

An Investigation of the Impact of Government Size on Economic Growth: New Evidence from Selected MENA Countries*

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Abstract

This paper investigates the impact of government size on economic growth in selected economies of the MENA countries by using a non-linear panel data approach over the period 1990-2011. The estimation results of Panel Smooth Threshold Regression model show that when the level of government consumption is very large, the positive impact of labor force on growth is intensified. On the other hand, export revenues in the countries under investigation have no positive effect on economic growth when the level of government consumption is high. The main result of this study confirms the negative impact of consumption expenditures on economic growth in this block of countries.

Keywords: Economic Growth, Government Size, Panel Smooth Threshold Regression Model, MENA Countries.

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1. Introduction

Output growth reflects the overall economic performance of a country. In oil producing and exporting countries, oil revenues can be used by authorities to hide their inefficiency resulted from government intervention and mismanagement. Due large government expenditure in Middle East and North Africa (MENA), it is necessary to investigate the impacts of government size on economic growth in these countries.

Some researches such as Aschauer (1989), Munnell (1990), Evans and Karras (1994) have found that high level of public expenditure often occurs with high growth rates, while Folster and Henrekson (2001), Bassanini et al. (2001) and EC (2006) confirm that high government size (government spending to GDP ratio) is associated with low growth rates. On the other hand, Easterly and Rebelo (1993), Daveri and Tabellini (2000), Romer and Romer (2007), Furceri and Karras (2009) find out that there is a negative relationship between tax revenue and economic growth. Hence, they emphasize on reduction of government expenditure and revenues through levying low level taxes and also underline the importance of keeping the budget balanced to be able to promote economic growth and lower the unemployment rate.

The empirical results regarding the relationship between government size and economic growth is mixed. In other words, the problem of government size-growth nexus is not resolved. The results of some researches indicate that the ultra-size of government (very big or small governments) causes higher growth of output (see, e.g., Anaman, 2004; Kuştepelı, 2005; Mavrov, 2007; and Heidari et al. 2010; among others). There are others that find adverse impact of big government size on growth (see, e.g., Barro, 1991; Barro and Sala-i-Martin, 1995; Chandra, 2004; and Mavrov, 2007; among others). The main reasons for these differences can be attribute to differences in structure of economies and application of different experimental methods and theoretical models to study the nexus between these two variables.

Therefore, this paper provides a new evidence about the impacts of government size on economic growth, using production function utilized by Dar and AmirKhalkhali (2002). A non-linear model is developed to study the relationship between variables under investigation in selected MENA countries over the period 1990–2011. More specifically, we examine the validity of positive or negative impacts of government consumption expenditure on growth by using a Panel Smooth Threshold

Regression (PSTR) model. The estimation results confirm the negative impact of government expenditure on economic growth in MENA countries.

The rest of the paper is structured as follows: Section 2 contains the model specification and data. The empirical results are presented in section 3. Section 4 presents the concluding remarks.

2. Model Specification and Data

The empirical analysis is based on an unbalanced panel of twelve MENA region countries including Algeria, Egypt, Islamic Republic of Iran, Jordan, Lebanon, Malta, Morocco, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia, and Yemen over the years 1990–2011.

Based on the various researches which precisely debate non-linearity between government size and growth, the government size is known as the source of the nonlinear government size-growth nexus. Armeý (1995) implements the Laffer curve to present the nonlinear relationship between government size and economic growth that empirically confirmed by Sheehy (1993), Vedder and Gallaway (1998), and Chen and Lee (2005), then introduces inverted U-shape Armeý curve. He stress that low government expenditure can increase economic growth until it reaches a certain level that calls threshold government size, but high level of government expenditure causes a back growth of output resulting additional projects financed by the government that become increasingly less productive, because of negative impact of excess infrastructure on marginal benefits. Indeed, the big government size contributes in output's reduction by diminishing of constructive features of government's intervention through adverse effects of further expansion of government (see, e.g., Herath, 2012).

