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Abstract

This paper empirically explores how fiscal policy - represented by acceleration in government spending - exerts asymmetric effects on economic growth in the context of a developing country, Egypt in particular. By allowing the theoretical plausibility of asymmetric effects of fiscal policy on economic activity, our research suggests that nothing can guarantee linearity between the growth impact of increasing and decreasing government expenditures. Using a non-linear ARDL model on Egypt data - at both aggregated and disaggregated levels- for the period 1980-2013, this paper provides new evidence of a non-linear relationship between government spending and economic growth.

JEL Classification: E62, O11

Keywords: fiscal policy economic development non-linear ARDL Egypt

ملخص

تبحث هذه الورقة تجريبيا التأثير الغير مماثل للسياسة المالية - ممثلة في تسارع الإنفاق الحكومي - على النمو الاقتصادي في سياق دولة نامية، ومصر على وجه الخصوص. من خلال السماح لمعقولية نظرية الآثار غير المتماثلة للسياسة المالية في النشاط الاقتصادي، وتشير أبحاثنا أن لا شيء يمكن أن يضمن علاقة خطية بين تأثير النمو من زيادة وخفض الإنفاق الحكومي. باستخدام نموذج ARDL غير الخطي على البيانات في مصر - على مستوى البيانات المجمعة والمفصلة على حد سواء للفترة 1980-2013، تقدم هذه الورقة أدلة جديدة على وجود علاقة غير خطية بين الإنفاق الحكومي والنمو الاقتصادي.

1. Introduction

Does tight fiscal policy slow the economy more than an easy fiscal policy accelerates the economy? Extant empirical research tend to suggest that it may be the case, especially in a number of developed economies, such as the USA. While the theoretical predictions in this regard remain consistent across distinctions in development pathways, the heterogeneity in empirical estimates of the identified non-linear effects for developing economies remain a cause of worry. The reason is that in many developing economies, such as Egypt, government size may not sharply raise inflation and nominal interest rate as much as would be expected under an economy with complete information and lesser degree of market imperfection. The burden of embedded uncertainty that comes with these characteristics in developing economies can significantly determine the extent of non-linearity, if it exists at all! Possibly due to the problem of aligning macroeconomic theory to that of flexible econometric framework, the extant literature (in developing country context, in particular) has largely presumed a 'symmetric effect' of government spending in periods of expansion and contraction. The recent research (the monetary policy-growth context especially) however, envisage a different story. Making full use of newly developed econometric tools and the developed country context[1], recent research has demonstrated that the dynamic adjustment that follows due to the expansion of economic policies in the period of boom may experience duration of longer adjustment to long-run equilibrium at a time when the economy is facing contraction. This differential possibility of accommodating asymmetric effects of fiscal policy shocks in the context of Egypt is the main empirical objective of this paper.

But what could be the optimal government size that would unleash a sustainable high growth in the long-run? There is a long-lived debate in this regard. In a developing country, such as Egypt, the government tends to use fiscal policy instruments to catalyse growth and stabilise the economy. Economic theory justifies such intervention as a response to markets failure in providing public goods, internalizing externalities and covering costs when there are significant economies of scales (Devarajan et al., 1993). However, while empirical evidence is ambiguous and does not offer a clear answer on the growth impact of public spending, governments, regardless of their positions (i.e., right or left), tend to inject the economy with large amounts of stimulus packages during harsh times hoping to bailout and save businesses from collapse. Although these plans may work well in rich countries, it is much more difficult to secure such necessary funds in developing countries. In fact, these difficulties become even worse in times of economic and institutional shocks.

With special reference to Egypt, and in particular, ever since 2011, the budget deficit turned into a threatening level. The Egyptian economy was engulfed by successive political and economic shocks, which have had serious implications on its net international reserves and public expenditures. In a similar situation as in Egypt, it would be useful to policy makers to bring forward the question of to what extent government spending is expected to spur economic growth and thence the motivation of the current study. In fact, it is imperative to fiscal authorities to not only identify the most efficient way of allocating available resources, but also to figure out how to prioritise this spending. Such an urgent need for a priorities-based government spending undoubtedly becomes even more coveted in times of economic and institutional shocks; hoping to pave a shorter path towards stabilising the economy. Accordingly and in contrast to the current literature which presumes symmetries, this paper investigates the asymmetric growth impact of government expenditures. More particularly, our main research question is whether increasing government expenditures would have the same impact, in terms of its magnitude, on growth as does decreasing those expenditures. For at least two reasons, this question is becoming increasingly important for Egyptian policy makers.

