# OPTIMAL GOVERNMENT SIZE AND ECONOMIC GROWTH IN DEVELOPING AND MENA COUNTRIES: A DYNAMIC PANEL THRESHOLD ANALYSIS

Ridha Nouira[1] and Mohamed Kouni[2]

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Send correspondence to:
Ridha Nouira
Faculté des Sciences Économiques et de Gestion de Mahdia
nouira.ridha75@gmail.com

[1] ESA, and FSEG Mahdia, Tunisia.

[2] ISAE, University of Gafsa, Tunisia. kouni.mo@gmail.com

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**Abstract**

This paper aims to investigate the optimal government size as well as its effect on economic growth in selected MENA and developing countries over the period from 1988 to 2016. 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 economic growth for all panel groups. Indeed, the threshold is between 10-30 percent for whole sample, 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. Moreover, we found evidence of a U-shaped relationship between government expenditure and economic growth.

**Keywords:** Government size, Growth, Panel tests of Threshold effects, large dynamic heterogeneous panels, cross-section dependence, MENA.

**JEL Classifications:** C23, E62, O40.

**ملخص**

تهدف هذه الورقة إلى التحقق من الحجم الأمثل للحكومة وكذلك تأثيره على النمو الاقتصادي في دول مختارة من دول الشرق الأوسط وشمال أفريقيا والبلدان النامية خلال الفترة من 1988 إلى 2016. نستخدم نموذج شوديك واخرين (2017) من أجل تقدير سقف الانفاق العام وتأثيره على النمو. تُظهر النتيجة الرئيسية لهذه الدراسة أن هناك آثار لسقف الإنفاق الحكومي على النمو الاقتصادي لجميع المجموعات. والواقع أن سقف الإنفاق يتراوح بين 10 و 30 في المائة للعينة الكاملة و 20 و 30 في المائة في بلدان الشرق الأوسط وشمال أفريقيا و 10 و 20 في المائة بالنسبة للبلدان النامية. من الواضح أيضًا أن تأثير سقف هذا الانفاق أكبر بكثير بالنسبة لبلدان منطقة الشرق الأوسط وشمال أفريقيا. علاوة على ذلك ، وجدنا أدلة على وجود علاقة على شكل U بين الإنفاق الحكومي والنمو الاقتصادى.

## 1. 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 was popularized 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. Nevertheless, an increase in public spending beyond optimal threshold enhances taxes, but 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 boost 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 some aspects. 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, there is very little research in the literature that already conducts a comparative analysis between MENA and other developing countries. But also there are 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 for all panel groups. The threshold is between 10 and 30 percent for whole sample, 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 suggest across various groups a positive long-term relationship between government expenditures 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; and finally Section five is devoted to a summary and conclusion.

## 2. Literature Review

The debate was animated several years ago. Indeed, after 1929 crisis, Keynes published in 1936 his general theory, and recommended that in order to attain full employment

equilibrium; the state should intervene in economy by adopting a budget policy. Therefore, after Second World War about all states adopted an expansionary fiscal policy multiplying their budget expenditures. Thus, world economy has known a golden growth period over about thirty years from 1945 to 1975.

### 2.1. Main trends

It is important to emphasize that modern macroeconomic theory treated public expenditures as a main component of aggregate demand and the main control variable of budget policy. Furthermore, 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. Similarly, 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).

### 2.2. Positive effect of public expenditure on growth

Barro was the first author who developed an endogenous growth model with public expenditures in 1990. In this model, the author showed that the growth rate depends on the structure of government spending. He also predicts that the 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 boost growth.

Furthermore, several other works have been conducted in order to analyze this relationship. Ashauer (1987) finds that public spending stimulates the private capital and investment. 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.

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 sector) 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. It generates a direct impact through the change in its size and composition and an indirect effect through change in employment shares between the two sectors. The main result of this study demonstrated 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 enhance the growth rate in long run.

Based on DEA method, Ventelou and Bry (2006) report 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 authors conclude 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. They concluded that developing countries have been misallocating public expenditures.

### 2.3. No significant or negative effect of public expenditure on growth

Tatom (1991) and Holtz-Eakin (1994) argue that the effect of infrastructure is not significant. Moreover, Cullison (1993) analyzes 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.

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

### 2.4. 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 permit to reduce significantly the transactions costs and create a favorable affairs climate. However, an increase of public spending enhances taxes and decreases growth. 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).

Zugravu 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 demonstrated that the optimal level of public spending has a positive effect on economic growth.

Similarly, 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 et al. (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 has shown 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.

Andrade et al. (2005) start 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. The authors showed that the Wagner law is proved for the case of EU. Indeed, 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. The main conclusion in this study is that we can produce the same effect on growth using two "antagonist" budget policies. They also find that for the same government size, the optimal growth rate in the case where the population is young (in which the preference rate to consumption is high) is lower than the one where the population is getting older because the 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. Similarly, Asimakopoulos and Karavias (2015) estimated 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 have proven 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 have proven an inverted U relation between government spending and economic growth. They also find that the optimal size of government expenditure share of GDP was 28.5% for eight ASEAN countries.

