant, with years of depressed GDP, high unemployment, and restricted access to capital markets.”

- The estimates of equations (3) and (8) for the linear specifications and the quadratic specifications show a positive and non-significant effect of political stability and absence of violence on economic growth. The effect remains positive in response to the different economic, financial, and monetary situations of these MENA countries. Some governments (Yemen, Oman, Tunisia, etc.) are subject to political risk, and the economic cycle is influenced by political and institutional characteristics. The essential objectives of political stability and the absence of violence are to avoid budget deficits and increase public debt. Indeed, political stability and economic growth are essential to ensuring the smooth running of the public finances of states. However, following the health and economic crisis, these MENA countries were affected by an increase in their public deficit. Thus, the slowdown in economic growth is linked to an increase in debt levels. (Debt has a negative and significant effect on each specification.) Alesina and Tabellini (1989), Özler and Tabellini (1991), and Cukierman et al. (1992) claimed that political instability causes a decline in investment and growth.

- The two exogenous variables corruption control and regulatory quality describe a positive and significant relationship at the 10% level. We can conclude that a low level of corruption 2.32E-06 for specification (2) and 2.52E-06 for specification (7) can negatively

influence economic growth. These two estimates verify the work of Mauro (1997) and Collier (2000), who showed that corruption slows down the growth rate of a country's production.

- Finally, the effect of the variable (SDGE) on economic growth is positive and significant at the 10% threshold, while the effect of its square (DEBT) is negative and significant. This indicates that there is a non-linear relationship between debt and economic growth. "Indeed, public debt positively affects economic growth up to a certain threshold. Beyond this threshold, the effect became negative. However, above a certain level, debt is detrimental to growth owing to the inability of countries to pay their commitments. From model (3), we present the turning point and try to apply the derivative to this equation.

$$\mathbf{Y_{it} = \alpha_1 Y_{i,t-1} + \beta SDGE_{it} + \delta X_{it} + \alpha_3 SDGE^2_{it} + \alpha_4 INS_{it} + \varepsilon_{it}} \qquad (2)$$

The optimal debt level (DEBT = $SDGE^2$) that maximizes the GDP determines the corresponding threshold. In the mathematical calculation, we apply the first derivative of Y with respect to the SDGE. Thus, the turning point cancels the next derivative for each specification.

$$\frac{\partial Y}{\partial SDGE} = \beta + 2\alpha_3 SDGE = 0 \qquad SDGE = -\frac{\beta}{2\alpha_3}$$

Equation (6)	Equation (7)	Equation (8)	Equation (9)
5.3696	5.4046	0.5735	5.8933

From these points, the debt changes its sign. However, we notice that the three equations (6),(7), and (9) revolve around the value 5, while equation (8)(where the equation contains the variable SP), the turning point is fast, which is explained by the importance of the variable exogenous political stability and the absence of violence to achieve economic growth in those countries. Several economists participated in explaining this situation. They tried to instruct on debt reduction and growth enhancement for some countries of this sample that have been affected in recent years by health and economic crises (Tunisia, Egypt, etc.).

CONCLUSION

The objective of this study is to explain the relationship between public debt services and economic growth in MENA countries.
After synthesizing the main theoretical and empirical works, we determined the nature of the relationship between debt and economic growth using two empirical parts.
In the first part, we used panel cointegration techniques and Granger causality tests to verify the existence of a long-term relationship and examine the direction of the causalities between the different variables. The FMOLS and DOLS panel techniques were used to estimate the long-term parameters. Our Granger causality results show the existence of bidirectional causality between GDP and LFBCF and from LFBCF to TRE. In addition, there is a stronger relationship between TRE and CIFB. This result is interesting because it attempts to examine the dynamic links between the level of growth, total reserves, and domestic credit by banks in a panel of countries. Moreover, we have short-term unidirectional causalities from GDP to LSDE, from INF to LCMM, and from INF to LDNB, as well as another relation from LFBCF to INF, from CIFB to TRE, from TRE to LCMM, from CIFB to CGC, and LSDE and CMM. The existence of these short- and long-term causalities between the dependent variable GDP and the other variables explains the important role played by public debt services in stimulating economic growth.
At the level of the second part, the estimates are concentrated on a panel of 9 countries using the generalized method of moments (GMM) for the following exogenous variables: INF, LTRE, LCIFB, SDGE and debt and 3 other institutional variables INS grouping control of corruption, political stability and absence of violence and regulatory quality The econometric results obtained show that the SDGE variable has a positive effect on economic growth. However, two model specifications were applied: linear and quadratic. In the linear model, SDGE positively but significantly affects economic growth only when we add an institutional variable for each model. For the quadratic model, debt has a positive effect up to a certain point (this is the turning point), beyond which its effect becomes negative. The model, with the exogenous variable political stability and absence of violence, has a turning point around 0.5, which explains the importance of this variable in achieving economic growth. Moreover, for the other models, the threshold is approximately 5. In fact, these countries must improve their political stability and institutional quality to reduce public debt and stimulate economic growth.