On the one hand, due to high probability of existence of non-linear relationship between these variables, it seems that analyzing this issue in the framework of non-linear models will present best-fit from the nexus of variables under investigation. This is despite of the fact, the different degrees for government size indicator has applied by some researches such as Anaman (2004) and Kuştepelí (2005), and others have investigated only the quadratic equation form for their model to answer inverted U-shape of Armeý curve (see, e.g., Pevcin, 2004). But, the downright rest to Armeý curve or surveying the different degrees for government size indicator will be very defective. On the other hand, most

economists disagree about the existence of U-shape curve for the relationship of government size and economic growth.

The applied PSTR model in this study is the generalization of the threshold panel model of Hansen (1999). The integral model introduced by Dar and Amirkhalkhali (2002) with applying PSTR model approach has perused in this study. In order to prevent from bias in model specification, we use total factor productivity growth as one of the variables in the model. Dar and Amirkhalkhali (2002) generalize commonly used growth-accounting model based on the concept of Cobb-Douglas aggregate production function. The algebraic form of this basic model is as follows:

$$GY_{it} = \beta(GK)_{it} + \theta (GL)_{it} + A_{it} \quad (1)$$

$$A_{it} = \mu_i + \alpha(GS)_{it} + \rho(GX)_{it} + u_{it} \quad (2)$$

$$GY_{it} = \mu_i + \alpha(GS)_{it} + \beta (GK)_{it} + \theta (GL)_{it} + \rho (GX)_{it} + \varepsilon_{it} \quad (3)$$

Where GY is percentage of annual growth rate of GDP (2000 prices base), GS is government size (the percentage of real government consumption spending to real GDP ratio), GK refers to the annual growth rate of gross fixed capital formation to GDP ratio as a proxy of investment growth rate, GL and GX are the percentage of employment labor force to adult population ratio and annual growth rate of exports to GDP ratio. Moreover, A_{it} measures the rate of total factor productivity growth. Note that the residual ε_{it} is assumed to be $i.i.d.N(0, \delta_\varepsilon^2)$ and u_{it} refers to the individual fixed sections effect. The subscripts $i(i=1,2, \dots, n)$ and $t(t=1,2, \dots, T)$ indices the countries and time periods in the sample, respectively.

Although the impacts of government spending at the beginning of development process of each economy would be different from its impacts in the developed levels of that economy, this model unrealistically suppose that the government size-growth coefficient is constant for a set time period. These drawbacks are obviated by using the Panel Threshold Regression (PTR) model suggested by Deidda and Fattouh (2002). In order to investigate the relationship between variables under investigation, the simplest case of this model that supposes the existence of two extreme regimes and a single transition function is as follows:

$$GY_{it} = \mu_i + \alpha_0 GS_{it} + \beta_0 GK_{it} + \theta_0 GL_{it} + \rho_0 GX_{it} + [\alpha_1 GS_{it} + \beta_1 GK_{it} + \theta_1 GL_{it} + \rho_1 GX_{it}] G(q_{it}; \gamma, c) + \varepsilon_{it} \quad (4)$$

The transition function $G(q_{it}; \gamma, c)$ is a continuous function which depends on the value of threshold variable q_{it} , and it is normalized to be bounded between 0 and 1. González et al. (2005) by adaptation from STAR models which have introduced by Granger and Terasvirta (1993), and Jansen and Terasvirta (1996) specified the logistic form of transition function as follows:

$$G(q_{it}; \gamma, c) = [1 + \exp(-\gamma \prod_{j=1}^m (q_{it} - c_j))]^{-1}, \quad \gamma > 0, \quad c_1 \leq c_2 \leq \dots \leq c_m \quad (5)$$

Where, $c = (c_1, \dots, c_m)'$ is as the vector of threshold parameters or locations of occurrence of regime-switching. The parameter γ determines the slope of the transition function.

