Optimal government size and economic growth in developing and MENA countries: A dynamic panel threshold analysis

Ridha Nouira[(a)] *& Mohamed Kouni*[(b)]

(a) UREP, and FSEG Mahdia, -Tunisia: nouira.ridha75@gmail.com

(b) ISAE , University of Gafsa,Tunisia: kouni.mo@gmail.com

Abstract: This paper aims to investigate the relationship between public expenditures and growth in selected MENA and developing countries over the period from 1988 to 2016. Indeed, we use the model of Chudik et al. (2017) in order to estimate public expenditures threshold and its effect on growth. The main finding of this study shows that there is a government expenditure threshold effects on growth economic for all panel groups. Indeed, consistent with an important body of the recent literature, the threshold is between 10-30 percent for all countries, 20 and 30 percent for MENA countries and 10 and 20 percent for developing countries. It is also clear that this threshold effect is significantly greater for MENA countries. In addition, the results of the CS-ARDL model across various groups suggest a positive relationship between a government expenditure and economic growth.

Key Words: Government size, Growth, Panel tests of Threshold effects, large dynamic heterogeneous panels, cross-section dependence, MENA

I- Introduction

The impact of government size on economic growth draws more attention in economic literature for many years. There are three conflicting views about the relationship between government size and economic growth. The first view maintains that the public expenditure has a positive impact on growth. The second school regards that government spending and growth are negatively correlated. However, there is another theoretical trend in which researchers argue that the relationship between government expenditure and economic growth could be a non-linear rather than a linear relation (Chen and Lee, 2005; Martins and Francisco 2014; Thanh 2015, etc.). The non-linear relationship illustrated as an inverted U shaped curve and called Armey curve popularised by Armey (1995). The author showed that there are two opposite effects: the first effect is positive where public expenditures are productive and they permit to reduce significantly the transactions costs and create a favorable affairs climate. However, an increase of public spending enhances taxes and decreases growth. Indeed, in its first part the U shaped curve linking the size government to growth has an increasing trend (positive effect), while it takes a decreasing shape (negative impact) in the second part. This implies that there is an optimal level of government expenditure which could maximize economic growth.

It is in this perspective that this paper proposes to investigate the optimal level of government size as well as its effect on growth for selected MENA and developing countries. This study contributes to the existing literature in a number of ways. To the best of our knowledge, this is the first attempt that used the model of Chudik et al. (2017) in this field. Indeed, we adopt in this study a dynamic panel model recently developed by Chudik, et al. (2017). This model takes into account *dynamics, cross-country heterogeneity, cross-sectional dependence and feedback effects* between government expenditure and growth. Furthermore, in this paper we examine the long-term effects of government expenditure build-up on economic growth using ARDL and DL specifications discussed in Chudik et al. (2015), as well as their cross-sectionally augmented versions. Previous studies have not taken into their account all these econometric issues together despite their importance. Moreover, little are the studies which conducted a comparative analysis between MENA and other developing countries. But also there is a small number of studies conducted on MENA countries. In this study, we conduct a comparative analysis between the two groups.

The empirical results proved, consistent with the recent literature, that there is a government expenditure threshold effects on growth economic for all panel groups. Indeed, the threshold is

between 10-30 percent for all countries, 20 and 30 percent for MENA countries and 10 and 20 percent for developing countries. It is also clear that this threshold effect is significantly greater for MENA countries. In addition, the results of the CS-ARDL model across various groups suggest a positive relationship between a government expenditure and economic growth.

The rest of the paper is organized as follows. Section two presents a literature review. Section three examines data and methodology. Section four analyzes empirical results. Section five summarizes and concludes.

II- Literature Review

The debate started in several years ago. Indeed, after 1929 crisis, Keynes published in 1936 his general theory, and recommended that in order to attain full employment equilibrium state should to intervene in economy by adopting a budget policy. Therefore, after Second World War about all states adopted this intervention policy multiplying their budget expenditures. Thus, world economy has known a golden growth period over about thirty years from 1945 to 1975.

II.1. Main trends

It is also important to stress that modern macroeconomic theory treated public expenditures as a main component of aggregate demand and the main control variable of budget policy. Nevertheless, there are mainly diverged two points of view about the role of public expenditures. Hence, the debate around public policies efficiency opposed Keynesians to monetarists. Contrary to Keynesians, the monetarists were unconvinced by the ability of governments to stabilize the economy. In the same way, the new classical school, especially Lucas (1970) and Sargent and Wallace (1975) showed that if rational expectations are introduced a budget policy could not explain the gaps between product and its natural equilibrium level. However, the new Keynesians and growth theory show that public expenditures constitute among main factors of growth (Barro, 1990).

II.2. Positive effect of public expenditure on growth

Barro was the first author who developed an endogenous growth model with public expenditures in 1990, in which the author showed that the growth rate depends on the structure of government spending. He predicts also that expenditures in infrastructure and in law constitute the highly productive categories of public spending. The expenditures in law are productive because they reinforce property rights and therefore the growth.

Further, several other works have been conducted in order to analyze this relationship. Ashauer (1987) finds that public spending stimulates the private capital and investment. Indeed, infrastructure has a potential positive impact on marginal productivity of capital. This means that private investment and public investment are complimentary. The same result is confirmed by Erden and Holcomb (2005) where they find that public expenditures complements private investment.