[1] A succinct review of the literature will follow in the ensuing section.

First, Egypt has been trying to recover from recent shocks. Thus, the economic returns to its fiscal policy should be empirically tested. Second, a disaggregated analysis of government expenditure might be more valuable from the policy perspective (Bose et al., 2007).

To do so, this paper follows the theoretical model introduced by Ram (1986) to rationalize the relationship between government spending and economic growth in Egypt measured as the percentage change in real per capita GDP. We use annual data spanning the interval between 1980 and 2013. For estimation purposes, the paper employs a relatively new technique, Non-linear Autoregressive Distributed Lag (NARDL) model proposed by Pesaran et al. (2001) and extended by Shin et al. (2013), which allows for not only examining this relationship in both short and long run, but also allows for a distinction between the effect of positive and negative changes in the underlying fiscal policy tool. The remaining of this paper is as follows. Section 2 introduces a brief overview of the Egyptian economy in the aftermath of 2011 political and economic shocks. Section 3 reviews the relevant literature. Section 4 discusses the theoretical model and econometric methods. Section 5 presents the dataset along with a preliminary analysis of the asymmetric long-run effects of government expenditures. Our empirical results are discussed in section 6. Finally, section 7 concludes and draws on policy implications.

2. The Egyptian Economy: A Post-Shock Brief Overview

At the outset of 2011, the Egyptian economy was hit deeply by a political turmoil which undermined confidence in the economy and put public finance under pressure. Since that time political upheaval continued to have its toll upon the growth prospects as well as on the government's plans to correct for structural fiscal problems and vulnerability. On the growth front, the annual GDP growth has dropped to 1.82% in 2011 down from an average of $5-6\%$ between 2000 and 2010. Similar drops were witnessed in terms of the per capita GDP, where it hit negative values for the first time after a decade of expansion; a trend that continues through to 2014, see Figure 1.

On the fiscal front, the political unrest had severe repercussion on budget deficit in Egypt. In such harsh time, fiscal authorities are likely to increase socially-geared spending to cushion the political tension. In the meantime, public revenues are likely to witness severe drops. As a result, it is not surprising to see figures for budget deficit and debt stock rising in Egypt after the shock. According to figure 2, budget deficit has increased dramatically in 2011 and 2012 both as a percentage of GDP and in real terms. In addition, the international reserves have witnessed a sharp drop, see figure 3. Therefore, it would be important to policy makers in Egypt to be informed about the growth impact of fiscal policy, especially in the aftermath of political and economic shocks.

3. Literature Review

Neither economic theory nor empirical evidence provides clear-cut answers to the question of how government expenditure affects economic growth. Much less is known about how its components related to different sectors help in this regard, see Barro (1991) where it is argued that the impact of government spending may vary depending on the component of government expenditures that is under consideration. Nevertheless, fiscal policy related literature may take one of two positions regarding the growth impact of government spending; a supportive role against crowding-out effect on private investments. On one hand, government spending on human capital investment may boost labour productivity, and thus encourage private investment. On the other hand, it may restrain economic growth as it mostly comes on the expense of increased taxes and government borrowing. With this respect, in the neoclassical growth models (e.g., Cass (1965) and Solow (1956)) wherein the long-run growth is exogenously driven by technical progress, assumes transitory effects of shocks to fiscal policy on economics growth. Thus, these type of models claim no effect of government spending on aggregate output (Romp and De Haan, 2007; Nurudeen and Usman, 2010).