According to theoretical researches, although government consumption expenditure in beside of investment expenditure occurs about in the same time, but government consumption expenditure has ineffective impacts on output growth in some times. Because of different effects of government expenditures in various periods, considering the total government expenditure to *GDP* ratio as a proxy of government size to delineate its impact on output growth causes the unreliable results to decide about government financial policies. Some studies for developing countries such as Gramlich (1994) stress that the structural investments have significant impact on growth rates of next periods, and sometimes these type of expenditures have not causal role in economic growth. On the other hand, because of different expenditure's occasions and aspect of impressing of government consumption expenditure on economic rather to investment expenditure, the government consumption spending to *GDP* ratio have been considered as index of government size in this research to program composition of government expenditures.

González et al. (2005) believe that considering one or two threshold value ($m=1$ or $m=2$) will be enough in order to specify the variability of parameters. They stress that for $m=1$, the PSTR model implies that two extreme regimes are associated with low and high values of q_{it} with a single monotonic transition of the coefficients from $\alpha_0, \beta_0, \theta_0, \rho_0$ to $\alpha_1 +$

$\alpha_1, \beta_0 + \beta_1, \theta_0 + \theta_1$ and $\rho_0 + \rho_1$ as q_{it} increases, where the change is centered around c_1 . If $\gamma \rightarrow \infty$, the PSTR model in equation (4) reduces to the two-regime panel threshold regression (PTR) model of Hansen (1999). Indeed, when $q_{it} > c_1$, the transition function $G(q_{it}; \gamma, c)$ attains the value of 1 and 0 otherwise. For $m=2$, the minimum of transition function is at $(c_1 + c_2)/2$ and attains the value of 1 both at low and high values of transition variable (q_{it}). If $\gamma \rightarrow \infty$, the count of regimes raise to a three-regime whose outer regimes are identical and different from the middle regime. But, when $\gamma \rightarrow 0$ for any value of m , the transition function $G(q_{it}; \gamma, c)$ becomes constant and the model collapses into a homogenous or linear panel regression model with fixed effects (González et al. 2005).

González et al. (2005) and Colletaz and Hurlin (2006) have introduced a testing process to investigate the existence or non-existence of non-linear relationship between variables under investigation in order to present a context to create reliable estimation of PSTR by using Non-Linear Least Squares (NLS) approach.

Since, the surveying of linearity in PSTR under $H_0: \gamma = 0$ or $H_0: \alpha_1 = \beta_1 = \theta_1 = \rho_1 = 0$ will have unidentified nuisance parameters, the associated tests will be nonstandard. Therefore, in order to away identification problem, it is necessary that replace $G(q_{it}; \gamma, c)$ in equation (4) by its first-order Taylor expansion around $\gamma = 0$ which can be viewed as the testing of equivalent hypothesis in auxiliary regression (González et al., 2005). Taylor expansion for the PSTR model with n threshold is as follow¹:

$$GY_{it} = \mu_i + \alpha_0 GS_{it} + \beta_0 GK_{it} + \theta_0 GL_{it} + \rho_0 GX_{it} + \tau_0(\alpha_1 GS_{it} + \beta_1 GK_{it} + \theta_1 GL_{it} + \rho_1 GX_{it}) + \tau_1 q_{it}(\alpha_1 GS_{it} + \beta_1 GK_{it} + \theta_1 GL_{it} + \rho_1 GX_{it}) + \dots + \tau_n q_{it}^n(\alpha_1 GS_{it} + \beta_1 GK_{it} + \theta_1 GL_{it} + \rho_1 GX_{it}) + u_{it} \quad (6)$$

Due to the τ_n parameters is proportionate with γ parameter of transition function, the testing of linearity under $H_0: \tau_1 = \dots = \tau_n = 0$ and $H_1: \tau_1 \neq \dots \neq \tau_n \neq 0$ is possible. The Wald Lagrange Multiplier, Fischer Lagrange Multiplier and likelihood ratio coefficients are as the criteria in process of testing. The testing of remaining non-linearity on PSTR model to determination of the count of necessary transition functions for specifying of PSTR model is the next stage after existence the non-linearity nexus between the variables. The null hypothesis H_0 of

this test is the existence of one transition functions, while the alternative hypothesis H_1 is the existence of at least two transition functions for PSTR model.