On the other hand, Narayan (2004) conducted a study on the relationship between public and private investment in Fiji. The author concluded that the public investment is complementary to private investment in case where there is a period of political stability (over the period from 1950 to 1975). Nevertheless, government spending has not been complementary to private investment over the period 1976-2001 characterized by a great political instability.

Felice (2016) developed a dual endogenous growth model (Two private sectors are considered by the model: traditional and modern) with public expenditures. The author analyzed the effect of two public spending categories (infrastructure and some other public goods and services) on factor productivity and employment. He showed that the productive public expenditure affects directly and indirectly the growth rate in the long run. Indeed, it generates a direct impact through the change in its size and composition and an indirect effect through change in employment shares between two sectors. The main result of this study showed that if the share of government spending for traditional sector increases, the employment share in modern sector decreases. Thus, an increase in productive public investment and/or the change in its composition increase the growth rate in long run.

Ventelou and Bry (2006) showed, based on DEA method that government spending has a positive effect on macroeconomic growth. But, when “deviations from the efficiency frontier are not “pure misallocation” and would better be connected with an index of social wellbeing.” The author concluded that there is no reason for which government limits public spending.

Devarajan et al. (1996) argued that the effect of the share of current expenditures on growth is positive and statistically significant. Nevertheless, the relationship between the capital component of public spending and per-capita growth is negative. Authors concluded that developing countries have been misallocating public expenditures.

II.3. No significant or negative effect of public expenditure on growth

However, Tatom (1991) and Holtz-Eakin (1994) argue that the effect of infrastructure is not significant. Cullison (1993) analyzed the effect of 21 categories of public expenditures on economic growth, among which education, civilian safety, training and infrastructure. He showed that there are only two categories which have a positive and significant effect on growth: education and labor training.

Manamperi (2016) argue that the military expenditure has a significant negative impact on economic growth for Turkey and it has not a significant effect on growth for Greece.

II.4. Non-linear relationship between public expenditures and growth: Optimal size of government

Armey (1995) developed an inverted U-shaped curve similar than the Laffer curve in order to study the impact of public expenditures on growth. The author showed that there are two opposite effects: the first effect is positive where public expenditures are productive and they permit to reduce significantly the transactions costs and create a favorable affairs climate. However, an increase of public spending enhances taxes and decreases growth. Indeed, in its first part the curve linking the size government to growth has an increasing trend (positive effect), while it takes a decreasing shape (negative impact) in the second part (Andrade et al. 2005).

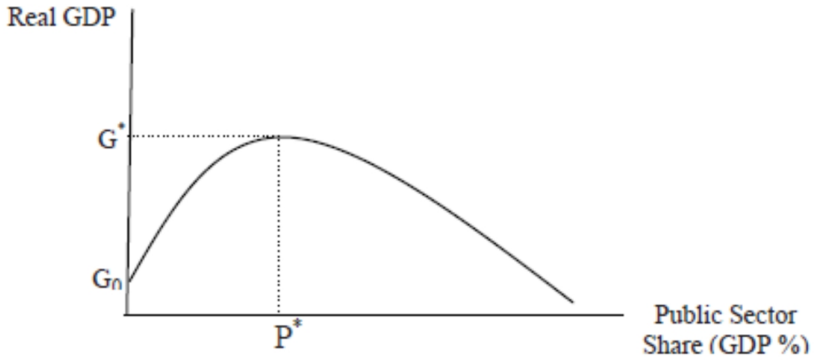

Figure 1: Armey Curve
Source: Altunc and Aydin (2013)

Further, Zogravu and Sava (2014) applied the Armey's model in order to determine the optimal volume of current and capital public expenditures which permit to maximize growth. The results showed that the optimal level of public spending has a positive effect on economic growth. Indeed, the optimal level of capital public expenditures should be higher than the observed level. Nevertheless, the current expenditures should decrease.

Based on Armey's model, Altunc and Aydin (2013) showed that the optimal government expenditure for Turkey, Romania and Bulgaria range from 22% to 25% of GDP. If this share exceeds this threshold, the effect of public expenditure becomes negative.

Chen and Lee (2005) argued that over-expanding public expenditure is not favorable to economic growth. Nonetheless, it reduces growth, through crowding effect and increasing taxes.

Zhang, Ru and Li (2016) studied in an endogenous growth model the effect of two public spending categories; public capital and public services, on economic growth and they also search the optimal public spending composition and optimal taxation structure. The study finds that there is an intrinsic relation between the composition of income tax and the composition of public expenditure. The optimal situation can be achieved if income tax finances public services and consumption tax finances public capital.

It is clear that there are little studies which search the optimal composition of public expenditures. Nevertheless, there is a need for both searchers and policy makers to know what the optimal allocation of public resources is considered, especially for developing countries. This is constitutes our aim in the rest of paper.