In contrast to neo-classical growth models stand endogenous growth theory whereby there is a productive role for government spending (Fedderke et al., 2006). Examples of endogenous growth models, among others, include Becker et al. (1990), Lucas (1988), Rebelo (1992), and Romer (1986), Romer (1990). In these models, shocks to fiscal policy can raise the steady-state income per capita, and thus there is a possible linkage between the size of government and the country's economic growth (Ghali, 1997; Romp and De Haan, 2007). Therefore, as in the Keynesian model, government expenditure is an effective policy tool that leads to higher economic growth (Nurudeen and Usman, 2010). As a result, it is possible to treat government expenditure as an element in the aggregate production function function(Ghali, 1997). The literature assumes two different ways to include the government expenditure in the production function. First, it may simply enter the production function directly as a complement component to human and physical capital stock or it may be considered to influence multi-factor productivity. Alternatively, government expenditure could be considered part of the technological constriant that determines total factor productivity (Duggal et al., 1999; Romp and De Haan, 2007).

On another front, empirical evidence of growth impact on government expenditure is inconclusive. These studies could be classified as follows. Cross-section studies such as Landau (1983, 1986); Ram (1986); Romer (1986); Barro (1991). Although their results remain mixed, these type of studies tend to report a detrimental effect of government spending on economic growth. This is partly explained due the lack of capturing the dynamics of the relathionship (Abu-Bader and Abu-Qarn, 2003). More recent studies use time series techniques such as unit root and cointegration tests to capture the dynamics of such relationship (Narayan et al., 2008). However, their answer is still not clear. Easterly and Rebelo (1993), as an example of time series studies, find that public investment is consistently correlated with economic growth. Barro (1991), on other hand, confirms the detrimental effect of the public sector on economic growth.

Another strand of studies set up conditions under which government spending triggers growth. According to the World Bank study (1994), public spending *per se* is insufficient to generate sustainable economic growth. Banister and Berechman (2001) discuss the conditions under which public spending in developing countries can promote growth. Other studies distinguish between productive and non-productive government expenditures. However, these studies articulate that even productive expenditures when used in excess could become unproductive (Devarajan et al., 1996). Furthermore, empirical results reported in Wu et al. (2010) support the hypothesis that government spending is helpful to economic growth regardless of how government size and economic growth are measured. However, disaggregated studies have underlined that the growth impact of government expenditure will eventually depend, *inter alia*, the contribution of these components to economic growth which is not necessarily to be identical or homogeneous across all components (Devarajan et al., 1996).

To sum up, the current paper builds its base within the framework of the Keynesian and endogenous growth models as will be discussed in details in Section 4. In this regard, the endogenous models are more attractive compared to the traditional models in the sense that they do not depend on exogenous technological changes or labour growth (Ghali, 1997). Moreover, the current study distinguishes itself from the existing literature in a very important aspect. Given that cross-section can not capture the dynamics of the relationship between government expenditure and economic growth, it adopts a time-series technique. However, typical time series regressions for explaining government spending or economic growth generally assume linearity and none of these studies has brought such assumption to the stage to be tested. Therefore, the current study claims to be the first empirical study that tests the linearity assumption. With this respect, non-linearity, if exists, could have important policy implications that should be counted for when designing an active fiscal policy. Hence, using a

NARDL analysis, this paper complements the time series approach to the study of fiscal correlates of growth.

4. Methodology

4.1 Theoretical framework

The current paper builds on the model introduced by Feder (1983) and adopted by (Ram, 1986). The model consists of two-sector production function (government G and non-government C). Their output depends on the inputs of labour L and capital K. The government size is allowed to have externalities on the non-government sector. The production functions of the underlying sectors could be represented as follows.

$$C = C(L_c, K_c, G) \quad (1)$$

$$G = G(L_g, K_g) \quad (2)$$

where g and c denotes the inputs for the government and non-government sectors. The total inputs L and K are given as below. The total output Y is given as the sum of outputs in the two sectors. Assuming constant factor productivities in both sectors so that

$$L_c + L_g = L \quad (3)$$

$$K_c + K_g = K \quad (4)$$

$$C + G = Y \quad (5)$$

$$G_L/C_L = G_K/C_K = (1+\delta) \quad (6)$$

where G_L denotes the partial derivative of function G ($\frac{\partial G}{\partial L}$) which is equivalent to $\frac{\Delta G}{\Delta L}$. Note that the corresponding sign to δ refers to which sector has higher marginal factor productivity. If $\delta > 0$ implies hight input productivity in the government sector. Getting the total differential of the production function and using 4.1 and 6, we get an approximation for the aggregate growth equation as follows.