REFERENCES

1) Aizenman, J., Kletzer K., Pinto B.,(2007) « Economic Growth with Constraints on Tax Revenues and Public Debt: Implications for Fiscal Policy and Cross-Country Differences». NBER Working Paper 2007.
2) Alesina, A. et G Tabellini (1989), « External Debt, capital Flight and Political Risk », Journal of International Economics, 27(3-4): 199-220.

3) Alesina, A., S. Ozler, N. Roubini et P. Swagel (1996), « Political Instability and Economic Growth », Journal of Economic Growth, 1(2): 189-211.
4) Aschauer, D.A., (2000)«Do states optimize? Public capital and economic growth», The Annals of Regional Science 34,2000, p343–363.
5) Atish R. Ghosh, Jonathan D. Ostry (2015) « les gouvernements doivent-ils réduire la dette publique ? » La Découverte | « Regards croisés sur l'économie » 2015/2 n° 17 | pages 88 à 100
6) Baum, A., Checherita-Westphal, C., & Rother, P., (2013) «Debt and growth: New evidence for the euro area», Journal of International Money and Finance,2013,p 809–821.
7) Berthélemy, J.-C., et A. Yaroudakis (1996), "Economic Growth, Convergence Clubs, and the Role of Financial Development", Oxford Economic Papers, 48(2), p. 300–28.
8) Chang, T., Chiang, G., (2009)«The behavior of OECD public debt: a panel smooth transition regression approach», The Empirical Economics Letters, 2009.
9) Checherita-Westphal, C., & Rother, P.,(2012) «The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area». European Economic Review,2012, p 1392–1405.
10) Ferreira, C. , (2009)«Public debt and economic growth: A granger causality panel data approach. ISEG-Technical University of Lisbon» *Working Paper* Nº 24,2009.
11) DURLAUF, S. N. et P. A. JOHNSON (1995), "Multiple Regimes and Cross-Country Growth Behaviour", Journal of Applied Econometrics, 10(4), p. 365-84
12) HANSEN, B. E. (2000), "Sample Splitting and Threshold Estimation", Econometrica, 68(3), p. 575-603.
13) Jean-Claude Berthélemy (2006) « Clubs de convergence et équilibres multiples : comment les économies émergentes ont-elles réussi à échapper au piège du sous-développement ? De Boeck Supérieur | « Revue d'économie du développement » 2006/1 Vol. 14 | pages 5 à 44 ISSN 1245-4060 ISBN 9782804151270 DOI 10.3917/edd.201.05
14) Krugman, P., (1988) «Financing versus Forgiving a Debt Overhang», Working Paper Series, Nº 2486, January, 1988.
15) Kumar, M., Woo J., (2015) «Public Debt and Growth». *IMF Working Paper* N°10,2010,p174.
16) Leila ben Ltaief (2014) « Dette publique et croissance économique : investigation empirique pour la zone euro, l'Union européenne et les pays avancés, l'Actualité économique Volume 90, numéro 2, juin 2014, p. 79–103.
17) Makrem Ben Doudou and Faycel Rahali (2018) « Démocratie, stabilité politique et croissance économique : estimation à partir d'un modèle en panel dynamique », l'actualité économique , revue d'analyse économique Volume 94, Number 1, March 2018
18) Miguel P-A, Marcos S-N, (2015)«Granger causality between debt and growth: Evidence from OECD countries». International Review of Economics and Finance N°35, 2015,p66- 77.
19) Panizza, U., & Presbitero, A. F. (2014): «Public debt and economic growth: Is there a causal effect? », Journal of Macroeconomics, N° 41,2014,p 21–41.
20) Reinhart C. et K. Rogoff, 2009(a), This Time is Different: Eight Centuries of Financial Folly, Princeton University Press. En français : Cette fois, c'est différent : huit siècles de folies financières, Pearson.
21) Reinhart C. et K. Rogoff, 2009(b), « Growth in a Time of Debt », American Economic Review Papers and Proceedings, décembre.
22) Sachs, J. ,(1984) «Theoretical Issues in International Borrowing», Princeton Studies in International Finance,N°54, July,1984.
23) Saint-Paul, G.,(1992) «Fiscal policy in an endogenous growth model», Quarterly Journal of Economics N°107, 1992,p1243–1259.
24) Schclarek, A. (2004), « Debt and Economic Growth in Developing and Industrial Countries », Lund University, Department of Economics, Working Paper, no 34.
25) Yeva S. Nersisyan, L. Randall Wray (2011) « un excès de dette publique handicape-t-il réellement la croissance » OFCE | « Revue de l'OFCE » 2011/1 n° 116 | pages 173 à 190.