3. Empirical Results

3-1. Cross Sectional Dependency and Stationary Results of Each Variable

In panel data econometrics, it is supposed that under investigation data have cross-sectional independence. This presumption cannot be correct for every time. Some cross-sectional independence tests such as Friedman (1937), Breusch and Pagan (1980) and Pesaran's cross-section dependence test have suggested for this purpose. Pesaran (2004) proposes a simple test for error cross section dependency that has correct size and sufficient power even in small samples. To check if the MENA panel at hand is characterized by cross section dependency, the residuals of the individual ADF (l_i) regressions from the preceding single country analysis are used to compute Pesaran's (2004) test statistic. The test draws on the residuals of both the intercept and the intercept and linear trend specifications. The test statistic of cross section dependency for an unbalanced panel is as follows:

$$CD = \sqrt{\frac{2}{N(N-1)}} (\sum_{i=1}^{N-1} \sum_{j=i+1}^N \sqrt{T_{ij}} \hat{P}_{ij})(7)$$

Where, \hat{P}_{ij} are the pairwise correlation coefficients from the residuals of the ADF regressions. The correlations are computed over the common set of observations T_{ij} for i and j , where $i \neq j$. In specific significant level, if the computed CD statistic is greater than critical value of standard normal distribution, the null hypothesis of CD test will be rejected and thus the existence of cross section dependency between data will be confirmed. Thereupon the results of standard stationary tests such as IPS²(2003) and LLC³ (1992) are biased in the presence of cross section dependence, and in this situation we use the other unit root test such as CADF or CIPS tests (samadi and abolhasanbeigi, 2013).

Table 1. The Computed CD Test’s Statistic for the Variables under Investigation

Variable	GY	GS	GK	GL	GX
CD test statistic	1.1038	0.7640	0.7317	0.6916	0.2788

Source: results of research by EViews 7.1.

Notes: Critical values for significant levels on 1%, 5% and 10%.are 1.64, 1.96 and 2.57, respectively.

The results of Table 1 indicate that the computed CD test’s statistic for all variables under investigation is less than critical value of standard normal distribution in all significant levels. Thus, the nullhypothesis of CD test can’t be rejected and therefore the IPS (2003) and LLC (1992) tests will produce unbiased results about the stationarity.

The results in Table 2 indicate that the variables under investigation are stationary.

Table 2. Results of Unit Root Tests

Variable	IPS test		LLC test	
	Statistic W	Prob.	t statistic	Prob.
<i>GY</i>	-6.270	0.000	-5.838	0.000
<i>GS</i>	-1.908	0.028	-4.397	0.000
<i>GK</i>	-3.882	0.000	-2.602	0.004
<i>GL</i>	-9.142	0.000	-8.467	0.000
<i>GX</i>	-3.128	0.000	2.165	0.984

Source: results of research by MATLAB.

Null: Unit root (assumes common unit root process).

3-2.Tests for Linearity and Remaining Non-linearity in the PSTR Model

The results of linearity tests between the variables with considering the government size indicator as the threshold variable of model are presented in Table 3.

Table 3. Linearity Test and the Number of Regimes Testing: Result of Tests for Remaining Non-Linearity in the PSTR Model

	m=1			m=2		
	LM _w	LM _F	LR	LM _w	LM _F	LR
$H_0: r = 0$ <i>vs</i> $H_1: r = 1$	10.096 (0.039)	2.453 (0.047)	10.335 (0.000)	10.827 (0.212)	1.294 (0.248)	11.108 (0.000)
$H_0: r = 1$ <i>vs</i> $H_1: r = 2$	2.416 (0.660)	0.544 (0.704)	2.429 (0.657)	4.888 (0.769)	0.545 (0.821)	4.943 (0.764)

Source: results of research by MATLAB.