$$dY = C_K dK_C + G_K dK_G + C_L dL_C + G_L dL_G + C_G dG \quad (7)$$

where C_X and G_X are the marginal product of factor X in the private and government sector, respectively. Using Eq. 6 and 7, and assuming that the growth rate of total labour is equal to the sum of labour growth rates in both sectors, we can derive the aggregate growth equation as in Eq. 8, which represents the basis of the empirical model.

$$dY/Y = (I/Y) + (dL/L) + (dG/G) \quad (8)$$

4.2 Empirical methodology

The methodology used in this paper imports its origin from the autoregressive distributed lag ARDL model which is first introduced in Pesaran and Shin (1998) and Pesaran et al. (2001). The ARDL model has been proved to be an efficient technique for determining cointegrating relationships in small samples and also can be applied regardless of the regressors' order of integration. That is, it can be applied regardless the stationarity property of the variables in the model, thus allowing for statistical inference on long-run estimates which are not possible under alternative cointegration techniques.

The technique of modelling long-term relationship created by Pesaran et al. (2001) and expanded by Shin et al. (2013) is the nonlinear autoregressive distributed lag (NARDL) model, which is an asymmetric extension of the linear ARDL. The NARDL model uses partial sum decompositions to implement nonlinearity. Both short-run and long-run asymmetries can be encompassed in the transmission process as NARDL coherently models the long-term relationship as well as the dynamic adjustment pattern. The asymmetric co-integrating relationship is expressed as follows:

$$y_t = \beta^+ \mathbf{x}_t^+ + \beta^- \mathbf{x}_t^- + u_t \quad (9)$$

where y_t is the outcome variable, $\mathbf{x}_t^+$ and $\mathbf{x}_t^-$ are the partial sum process of positive and negative changes in a $k \times 1$ vector of regressors $\mathbf{x}_t$ and u_t is the error term. In Eq. 9, β^+ and β^- denote the related asymmetric long-term parameters and $\mathbf{x}_t$ can be decomposed as:

$$\mathbf{x}_t = \mathbf{x}_0 + \mathbf{x}_t^+ + \mathbf{x}_t^- \quad (10)$$

$\mathbf{x}_t^+$ and $\mathbf{x}_t^-$ are the partial sum process of positive (+) and negative ($-$) changes in $\mathbf{x}_t$, which are defined as shown below:

$$\mathbf{x}_t^+ = \sum_{i=1}^{t} \Delta \mathbf{x}_i^+ = \sum_{i=1}^{t} max(\Delta \mathbf{x}_i, 0) \quad (11)$$

$$\mathbf{x}_t^- = \sum_{i=1}^{t} \Delta \mathbf{x}_i^- = \sum_{i=1}^{t} max(\Delta \mathbf{x}_i, 0) \quad (12)$$

The error correction model correlated with the same asymmetric co-integrating relationship as in Eq. 13 was developed by Shin et al. (2013) by incorporating the ARDL (p, q) extension in Eq. 9 which is referred to as NARDL model:

$$\Delta y_t = \rho y_{t-1} + \theta^+ \mathbf{x}_{t-1}^+ + \theta^- \mathbf{x}_{t-1}^- + \sum_{i=1}^{p-1} \phi_j \Delta y_{t-j} + \sum_{j=0}^{q} (\pi_j^+ \Delta \mathbf{x}_{t-j}^+ + \pi_j^- \Delta \mathbf{x}_{t-j}^-) + \varepsilon_t \quad (13)$$

where ε_t is the error term, $\beta^+ = -\theta^+ / \rho$ and $\beta^- = -\theta^- / \rho$ are the asymmetric long-run parameters, see (Greenwood-Nimmo and Shin, 2013).

5. Data and Preliminary Analysis

5.1 Data and variables

At empirical level, the NARDL presented above is employed to examine the asymmetric growth impact of government expenditures. Our empirical strategy allows for a detailed investigation for such relationship in both the short run and the long run as well as distinguishing between the effects of increasing and decreasing government expenditures on economic growth. First, we construct a NARDL model using aggregated data on government expenditures. Second, we use the same modelling technique to examine the growth impact of government expenditures on different sectors in the economy. Our dataset includes annual data for Egypt, and covers the period of 1980-2013. Our bivariate model includes economic growth and government expenditures. While economic growth is measured in terms of changes in real per capita GDP, government expenditure at the aggregated level is expressed in real and growth terms. At disaggregated level, our empirical analysis is constrained by the availability of data of disaggregated public spending. In particular, we consider government expenditures on education and military expenditures. Data are extracted from the Datastream.