It is clear that studies which have focused on the optimal size of government are relatively few compared with those conducted on 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 constitutes our aim in the rest of the paper.

## 3. Data and Methodology

The aim of this section is to estimate the optimal government size as well as its effect on growth for the case of 36 countries divided into two groups: MENA countries and other developing-countries (15 MENA countries and 21 developing countries)[3] over the period from 1988 to 2016. The data used in this study have been collected from World Development Indicators (WDI) database. To carry out this analysis, a model which fits into a theoretical framework of works treating this relationship such as 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) is already applied. We will investigate the nature of the relation between public spending and growth and we test the existence of a tipping level for government expenditure beyond which the economic growth falls significantly. For this, a dynamic panel threshold approach is used in order to investigate this non-linear effect. As shown in previous part of this study, only a small number of papers which have been 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, in a recent dynamic panel threshold approach Kremer et al. (2013) use a cross sectional model and panel settings to Caner and Hansen (2004)'s instrumental variable. The authors 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) have built a new dynamic panel threshold but continue to assume slope homogeneity and use instruments to deal with endogeneity once the fixed effects are

[3] See Appendix A.

eliminated by first differencing. In this study, we estimate 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, we examine in this section 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. Indeed, we start our econometric analysis with the following "reduced form" panel threshold-ARDL specification for growth $\Delta y_{it}$

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

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

Chudik et al. (2017) propose 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 $\Delta Y_i$ is a $(Tx1)$ vector of observations on $\Delta y_{it}$, $Q_i$ is a matrix of variables $Q_i = \left(1, \Delta y_{i,t-1}, \Delta gov_{it}, \Delta gov_{it-1}\right)$ 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 $\tau$ 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

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

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.

**4. Empirical results**

Based on the novel dynamic panel threshold approach of Chudick et al. (2017) we take into account the country-specific heterogeneity in dynamics, error variances, and cross-country correlations, but we further assume homogeneous threshold parameters. Then, in order to estimate the model we start by testing the existence of threshold effect between government expenditure and growth, using the new threshold-effects tests in the case of heterogenous dynamic panel data models, recently developed by Chudik et al. (2017). 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, $\mathrm{g}_1(\mathrm{gov}_{\mathrm{it}}, \tau)$. The critical values of SupF and AveF statistics at 10% are reported in Appendix B. The left of the tables gives the results of the ARDL and DL specifications, (1) and (2), while the right of the tables provides 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).

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. However, 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. Indeed, consistent with an important body of the recent literature, the threshold is between 10-30 percent for whole sample, 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) have proven that the optimal level of government size that maximizes economic growth for 86 developing countries is around 19.12%. Despite that this result is overall in the threshold interval gotten by the literature, the result concerning MENA countries remains relatively high. This could be explained by the specificities of the region. It is true firstly that this region is characterized by relatively young population (about 40% of the population and more than 30% of labor force) which needs a lot of public spending, especially in education and health fields. These spending are also productive and contribute to human capital investment and, consequently to growth. But also these economies are in expansive phase.

Therefore, they need more and more expenditures in order to attain optimal situation and boost their growth. Finally, for some rich MENA countries petroleum can reinforce the role of public expenditures, and even when the share of public spending is high, it could lead economy to an optimal growth in this case.

Furthermore, 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). The results demonstrate 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.

This means that the share of government expenditure must be getting down in some countries (Brazil and South Africa) and could increase in other countries (Indonesia, Sri Lanka, Algeria, Bahrain, Egypt, 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.

### 4.1. Robustness analysis

In this section we conduct a robustness check of the results reported in table 1 to 3 and we include two control variables: Openness ratio and human capital as additional regressors in the different specifications. The estimation results are reported in Table 5.

Obtained 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.

### 4.2. Results from a panel threshold-CS-ARDL model

We estimate now the model presented in section 3 using a recently approach (CS-ARDL) developed by Chudik and Pesaran (2015) and taking into account the previously estimated threshold. 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. Table 6 presents the estimation results of the model for two regimes: upper and lower regime. We also introduce two additional determinants of growth, namely human capital and trade openness.

As shown in Table 6, for the full sample government expenditure is positively and significantly correlated with economic growth. Indeed, the significance threshold is equal to 5% level in the first regime regression (in which government expenditure in percentage of GDP is smaller than the threshold value equal to 0.3). While when the level of government exceeds the threshold value, the initial positive relation vanishes and the effect of government expenditures on economic growth becomes negative. This confirms the existence of an inverted ‘‘U-shaped’’ relationship between government expenditure and economic growth in whole sample. Such an inverted ‘‘U-shaped’’ relationship remains valid even if we split our sample to MENA and developing countries with estimated thresholds equal to 0.3 and 0.1 respectively. This result reveals 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. The coefficient of the trade openness is positive and statistically significant at 5 percent level in the majority of regressions. The trade openness has a positive and significant effect for the three panel groups. Similarly, the coefficient of human capital variable is positive in most specifications.