Andrade et al. (2005) started from Armey curve and Barro model (1990) in order to determine the optimal size of government for the case of EU countries over the period from 1960 to 2002. Authors showed that the Wagner law is proved for the case of EU, where there is a positive relationship between public expenditures and GDP. They get also a non-linear relationship between the two variables, but Armey curve is inversed. They concluded that we can produce the same effect on growth using two "antagonist" budget policies. They also argued that for the same government size, the optimal rate of growth in the case of young population (in which preference rate to consumption is high) is lower than the case of elderly population because state realizes both productive and unproductive expenditures. Thus, in the case of young

population the share of unproductive expenditures is high than the one of productive expenditures. In the same way, Asimakopoulos and Karavias (2015) tested the nature of this relationship and identified the optimal level of government size using a novel non-linear panel generalized method of moments approach. Indeed, they proved that this relationship is non-linear and significant above and below the optimal level. In addition, Chen et al. (2016) studied the optimal level of government investment, in a growth model for the case of 65 developed and developing countries over the period 1991-2014. Their results showed that the effect of government expenditures on growth is decreasing as the expenditures rise. This effect becomes negative when public expenditures/GDP ratio attains a certain threshold. The same result is obtained by Hok et al. (2014) from where they proved an inverted U relation between government spending and economic growth. They find also that the optimal size of government expenditure share of GDP was 28.5% for eight ASEAN countries.

III- Data and Methodology

In this study, the relationship between government expenditure and economic growth will be investigated for the case of 36 countries divided into two groups: MENA countries and other developing-countries (15 MENA countries and 21 developing countries; see Appendix A for the list of countries) over the period from 1988 to 2016. The data used in this study come from World Development Indicators (WDI) database. Further, based on the most recent growth literature which showed that there is a non-linear relationship between economic growth and government expenditure (Chen et al. (2016), Hok et al. (2014), Altunc and Aydm (2013), Chobanov and Mladenova (2009), Chiou-Wei et al. (2010), Gunalp and Dincer (2010) and Chen and Lee (2005)), we will test in this study this relationship. We will show that there is a non-monotonic relation in which there exists a tipping level for government expenditure beyond which the economic growth falls significantly. For this, we perform a dynamic panel threshold approach that attempts to investigate this non-linear effect. As we already shown in previous part of this study, there is only a small number of papers conducted on threshold panel data models. Hansen (1999) developed an approach to testing the statistical significance of threshold effects in the case of static panels with fixed effects and homogeneous slopes. Furthermore, a more recent dynamic panel threshold approach developed by Kremer et al. (2013) utilize cross sectional model and panel settings to Caner and Hansen (2004)'s instrumental variable. Kremer et al. (2013) made their work applicable to the dynamic panel models by offering forward orthogonal transformation to deal with the country specific fixed effects. Seo and Shin (2014) developed a new dynamic panel threshold but continue to assume slope homogeneity and use

instruments to deal with endogeneity once the fixed effects are eliminated by first differencing. In this study, we argue a dynamic panel model recently developed by Chudik, et al. (2017). This model takes into account dynamics, cross-country heterogeneity, cross-sectional dependence and feedback effects between government expenditure and growth. Furthermore, in this paper we examine the long-term effects of government expenditure build-up on economic growth using ARDL and DL specifications discussed in Chudik et al. (2015), as well as their cross-sectionally augmented versions. We start our econometric analysis with the following "reduced form" panel threshold-ARDL specification for growth Δy_{it}

$$\Delta y_{it} = c_i + \varphi' g(d_{it}, \tau) + \sum_{l=1}^{P} \lambda_i \Delta y_{i,t-l} + \sum_{l=1}^{P} \beta_i \Delta d_{i,t-l} + v_{it} \qquad (1)$$

We also consider the alternative approach of estimating the long-run effects using the distributed lag (DL) given by

$$\Delta y_{it} = c_i + \theta' g(gov_{it}, \tau) + \phi_i \Delta gov_{it} + \sum_{l=0}^{P} \alpha_i \Delta^2 gov_{it-l} + v_{it} \qquad (2)$$

Where y_{it} is the log of real GDP, gov_{it} is the log of government expenditure in percentage of GDP. $g(gov_{it}, \tau)$ is the threshold variable and can be: $g_1(gov_{it}, \tau) = I[gov_{it} > \ln(\tau)]$ and/or $g_2(gov_{it}, \tau) = I[gov_{it} > \ln(\tau)] * max(0, gov_{it})$: The threshold variable $g_1(gov_{it}, \tau)$ takes the value of 1 if government expenditure is above the given threshold value of τ and zero otherwise. The interactive threshold term, $g_2(gov_{it}, \tau)$, is non-zero only if $gov_{it} > 0$, and $gov_{it} > \ln(\tau)$. The threshold coefficient, τ , can then be determined by a covering search method (for more details see Chudik et al. (2017)).