Table 4 Granger causality test results

*Indicates statistical significance at 1%. ** indicates a significance of t-statistic and D denotes the first difference of the variable considered; lagged ECT is the error correction term derived from the long-term cointegrating relationship. (Red indicates a two-way relationship between the two variables).

Dependent variable	short term										Long term ECT
	PIB	INF	D(LFBCF)	LTRE	LCIFB	D(CGC)	D(LSDE)	LCMM	D(SDGE)	D(LDNB)	
PIB		4.10294	6.05273	0.57432	1.53595	0.03080	3.30570	1.28129	0.40502	0.34248	0.002975
		(0.0181)*	**(0.0029)***	(0.5642)	(0.2180)	(0.9697)	**(0.0391)***	(0.2804)	(0.6676)	(0.7105)	[1.72466]
INF	0.98516		1.25780	1.25386	5.15245	0.88008	0.26725	3.33719	0.33769	3.21739	-0.003504
	(0.3754)		(0.2872)	(0.2883)	**(0.0068)***	(0.4168)	(0.7658)	**(0.0382)***	(0.7140)	**(0.0428)***	[-1.35282]
D(LFBCF)	3.83473	3.60654		3.36653	0.83383	0.26344	1.20615	0.28277	2.43089	1.96535	2.43E-05
	(0.0235)*	**(0.0295)***		**(0.0373)***	(0.4363)	(0.7687)	(0.3023)	(0.7541)	(0.0915)	(0.1433)	[0.30060]
LTRE	0.46308	0.02579	6.27678		4.13062	1.90260	0.13007	3.91301	1.63404	1.49365	-4.03E-05
	(0.6301)	(0.9745)	**(0.0024)***		**(0.0179)***	(0.1528)	(0.8781)	**(0.0221)***	(0.1984)	(0.2280)	[-0.21757]
LCIFB	1.07194	3.33687	4.09840	5.03978		2.66517	2.66528	2.65996	0.80512	1.01495	-0.000112
	(0.3445)	**(0.0380)***	**(0.0184)***	**(0.0076)***		**(0.0728)***	**(0.0729)***	**(0.0730)***	(0.4489)	(0.3648)	[-1.66138]
D(CGC)	1.63255	0.92279	0.60444	1.97660	0.80712		4.87404	1.32737	0.83084	0.45892	-0.002180
	(0.1984)	(0.3995)	(0.5477)	(0.1422)	(0.4478)		**(0.0089)***	(0.2681)	(0.4376)	(0.6328)	[-0.57881]
D(LSDE)	0.40853	0.17575	2.44471	3.24120	1.98347	0.40985		1.38294	9.04158	0.81204	-6.33E-05
	(0.6653)	(0.8390)	**(0.0903)***	**(0.0417)***	(0.1411)	(0.6645)		(0.2543)	**(0.0002)***	(0.4459)	[-0.42304]
LCMM	1.74786	5.03570	4.61411	0.43385	3.42573	3.77002	0.13325		1.12858	1.88122	0.001370
	(0.1774)	**(0.0077)***	**(0.0115)***	(0.6489)	**(0.0349)***	**(0.0252)***	(0.8754)		(0.3265)	(0.1562)	**[2.4930]****
D(SDGE)	0.19637	0.14887	0.14637	0.78234	3.70875	0.54839	0.18127	1.05927		3.69279	-0.013936
	(0.8219)	(0.8618)	(0.8640)	(0.4591)	**(0.0268)***	(0.5790)	(0.8344)	(0.3495)		**(0.0272)***	**[-9.6855]****
D(LDNB)	5.39979	0.08350	5.15552	1.09135	1.03024	0.33061	1.62180	1.28080	0.17909		-0.000198
	(0.0053)*	(0.9199)	**(0.0067)***	(0.3385)	(0.3593)	(0.7190)	(0.2011)	(0.2811)	(0.8362)		**[-4.8668]****