Notes: The testing procedure to delineate the number of regimes is beginning with first stage that survey the linear model ($r=0$) against a model with one transition function ($r=1$), which continues by testing the single transition function against a double transition functions ($r=2$) providing the rejection of null hypothesis. The procedure resumes until the alternative hypothesis is not rejected.

Based on the information of all criterions, the linearity hypothesis is rejected. According to suggestion of result of linearity test, one number of transition functions will be sufficient to assess the non-linearity between government size and economic growth.

3-3. Determination of the Number of Location Parameters

In the next step, we follow the method proposed by Colletaz and Hurlin (2006) in order to select the optimal number of location parameters. To this end, we estimate the PSTR model for one transition function associated with one and two location parameters, and the corresponding value of the residual sum of squares. We then, follow Colletaz and Hurlin (2006) to compute the statistics of AkaikeInformation Criterion (AIC) and Schwartz Bayesian Criterion (SBC).

Table 4. Determination of the Number of Location Parameters

Criteria	qit=GS	
	r=1 , m=1	r=1 , m=2
RSS	1782.458	1752.994
AIC	2.0281	2.0230
BIC	2.1636	2.1720

Source: results of research by MATLAB.

Based on the results of Table 4, the Schwarz criterion suggests that the model with one transition function and threshold is optimal ($r = 1, m = 1$).

3-4. Estimation Results of PSTR Model and Discussion

The estimated parameters of final PSTR model have presented in Table 5. The estimated slope parameter (γ) that refers to velocity of transition from first regime to second regime for first transition function has estimated 4.85. Moreover, the estimated location parameter for real government consumption spending size has estimated 7.96 percent of *GDP*. Indeed, these location parameters are as the points of reference for discerning of three aforementioned regimes of PSTR model. Thus, the estimated parameter for each variable alters from one regime to other.

Based on our results, the impact of government size on economic growth is negative and significant in two regimes that implies to fatal effect of government size on economic growth. It is natural that in certain volume of financial authorities, low percentage of government consumption spending to *GDP* ratio associates with high percentage of government investment spending to *GDP* ratio which will can promote the economic growth in the long-run or at least after some cycles (dilatatory impacts of increased government investment spending). Also it is natural, when the high part of total government expenditure is devoted to productive activities (in low levels of government consumptions), the great part of labor force has employed by government sector. But, low levels of government payments rather to high labor force's mass causes to be productivity less which impresses output resulting reduction in demand via oppressing private consumption (Devereux et al. 1994)⁴ⁱ. On the other hand, low efficiency of output factors (labor force and capital) decreases economic growth rate by each additional unit of these physical capitals to output sector. Whereas these devoted resources could be very effectual in volume of government consumption expenditure higher than estimated location parameter 7.96 percent of *GDP*, because sufficient government consumption expenditures can indisputable be response to employed labor force). As results show the positive impacts intensity of output factors on growth has increased in second regime. The other results confirm that when the government consumption is high, the impact of investment would be in indirect relationship with economic growth in first regime. It is sound that the ungovernable high level of government investment spending cause managers of government policies has jobbery or rent-seeking behaviors in implement of various policies and/or programs. For example, the commission which mostly is cashed in treaties shifts implement's trade of projects (Toatu, 2004). Therefore

corruption and its instances cause reduction investment and economic growth by adding uncertainty to the returns on investment activities. (see, e.g., Romer, 1994; Boycko et al. 1995; Mauro, 1995; Ades and Di Tella, 1997; Mauro, 1997; Wei, 2000; Jain, 2001; and Meon and Sekkat, 2005; among others)⁵. Other reasons of negative impact of negative investment growth rate can be arise from low volume of private investment is very low resulting low domestic savings rates (domestic savings-to-*GDP* ratio) in MENA countries, especially for the non-oil countries. Based on the report of World Bank, low domestic saving has constrained higher private investment in this region.