Chudik et al. (2017) develop new tests for threshold effects in the case of large dynamic heterogeneous panel data models with cross-sectionally dependent errors. Using vector notations, equation (1) for $t = 1,2, \ldots . T$ can be written as

$$\Delta Y_i = Q_i \Gamma_i + \Phi F_i(\tau) + V_i \qquad \text{for } i = 1,2, \ldots N \qquad (3)$$

Where ΔY_i is a $(Tx1)$ vector of observations on Δy_{it}, Q_i is a matrix of variables $Q_i = (1, \Delta y_{i,t-1}, \Delta gov_{it}, \Delta gov_{it-1})$ and $F_i(\tau)$ is a (T x r) matrix of observations on the threshold variables in $g(gov_{it}, \tau)$. r is the number of threshold variable. The SupF test statistic for testing the null hypothesis $\varphi = 0$ is given by

$$\text{SupF} = \sup_{\tau \epsilon H} [F_{NT}(\tau)] \qquad (4)$$

Where H represents the admissible set of values for τ and

$$F_{NT}(\tau) = \frac{(RSS_r - RSS_u)/r}{RSS_u/(n-s)} \qquad (5)$$

RSS_u is the residual sum of squares of an unrestricted model, RSS_r is the residual sum of squares of the restricted model under the null $\varphi = 0$, n is the number of observations and s is the total number of estimated coefficients in the unrestricted model. Similarly, we define $AveF$ test statistics as

$$AveF = \frac{1}{\#H}\sum_{\tau \in H} F_{NT}(\tau) \qquad (6)$$

Where $\#H$ is the number of elements of H. The distributions of the $SupF$ and $AveF$ test statistics are non-standard, but they can be easily simulated. In this study$r = 1$, then we use the square root of $F_{NT}(\tau)$ in (4) and (6) to obtain the $SupF$ and $AveF$ test statistics, respectively.

IV- Empirical results

Based on the novel dynamic panel threshold approach of Chudick et al. (2017) we allow in this model for country-specific heterogeneity in dynamics, error variances, and cross-country correlations, but we further assume homogeneous threshold parameters. Before applying the threshold regression model, we apply a test for the existence of threshold effect between government expenditure and growth. Chudik et al. (2017) develop new tests for threshold effects in the case of heterogenous dynamic panel data models. The test of government expenditure-threshold effects are summarized in Table 1 for all countries, in Table 2 for MENA countries, and in Table 3 for other developing countries. Each table contains the $SupF$ and $AveF$ test statistics for the significance of the simple threshold variable, $g_1(gov_{it}, \tau)$. The critical values of $SupF$ and $AveF$ statistics at 10% are reported in Appendix B. The left panel of the table gives the results of the ARDL and DL specifications, (1) and (2), whilet the right panels provide the results for the ARDL and DL specifications augmented with cross-section averages, designated by CS-ARDL and CS-DL, respectively (see Chudik et al. (2017) for more details).

Table 1: Tests of government expenditure-threshold effects for all countries

	ARDL		DL		CS-ARDL		CS-DL	
lags	(1,1)	(2,2)	P=1	P=2	(1,1,1)	(2,2,2)	P=1	P=2
Regressions with threshold variables: $g_1(gov_{it},\tau) = I[gov_{it} > \ln(\tau)]$								
$\hat{\tau}$	0,3	0,3	0,3	0,3	0,2	0,3	0,1	0,1
SupF	2,75*	2,13	3,46***	2,97**	2,64*	2,9*	2,71*	2,93*
AveF	0,88*	0,63	1,74**	1,35*	0,98*	0,87	1,15**	1,27*
CD	10,52	10,13	12,34	12,47	-0,01	0,00	0,34	-0,86

Statistical significance of the Sup and Ave test statistics is denoted by * ,**, and ***, at 10%, 5% and 1% level, respectively. CD is the cross-section dependence test statistic of Pesaran (2004).

Table 2: Tests of government expenditure-threshold effects for MENA countries

	ARDL		DL		CS-ARDL		CS-DL	
lags	(1,1)	(2,2)	P=1	P=2	(1,1,1)	(2,2,2)	P=1	P=2
Regressions with threshold variables: $g_1(gov_{it},\tau) = I[gov_{it} > \ln(\tau)]$								
$\hat{\tau}$	0,2	0,2	0,2	0,3	0,3	0,3	0,2	0,3
SupF	2,75*	2,13	3,46***	2,97**	2,61*	2,96*	2,55*	2,64*
AveF	0,88*	0,66	1,75**	1,36*	0,94*	0,90	1,23**	1,28**
CD	0,86	1,31	1,38	1,50	-0,46	0,62	-1,14	-1,22

Statistical significance of the Sup and Ave test statistics is denoted by * ,**, and ***, at 10%, 5% and 1% level, respectively. CD is the cross-section dependence test statistic of Pesaran (2004).

Table 3: Tests of government expenditure-threshold effects for developing countries

	ARDL		DL		CS-ARDL		CS-DL	
lags	(1,1)	(2,2)	P=1	P=2	(1,1,1)	(2,2,2)	P=1	P=2
Regressions with threshold variables: $g_1(gov_{it},\tau) = I[gov_{it} > \ln(\tau)]$								
$\hat{\tau}$	0,2	0,2	0,2	0,1	0,1	0,1	0.1	0,1
SupF	2,61**	2,43*	3,23***	2,91**	2,68**	2,76*	2,87**	2,43*
AveF	0,82*	0,75	1,22*	1,42*	1,16*	1,09	1,30*	1,15
CD	12,20	12,38	13,8	13,41	1,29	1,38	0,64	0,37

Statistical significance of the Sup and Ave test statistics is denoted by * ,**, and ***, at 10%, 5% and 1% level, respectively. CD is the cross-section dependence test statistic of Pesaran (2004).