5.2 Preliminary analysis

In this section, we present main characteristics of data in order for us to present/analyse better the main empirical results we discuss in the next section. From the time series plot of log of real GDP per capita and the log of government expenditure Figure 4 [left panel], it is clear that between 1980-1993 when Egypt experienced a comparatively greater GDP growth (than the subsequent period, 1994-2015), the government expenditure too experienced a rise (hence is the visibility of two similar humps for both variables). However, between 1994-2015, the expansion of the economy experienced mixed fortune as these two decades foresaw periods of greater volatility in GDP growth. Interestingly, government expenditure experienced a steep rise since 1994 despite the relatively lower GDP growth during 1994-2015 than in 1980-1993. This simple temporal plot underlines the existence of possibly asymmetry: variable effects of government expenditure on growth during periods of expansion and contraction. Moreover, this figure also tells us the importance of a new economic feature in understanding the veritable correlation in asymmetry: during 1993-2015, Egypt continued to experience high fluctuations in GDP growth partly because of the global seize in growth vistas following financial turmoil, and partly due to the process of institutional reforms in trying to stabilize the economy from such shocks. This period of volatility - as is well-known from the econometric literature - can produce information asymmetric and chaotical dynamics in growth pattern thus leading to the persistence of embedded uncertainty in the economic system. The growth of government expenditure during this period of uncertainty is thus possibly led by the intention to infuse elements of stability and positive signals to the aggregate economy. The right panel of Figure 4 presents a complementary evidence in the form of ACF and spectral density plots. The latter, as evident in the graph, appears concentrated near the zero mass for both GDP and government expenditure indicating the possibility of persistence of (long-memory) non-stationary shocks. These graphs (especially the one for government expenditure) also depict smaller concentration of mass around 0.5 (horizontal axis) implying further that these non-stationary shocks are spread asymmetrically over the length of 1980-2015.

Figure 5 [left panel] presents a bivariate density plot for per capita GDP and government expenditure. It is evident that there is a non-linear relationship between government expenditure and GDP over 1980-2015. The elongated S-shape between these variables complement our earlier discussion that along the high volatility growth path, expenditure has been increasing (although non-linearly). Motivated by these preliminary evidence, we now proceed to estimating the magnitude of the non-linear effect and the adjustment mechanism of shocks to long-run equilibria.

6. Empirical Results

First, using the ADF unit root test, none of the individual series is found to be integrated of order two which is an important for the ARDL model[2]. Then, we consider consider a number of different specifications of Eq. 13 in order to estimate the dynamic relationship between government expenditure and economic growth in Egypt.

6.1 Aggregated analysis: evidence for asymmetries

We can now estimate the asymmetric ARDL model specified in Eq. 13. The selection of the optimal NARDL(p,q) specifications is based on the general-to-specific and the results are presented in Table 1. The results presented in Table 1 are concerned the OLS estimation of Eq. 13. Before proceeding to interpret the estimated coefficients and discussing their implications, it is important to verify the validity of the asymmetric impact assumption the model imposes as well as the asymmetric (non-linear) cointegration between the levels of y_t, $\mathbf{x}_t^+$ and $\mathbf{x}_t^-$.

In order to test for the cointegrating relationships in the model, Greenwood-Nimmo and Shin, (2013) employ the conintegation bound test (F_{pss}) of Pesaran et al. (2001), which is based on a modified F-test. The F_{pss} tests for the null hypothesis of no cointegration. In particular, the F_{pss} is an F-test that tests for the joint null-hypothesis that the coefficients of the lagged level variables are jointly equal zero. That is, the null of no cointegration is stated as $\rho = \theta^+ = \theta^- = 0$.

[2] Results for the ADF test are available upon request.