## 5. 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 economic growth 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 empirical results indicated that the relationship between government expenditure and economic growth is not monotonic nor is it linear. Specifically, we found evidence of a U-shaped relationship between government expenditure and economic growth. Indeed, a very high government expenditure can led to lower economic growth while reasonable government expenditure can led to increased growth. The coefficients of government expenditure are positive if government expenditure in percentage of GDP is smaller than the threshold value. However, excessive government expenditure might have adverse spillovers on long-term economic growth.

Based on these findings, certain policy implications can be proposed:

- 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.
- For the countries achieving the optimal threshold, they should also invest in the 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 hence 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.

This paper studies 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. Future empirical works could examine this relationship while taking into account different expenditures categories. It is also important to consider the decomposition of the budget in order to distinguish between productive and unproductive spending.

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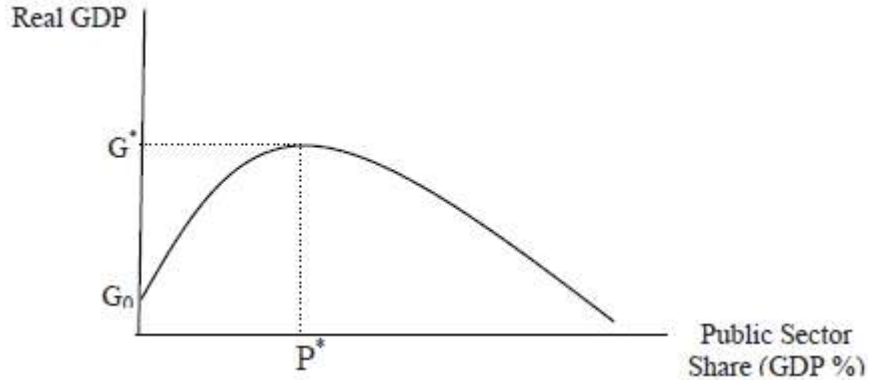
**Figure 1. Armey Curve**




Source: Altunc and Aydin (2013)

**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).

**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 | Mauritania |
| | | | | Jordan | Saudia |
| | | | | Kuwait | Tunisia |
| | | | | Saudia | |

Note: **Average of period* is the average current share of government expenditure in GDP over the period from 1988 to 2016; *** End the period* is the effective share of government expenditure in GDP in 2016.

**Table 5: Tests of government expenditure-threshold effects with additional explanatory variable**

| | | CS-ARDL | |
|---|---|---|---|
| **Lags** | | (1,1,1) | (2,2,2) |
| **Regressions with threshold variables:** $\mathbf{g_1(gov_{it}, \tau) = I[gov_{it} > ln\ (\tau)]}$ | | | |
| **all countries** | $\hat{\tau}$ | 0,2 | 0,2 |
| | SupF | 2,62** | 2,87* |
| **MENA Countries** | $\hat{\tau}$ | 0,3 | 0,2 |
| | SupF | 2,25* | 2,98* |
| **Developing countries** | $\hat{\tau}$ | 0,1 | 0,1 |
| | SupF | 2,95** | 1,97* |

Statistical significance is denoted by (*) and (**) at 10% and 5% level, respectively.

**Table 6: Threshold regression for Growth : Threshold variable *GOV***

| **Panel A : all countries** | | |
|---|---|---|
| | **Lower Regime ($Gov \leq \tau$)** | **Upper Regime ($Gov > \tau$)** |
| Y{t-1} | -0.25*** | -0.18** |
| | (-2.94) | (-1.98) |
| GOV | **0.02**** | **-0.01**** |
| | (2.56) | (-1.92) |
| Log(HC) | 0.31* | 0.28* |
| | (1.68) | (1.73) |
| Log(OPEN) | 0.57** | 0.41** |
| | (2.43) | (2.38) |
| **Panel B : MENA countries** | | |
| | **Lower Regime ($\leq \tau$)** | **Upper Regime ($> \tau$)** |
| Y{t-1} | -0.31*** | -0.26** |
| | (-3.18) | (-2.62) |
| GOV | **0.03***** | **-0.02*** |
| | (2.56) | (-1.67) |
| Log(HC) | 0.19 | 0.24* |
| | (1.14) | (1.81) |
| Log(OPEN) | 0.39** | 0.4** |
| | (2.16) | (2.37) |
| **Panel C : Developing countries** | | |
| | **Lower Regime ($\leq \tau$)** | **Upper Regime ($> \tau$)** |
| Y{t-1} | -0.28*** | -0.22*** |
| | (-2.94) | (-3.01) |
| GOV | **0.02***** | **-0.02*** |
| | (3.6) | (-1.82) |
| Log(HC) | 0.17 | 0.2* |
| | (0.88) | (1.68) |
| Log(OPEN) | 0.38* | 0.32* |
| | (1.77) | (1.68) |

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

## 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 |
| **Developing countries** | $SupF$ | 2.2 | 2.23 | 2.09 | 2.16 | 2.4 | 2.74 | 2.41 | 2.37 |
| | $AveF$ | 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**

| Developing 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**

| Developing 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% | | |