In the case of the ARDL and DL model the CD test highlights that the error terms across countries in our model exhibit a considerable degree of cross-sectional dependence which

implies that estimates obtained using standard panel ARDL and DL models might be very limited. In the case of CS-ARDL and CS-DL the CD statistic decline from 12 and 13 in the ARDL and DL to −0.4 and 0.8 in the CS-ARDL and CS-DL models. The $SupF$ and $AveF$ tests results are, overall, statistically significant in all cases. This result shows clearly the presence of government expenditure threshold effects on economic growth for all panel groups. This means that very high government expenditure can led to lower economic growth while reasonable government expenditure can led to increased growth. Indeed, consistent with an important body of the recent literature, the threshold is between 10-30 percent for all countries, 20 and 30 percent for MENA countries and 10 and 20 percent for developing countries. It is also clear that this threshold effect is significantly greater for MENA countries. The same result is obtained by Gunalp and Dincer (2010) from where they find for 20 transition countries that the optimal level of government expenditures was 17.3%. Altunc and Aydm (2013) conducted a study for 3 countries (Turkey Romania and Bulgaria) and found a public expenditures threshold within the range of 11-25%. Asimakopoulos and Karavias (2015) proved that the optimal level of government size that maximizes economic growth for 86 developing countries is around 19.12%. Further, if we compare empirical threshold with the average current share of the government expenditure over the period from 1988 to 2016 and with the effective share in 2016 (presented in appendix C), we can conclude that there are some countries below the threshold and others above the threshold. Table 4 provides the countries which are below/above threshold and the countries on the threshold.

Table 4: Position of Government expenditure share compared to the threshold

Below the Threshold		**Above the Threshold**		**On the Threshold**	
Average of period	End the period	Average of period	End the period	Average of period	End the period
Indonesia	Indonesia		Brazil	Argentina	Argentina
Singapore	Sri Lanka		South Africa	Bolivia	Bolivia
Algeria	Algeria			Brazil	Chile
Bahrain	Bahrain			Chile	China
Egypte	Egypte			China	Colombia
Iran	Iran			Colombia	Ecuador
Iraq	Jordan			Ecuador	India
Lebanon	Lebanon			India	Korea, Rep.
Mauritania	Morocco			Korea, Rep.	Malaysia
Morocco	Syria			Malaysia	Mexico
Syria	Turkey			Mexico	Pakistan
Tunisia	Yemen			Pakistan	Philippines

Turkey	Philippines	Peru
Yemen	Peru	Singapore
	South Africa	Thailand
	Sri Lanka	Uruguay
	Thailand	Venezuela, RB
	Uruguay	Kuwait
	Venezuela, RB	Mauritania
	Jordan	Saudia
	Kuwait	Tunisia
	Saudia	

This means that the share of government expenditure must be getting down in some countries (Brazil and South Africa) and increased in other countries (Indonesia, Sri Lanka, Algeria, Bahrai, Egypte, Iran Jordan Lebanon, Morocco, Syria Turkey and Yemen) in order to achieve the optimal level of growth. Therefore, the current expenditure share is not optimal in order to maximize growth and revive economic activity.

It is important to note that the main objective of this paper is not only the estimation of public spending threshold effects but also the estimation of the long-run effects of government expenditure on economic growth. We estimate in fact the model presented above using a recently developed method of Cross-Section Augmented ARDL approach (CS-ARDL) of Chudik and Pesaran (2015). In this approach, the authors extended the CCE approach by allowing for dynamic panels with heterogeneous coefficients and feebly exogenous regressors. This approach, established on the estimation of ARDL specifications, increased with cross-section means to eliminate the effects of the unobserved common factors, from which long-run effects can be indirectly estimated. One of the focus features of this approach is that it permits to estimate the long-run effects in large dynamic heterogeneous panel data models with cross-sectionally dependent errors. The estimations results are summarized in Table 4.

Table 5: Mean group estimates of the long-run effects of government expenditure on economic growth

	CS-ARDL		
Lags	(1,1,1)	(2,2,2)	(3,3,3)
Regressions with threshold variables: $g_1(gov_{it}, \tau) = I[gov_{it} > \ln(\tau)]$			
all countries	**0,030** **(0.011)**	**0,041*** **(0.024)**	**0,046*** **(0.025)**

MENA countries	**0,075** **(0.03)**	**0,074** **(0.036)**	**0,069*** **(0.04)**
developing countries	**0,055*** **(0.031)**	**0,101*** **(0.06)**	**0,11*** **(0.066)**

Standard errors are given in parentheses. Statistical significance is denoted by (*), (**) and (***), at 10%, 5% and 1% level, respectively.

The results across various groups suggest a positive relationship between a government expenditure and economic growth. Indeed, Table 4 shows that the coefficients of government expenditure are positive and mostly statistically significant at 10 and 5 percent levels, with their values ranging from 0.03 to 0.1. It is also important to stress that the estimators related to MENA regressions are relatively more significant than those related to other regressions (for whole sample and for developing countries). This result shows that public expenditure is among main factors of growth in developing countries, especially in MENA countries. It can be improved if these countries used optimally their budget, particularly in productive fields. In terms of volume, certain MENA countries which they below the empirical threshold such as Iran, Iraq, Egypt, Turkey and Tunisia, they can achieve an optimal growth rate if they engage more spending in their economies.