Pesaran et al. (2001) reports two critical bounds; the upper and the lower. To reject the null hypothesis, and therefore concludes the existence of countegration, the test statistics (F_{pss}) should be greater than the upper bound. Thus, it provides evidence of a long-run equilibrium relationship. On the other hand, if the F_{pss} statistic is smaller than the lower bound, we fail to reject the null hypothesis and a conclusion of no cointegration is made. Finally, if the F_{pss} value lies between the critical bounds, the test is inconclusive. The results for the F_{pss} tests are reported in Table 1. The test rejects the null hypothesis with the computed F-statistic (F_{pss}) equal to 11.096, 5.726, 9.135 and 11.096 for specifications 1,2,3,4, respectively, exceeding the upper bound critical value. Therefore, there is a statistical evidence that a long-run cointegrating relationship exists between the examined variables.

To test for asymmetries, the null hypothesis of no long- and short-run asymmetry is tested using the Wald test. In the long-run, the results reveal a significant difference in the impact of a negative shock than a positive shock for government expenditure on economic growth. That is, negative shocks on government expenditure will have a significantly different long-run run impact (in sign and magnitude) on economic growth than positive shocks. On the short-run, however, the impact is not significantly different. Such results strongly suggest that asymmetry need to be accounted for when studying the impact of changes in some macroeconomic variables on economic growth and, therefore, restrict the findings of symmetric models. In the case of Egypt, it is evident that a linear model for explaining long-run growth impact of government expenditure will most likely be misspecified.

In addition to the OLS estimation of Eq. 13 reported in Table 1, we present the cumulative effects of government expenditure on economic growth. The dynamic multiplier explains the adjustment process and the period of disequilibrium caused by a shock on the explanatory variable. That is, it explains the adjustment process from the initial equilibrium to the new equilibrium point that results from a positive or negative shock. As illustrated by Shin et al. (2013), even if no evidence of short run asymmetry is found, one can still observe asymmetry in the adjustment path given by the dynamic multipliers. This is because the adjustment path back to equilibrium depends on a combination of the long run parameters, the error correction coefficients, and the dynamics of the model itself.

Figure 6 illustrates the dynamic effects of positive and negative changes in the examined fiscal policy tool on growth. The dynamics of the government expenditure cumulative multiplier shows that the negative shock moves growth rates to a lower equilibrium point on the short run. Moreover, the dynamics of a positive shock are straightforward and show a positive impact on the short and long run. Note how the impact dies out gradually and the new equilibrium is reached after nearly three years. The overall conclusion, though, is that when government expenditure rises, economic growth reacts immediately but, however the negative shock to the same variable would have a stronger consequences on economic growth.

6.2 A disaggregated analysis of government expenditures

According to the aggregate analysis discussed above, our results show empirical evidence of a non-linear relationship between government expenditures and economic growth. Such evidence seems to hold under different specifications at an aggregated level of government expenditure. In order to complete this analysis, we take the analysis a further step to see whether the asymmetric growth impact would hold when considering government expenditures at a disaggregated level. In particular, subject to data limitation, we extend our analysis by examining the non-linear relationship between government expenditures and between military expenditure and economic growth measured as the change in per capita GDP.

Table 2 presents the dynamic asymmetric estimation of Eq. 13 considering government expenditures on education (model 5) and military expenditures (model 6). As is the case with the aggregated analysis, we first verify the validity of the asymmetric impact assumption imposed by the model as well as the non-linear cointegration properties of the series under consideration. As shown in Table 2, the F_{pss} statistics are 10.491 and 6.848 for models 5 and 6 respectively. Since that the bound test statistic exceeds the upper bound, we reject the null hypothesis of 'no cointegration', finding a statistical evidence of a long-run relationship between the examined variables in both models. When testing for asymmetries, we found interesting results. First, in model 5, it seems that there is a significant difference in the growth impact of negative and positive shocks for government expenditure on education. Interestingly, these asymmetries are found in both short run and long run. In particular, we reject the null hypotheses of Wald test (i.e., $\beta^{+} = \beta^{-}$ and $\pi^{+} = \pi^{-}$) as the computed tests statistics are 37.050 and 7.661, respectively. Second, when testing asymmetries in model (6), we find evidence of asymmetric growth impact of military expenditures only in short run.