On the other hand, the growth rate of exports to *GDP* ratio has positive impact on growth in small government size, but its impact is negative in the second regime. This implies to high efficiency of export revenues devoted to high government productive activities (not high government unproductive activities). As the main result of study, it can be remarked that fatal effect of government consumption expenditure survive forever. Thus, this results confirm the negative impact of this type of expenditure. Moreover, our results do not assent with inverted U-shaped curve for government consumption expenditure.

Table 5. Estimation Results of PSTR

Variable	parameters of model	coefficient (T- statistic)
<i>GS</i>	β_0	-49.106(-2.269)
	β_1	43.359(2.312)
<i>GK</i>	φ_0	-5.808(-1.965)
	φ_1	13.806(2.326)
<i>GL</i>	θ_0	20.205(1.870)
	θ_1	17.849(2.240)
<i>GX</i>	ρ_0	0.129(3.575)
	ρ_1	-0.135(-3.237)

1st regime: $G(q_{it}; \gamma, c) = 0$

$GY_{it} = \alpha - 49.10(GS)_{it} - 5.80(GK)_{it} + 20.20(GL)_{it} + 0.12(GX)_{it} + u_{it}$

2nd regime: $G(q_{it}; \gamma, c) = 1$

$GY_{it} = \alpha - 5.74(GS)_{it} + 7.99(GK)_{it} + 38.05(GL)_{it} - 0.006(GX)_{it} + u_{it}$

$\gamma = 4.851c = 2.074$ (antilog = 7.96 % real GDP)

Source: results of research by MATLAB.

Notes: The t statistics in parentheses are based on Corrected Standard Errors. The values in brackets are the standard deviations. γ , c refer to estimated slope parameter and estimated location parameter, respectively.

Finally, how trace of variables has introduced by diagram forms in order to round the empirical results and better expression of PSTR model. Figures 1 and 2 indicate the trace coefficients of investment growth rate and employment labor force to population ratio percent on economic growth, respectively. As it can be seen from Figure 1, negative impacts of investment shift to positive impact on economic growth simultaneous with transition from very small levels of government consumption expenditure to higher levels of it. Moreover, the rising in positive impact intensity's of employment labor force is very clear in Figure 2.

Figures 3 and 4 indicate the trace coefficients of annual growth rate of exports to *GDP* ratio and real government consumption spending to real *GDP* ratio percent on economic growth, respectively. As Figure 3 manifests the conversions of impacts of export revenues in different volumes of government consumption size, and Figure 4 unveils the various intensity of unfavorable impacts of government consumption expenditure on economic growth.

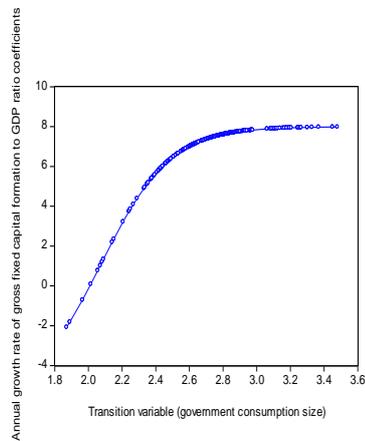


Figure 1.The trace coefficients of gross fixed capital formation to GDP ratio on economic growth

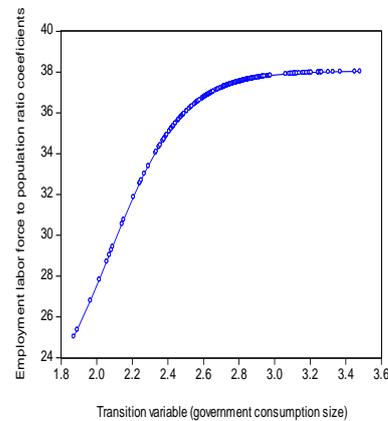


Figure 2.The trace coefficients of employment labor force on economic growth

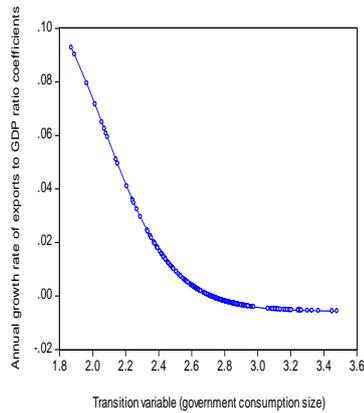


Figure 3.The trace coefficients of annual growth rate of exports to GDP ratio on economic growth