Robustness analysis:

In this section we conduct a robustness check of the results reported in table 1 to 5 and we include Openness ratio as an additional regressor in the different specifications. The estimation results are reported in Table 6.

Table 6: Tests of government-threshold effects and Mean group estimates of the long-run effects of government expenditure and openness rate on economic growth

		CS-ARDL	
Lags		(1,1,1)	(2,2,2)
Regressions with threshold variables: $g_1(gov_{it},\tau) = I[gov_{it} > \ln(\tau)]$			
all countries	$\hat{\tau}$	0,2	0,2
	SupF	2,62**	2,87*
	φ_{gov}	0,02* (0.012)	0,034* (0.018)
	φ_{open}	0,033* (0.02)	0,037 (0.021)
MENA Countries	$\hat{\tau}$	0,3	0,2
	SupF	2,256*	2,980*

	φ_{gov}	0.04*	0,043
		(0.021)	(0.027)
	φ_{open}	0.048*	0.054*
		(0.028)	(0.03)
Developing countries	$\hat{\tau}$	0,1	0,1
	SupF	2,951**	1,97*
	φ_{gov}	0.038*	0,041*
		(0.022)	(0.024)
	φ_{open}	0.031*	0.038*
		(0.018)	(0.027)

Standard errors are given in parentheses. Statistical significance is denoted by (*) and (**) at 10% and 5% level, respectively.

These results provide the least estimates for all panel groups presented above. The government expenditure threshold effect is statistically significant in all cases. The threshold is 20 percent for whole sample, from 20 to 30 percent for MENA countries and 10 percent for developing countries. The coefficients of the variables of government size and trade openness are positive and statistically significant at 10 percent level in the majority of regressions. The trade openness has a positive and significant effect for the three panel groups. It is important to stress that in an openness framework an efficient expansionary budget policy depends of some measures. Indeed, growth is more stimulated by public spending in the context of fixed exchange regime than in flexible regime (Mundell (1963) and fleming (1962)). Moreover, to attain an optimal growth rate it is also important to draw attention to twin deficits (budget and commercial). Indeed, if these two deficits are large, spending policy becomes less efficient. This is the case of an important number of developing countries whose, some MENA countries. Further, budget policy can lead economy on a balanced growth path in the case where government uses also rational funding sources, in order to get equilibrium between internal and external sources. Taking into account of all these variables is may be a hard task for policymakers, which explains the weak significance of the results in Table 6 comparing with those in previous tables.

V- Conclusion and policy implications

We are interested in investigating in this study the nature of the relationship between public spending and economic growth in MENA and some developing countries during the period from 1988 to 2016. This study contributes mainly to the existing literature in this field from a methodological point of view from where we argue a dynamic panel model recently developed by Chudik, et al. (2017). This model takes into account *dynamics, cross-country heterogeneity, cross-sectional dependence and feedback effects* between government expenditure and growth. Furthermore, in this paper we examine the long-term effects of government expenditure build-up on economic growth using ARDL and DL specifications discussed in Chudik et al. (2015), as well as their cross-sectionally augmented versions. The main finding of this study shows that there is a government expenditure threshold effects on growth economic for all panel groups. Indeed, consistent with an important body of the recent literature, the threshold is between 10-30 percent for all countries, 20 and 30 percent for MENA countries and 10 and 20 percent for developing countries. It is also clear that this threshold effect is significantly greater for MENA countries. In addition, the results of the CS-ARDL model across various groups suggest a positive relationship between a government expenditure and economic growth. Indeed, the coefficients of government expenditure are positive and mostly statistically significant at 10 and 5 percent levels, with their values ranging from 0.03 to 0.1. It is also important to note that these coefficients are relatively more significant for MENA countries than those for developing countries. However, the results of the robustness analysis are relatively less significant than the other results.

Therefore, taking into account this result some policy implications can be proposed as follows:

- There is a need for policymakers, in some developing countries, particularly in MENA countries from where their public expenditure share is inferior to empirical threshold to engage more spending in order to boost growth. Nevertheless, these expenditures, especially those coming from an external source should be affected to productive sectors in order to create added value and employment.
- It is also important to stress that for the countries where they achieve the optimal threshold they should invest more in institutional field in order to provide a clean framework in which public funds is efficiently allocated. For all countries (having a public share below or above threshold) there is a need to invest not only in public capital,

but also in institutions and fight against corruption. They should also ameliorate affairs' climate and enhance social cohesion.

While this study investigated the nature of the relationship between public expenditures and growth, and at our knowledge, this is the first attempt which used the model of Chudic et al. (2017) in this field, the future empirical works could studied this relationship taking into account different expenditures categories. The decomposition of the budget permits to distinguish between productive and unproductive spending and it can better light policymakers.

References:

Altunc, O. F. and Aydm, C, 2013. "The relationship between optimal size of government and economic growth: Empirical evidence from Turkey, Romania and Bulgaria", Procedia – Social and Behavioral Sciences, 92, 66-75.

Andrade S. J., Duarte M. A. S. and Berthomieu C. 2005. Le Rôle de la Consommation Publique dans la croissance : le cas des pays de l'Union Européenne. CEMAFI-UNSA.

Armey, R. 1995. *The freedom revolution*. Washington, DC: Rognery Publishing Co.

Ashauer, D. A. 1987. *Is government spending stimulative?* Federal Reserve Bank of Chicago, Staff Memoranda.

Asimakopoulos, S. and Karavias, Y. (2015) "The impact of government size on economic growth: a threshold analysis", Economics Letters, 139, pp. 65-68.

Barro J. R. 1990. Government spending in a simple model of endogenous growth. The journal of political economy, 98(5): 103-125.

Caner, M. and Hansen, B.E (2004): ”Instrumental Variable Estimation of a Threshold Model”, Econometric Theory 20, pp. 813-843.

Chen C.,Yao S., Hu P., Lin Y. 2016. Optimal Government Investment and Public Debt in an Economic Growth Model. *China Economic Review*, doi: 10.1016/j.chieco.2016.08.005

Chen, S.T. and C.C. Lee (2005), Government size and economic growth in Taiwan: A threshold regression approach, Journal of Policy Modeling, 27:9, 1051-1066.

Chiou-Wei, S. Z., Zhu, Z. and Kuo, Y. H., 2010. “Government size and economic growth: an application of the smooth transition regression model”, Applied Economics Letters 17(14), 1405-1415.

Chobanov, D., Mladenova, A. (2009). “What is the Optimum Size of Government?” Institute for Market Economics, Bulgaria. Available at: http://ime.bg/uploads/335309 OptimalSizeOfGovernment.pdf

Chudik, A., & Pesaran, M. H. (2015a), “Large panel data models with cross-sectional dependence: A survey”. In B. Baltagi (Ed.), The Oxford handbook on panel data. Oxford: Oxford University Press.

Chudik, A., & Pesaran, M. H. (2015b), “Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors”. Journal of Econometrics, 188, 393–420.

Chudik, A., K. Mohaddes, M. H. Pesaran, and M. Raissi (2016). Long-Run Effects in Large Heterogeneous Panel Data Models with Cross-Sectionally Correlated Errors. In R. C.

Chudik, A., K. Mohaddes, M. H. Pesaran, and M. Raissi (2017), “Is There a Debt-threshold Effect on Output Growth?” Review of Economics and Statistics, Volume 99, Issue 1 March 2017 p.135-150.

Cullison, W. 1993. Public investment and economic growth. *Federal Reserve Bank of Richmond Economic Quarterly*, *79*(4): 19–33.

Devarajan S., Swaroop V., Zou H-f. 1996. The composition of public expenditure and economic growth. Journal of Monetary Economics 37: 313 344.

ERDEN L., HOLCOMBE R. G. 2005. THE EFFECTS OF PUBLIC INVESTMENT ON PRIVATE INVESTMENT IN DEVELOPING ECONOMIES. *PUBLIC FINANCE REVIEW*, 33(5): 575-602.

Felice, G. 2016. Size and composition of public investment, sectoral composition and growth. *European Journal of Political Economy*, doi: 10.1016/j.ejpoleco.2016.07.001.

Fleming M. J. 1962. Domestic financial policies under fixed and under floating exchange rates. IMF Staff Papers 9: 369-79.

Hill, G. Gonzalez-Rivera, and T.-H. Lee (Eds.), Advances in Econometrics (Volume 36): Essays in Honor of Aman Ullah, Chapter 4, pp. 85–135. Emerald Publishing.3ñ45. Oxford University Press, New York.

Hok L., Jariyapan P., Buddhawongsa P. and Tansuchat R. 2014. Optimal Size of Government Spending: Empirical Evidence from Eight Countries in Southeast Asia. *The Empirical Econometrics and Quantitative Economics Letters* 3(4), pp. 31 – 44.

Gunlap, B. and Dincer, O., 2010. "The optimal government size in transition countries". Progress in economics research, 15, 153-169.

Hansen, B. E., 1999. "Threshold effects in non-dynamic panels: estimation, testing, and inference". Journal of Econometrics, 93, 345-368.

Holtz-Eakin D., Schwartz A. E. 1994. INFRASTRUCI1JRE IN A STRUCIURAL MODEL OF ECONOMIC GROWTH. *NBER*, WP No. 4824.

Keynes J. M. 1936. The general theory of employment, interest and money. Palgrave Macmillan (ISBN: 978-0-230-00 476-4).

Kremer, S., Bick, A. and Nautz, D., 2013. "Inflation and growth: new evidence from a dynamic panel threshold analysis". Empirical Economics 44 (2), 861-878.

Lucas R. E. 1972. Expectations and the neutrality of money. Journal of economic theory, 4: 103-124.

Manamperi, N.,Does Military Expenditure Hinder Economic Growth? Evidence from Greece and Turkey. *Journal of Policy Modeling,* http://dx.doi.org/10.1016/j.jpolmod.2016.04.003.

Mundell R. 1963. Capital mobility and stabilization policy under fixed and flexible exchange rates. Canadian J of Economics and Political Science 29: 475-85.