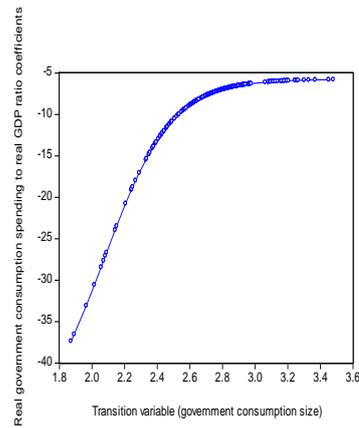


Figure 4.The trace coefficients of real government consumption spending to real GDP ratio on economic growth

4. Conclusions

This paper studies the effect of various threshold variables on the government size and growth nexus. Using a Panel Smooth Threshold Regression model, this research investigates the non-linearity between government size and economic growth. Our main results can be summed up as follows: first, there is a non-linear relationship between government size and economic growth. Moreover, the results indicate that the intensity of positive impact of labor force on growth has increased when the level of government consumption size is high. On the other hand, the investment has positive impact on economic growth when the level of government consumption size is low. On the one hand, export revenues in MENA countries have no positive effect on economic growth when the level of government consumption is large. The main result of this study is referring to negative impact of consumption expenditure on economic growth. Hence, MENA countries can enhance their economic growth and reduce their domestic financial imbalances by decreasing their budget deficits and reforming their financial sectors.

Endnotes

1. The second transition function in Taylor expansion access specifies as follow:

$$\begin{aligned}
 GY_{it} = & \mu_i + \alpha_0 GS_{it} + \beta_0 GK_{it} + \theta_0 GL_{it} + \rho_0 GX_{it} + \tau_0 (\alpha_1 GS_{it} + \beta_1 GK_{it} \\
 & + \theta_1 GL_{it} + \rho_1 GX_{it}) + (\alpha_1 GS_{it} + \beta_1 GK_{it} + \theta_1 GL_{it} + \rho_1 GX_{it}) g_1(q_{it}; \gamma_1, c_1) \\
 & + \tau_0 (\alpha_2 GS_{it} + \beta_2 GK_{it} + \theta_2 GL_{it} + \rho_2 GX_{it}) + \tau_1 q_{it} (\alpha_2 GS_{it} + \beta_2 GK_{it} \\
 & + \theta_2 GL_{it} + \rho_2 GX_{it}) + \dots + \tau_n q_{it}^n (\alpha_2 GS_{it} + \beta_2 GK_{it} + \theta_2 GL_{it} + \rho_2 GX_{it}) + u_{it}
 \end{aligned}$$

2. Im, Pesaran, & Shin (2003)
3. Levin, Lin, & Chu (2002)
4. Their work was based on the examination of impact of government spending shocks in a neoclassical model with increasing returns to scale and monopolistic competition which bring an endogenous rise in aggregate productivity resulting from an increase in government consumption. They found that an increase in productivity stimulates the real wages and this in turn will lead to higher private consumption.
5. These researchers emphasize that corruption adversely affects investment by adding uncertainty to the returns of investment activities. Moreover, high additional cost incurred by an economy due to corruption tends to act as a tax on ex-post profits and hence decreases the individuals' incentive to invest. Entrepreneurs relinquish to corrupt officials a portion of the proceeds from their investment in order to gain access to their target markets. On the other hand, effort to avoid detection and punishment is necessitated with a rise in uncertainty. Therefore, corruption is viewed more as a destroyer in comparison to [conventional] taxation (Shleifer and Vishny, 1993: 612).

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