Narayan, P. K. 2005. The saving and investment nexus for China: evidence from cointegration tests. Applied economics, 37(17): 1979-1990.

Pesaran, M.H., (2004), "General Diagnostic Tests for Cross Section Dependence in Panels," Cambridge Working Papers in Economics, No. 435, University of Cambridge, and CESifo Working Paper Series No. 1229.

Sargent J. T., Wallace N. 1975. "Rational" expectations, the optimal monetary instrument and the optimal money supply rule. The journal of political economy, 83(2): 241-254.

Seo, M.H. and Shin, Y., 2014. "Dynamic Panels with Threshold Effect and Endogeneity". London School of Economics Research Lab Working Paper Series, No: EM/2014/577.

Tatom, J. 1991. Public capital and private sector performance. *Federal Reserve Bank of St Louis Review, 73*: 3–15.

Ventelou B., Bray X. 2006. The role of public spending in economic growth: Envelopment methods. Journal of policy modeling, 28: 403-4013.

Zhang L., Ru Y., Li J. 2016. Optimal tax structure and public expenditure composition in a simple model of endogenous growth, *Economic Modelling,* 59:352-360

Zugravu B-G. Sava A-S. 2014. Patterns in the composition of public expenditures in CEE countries. *Procedia Economics and Finance*, 15: 1047-1054.

Appendix:

Appendix A:

List of countries

MENA Countries	Developing Countries
Algeria	Argentina
Bahrain	Bolivia
Egypt.	Brazil
Iran,	Chile
Iraq	China
Jordan	Colombia

Kuwait	Ecuador
Lebanon	India
Mauritania	Indonesia
Morocco	Korea
Saudi	Malaysia
Syria	Mexico
Tunisia	Pakistan
Turkey	Philippines
Yemen	Peru
	Syria
	South Africa
	Sri Lanka
	Thailand
	Uruguay
	Venezuela

Appendix B:

The critical value of $SupF$ and $AveF$ statistics at 10%

		ARDL		**DL**		**CS-ARDL**		**CS-DL**	
		(1,1)	(2,2)	P=1	P=2	(1,1,1)	(2,2,2)	P=1	P=2
All countries	$SupF$	2.56	2.72	2.61	2.71	2.61	2.95	2.41	2.51
	$AveF$	0.87	0.9	0.97	1.13	0.92	0.97	1.1	1.21
MENA countries	$SupF$	2.57	2.7	2.59	2.71	2.57	2.92	2.48	2.59
	$AveF$	0.86	0.9	0.98	1.18	0.93	0.97	0.98	1.17
	$SupF$	2.2	2.23	2.09	2.16	2.4	2.74	2.41	2.37

Developing countries	$AveF$	0.8	0.91	0.98	1.1	0.95	1.12	1.17	1.24

Appendix C:

Average of the government expenditure share of GDP			
developping countries	**GOV/GDP**	**Mena Countries**	**GOV/GDP**
Argentina	12,31%	**Algeria**	**16,46%**
Bolivia	14,23%	**Bahrain**	**18,03%**
Brazil	18,57%	**Egypte**	**11,54%**
Chile	11,00%	**Iran**	**11,97%**
China	14,00%	**Iraq**	**15,89%**
Colombia	15,60%	Jordan	22,17%
Ecuador	11,91%	Kuwait	26,02%
India	11,14%	**Lebanon**	**15,30%**
Indonesia	**8,39%**	**Mauritania**	**19,87%**
Korea, Rep.	12,68%	**Morocco**	**17,71%**
Malaysia	12,43%	Saudia	25,16%
Mexico	11,21%	**Syria**	**12,95%**
Pakistan	11,15%	**Tunisia**	**16,99%**
Philippines	10,47%	**Turkey**	**12,64%**
Peru	10,47%	**Yemen**	**14,43%**
Singapore	**9,91%**		
South Africa	19,16%		
Sri Lanka	10,82%		
Thailand	13,29%		
Uruguay	12,28%		
Venezuela, RB	11,15%		

The government expenditure share of GDP in 2016			
developping countries	**GOV/GDP**	**MENA Countries**	**GOV/GDP**
Argentina	18,41%	**Algeria**	**19,73%**
Bolivia	17,53%	**Bahrain**	**17,64%**
Brazil	20,18%	**Egypte**	**11,43%**
Chile	13,54%	**Iran**	**12,70%**
China	13,97%	Iraq	23,90%
Colombia	18,40%	**Jordan**	**19,94%**
Ecuador	14,34%	Kuwait	24,56%
India	11,65%	**Lebanon**	**14,55%**
Indonesia	**9,45%**	Mauritania	20,40%
Korea, Rep.	15,21%	**Morocco**	**18,94%**
Malaysia	12,58%	Saudia	25,77%
Mexico	12,20%	**Syria**	**12,31%**

Pakistan	11,85%	Tunisia	20,00%
Philippines	11,13%	**Turkey**	**14,75%**
Peru	13,31%	**Yemen**	**13,30%**
Singapore	11,28%		
South Africa	20,47%		
Sri Lanka	**8,57%**		
Thailand	17,09%		
Uruguay	14,45%		
Venezuela, RB	12,39%		