By verifying the existence of cointegration and non-linearity, we turn the discussion to interpret the estimated long-run coefficients presented in Table 2. Our estimation shows that increasing government expenditure on education would have a greater impact on economic growth compared to the negative impact of decreasing the same spending by one percent. More particularly, while increasing government expenditures on education by one percent would increase the per capita GDP by 18 percent, the same proportionate drops in that variable would lead to slower growth by only 10 percent. This evidence suggest that increased government spending on education would have a greater impact on growth more that decreases in the long run.

Finally, Figure 7 presents the dynamic effects of positive and negative changes in the examined fiscal policy tools on growth. In model (5), the cumulative multiplier shows that when government expenditures on education rises, economic growth reacts immediately but, however the positive shock to the same variable would have a stronger effects on economic growth. On the other hand, the dynamic multiplier for model (6) (Figure 7 shows that these asymmetries would be statistically significant only in the short run.

7. Conclusion and Policy Implications

The paper exploits the asymmetric dynamic multipliers within a non-linear ARDL framework to examine the growth impact of fiscal policy in Egypt. Our results show empirical evidence of a non-linear relationship between government expenditures and economic growth. Such evidence points to a possibly sever misspecification problem encounters the currently prevailing linear models linking growth to government expenditures. Our exercise may help Egyptian policy makers in crafting a number of policy scenarios for the post-awakening development agenda. In particular, building on our empirical findings, governments should be able to identify sectors with the highest growth impact of increased government expenditures as well as those sectors with the least disruptive consequences in response to budget cuts. This, in its turn, would help policy makers to follow a priorities-based government spending policy; which may fit well the current situation in Egypt.

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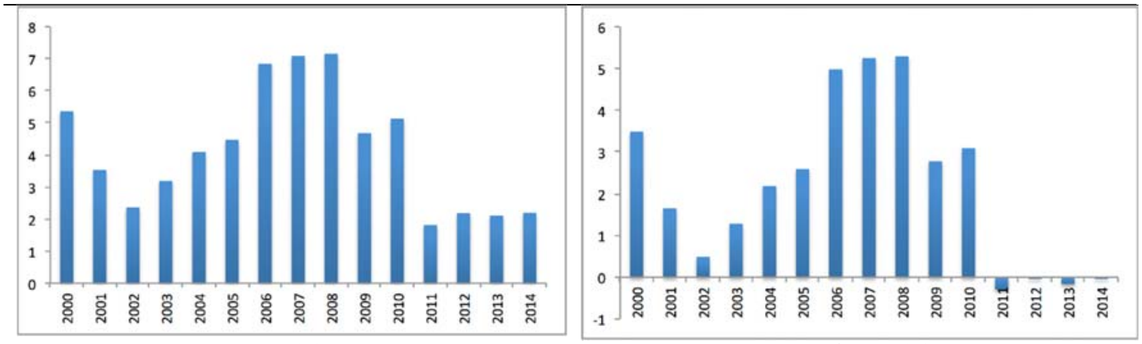
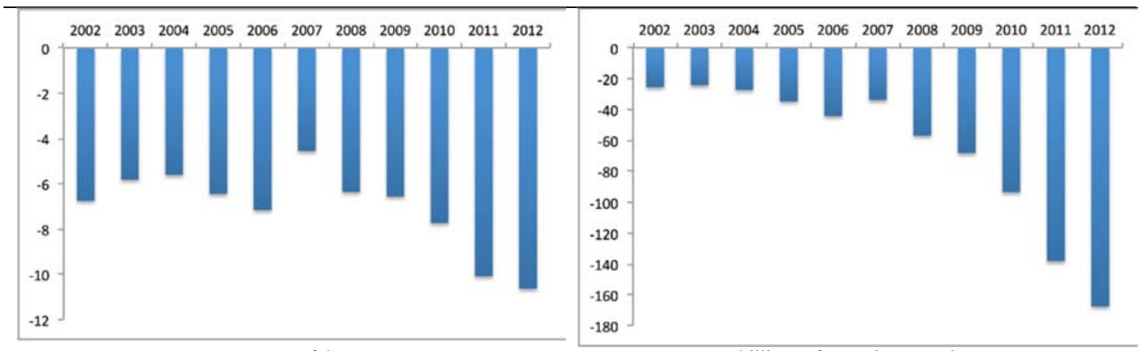
Figure 1: Egypt's Economic Growth 2000-2014



GDP (%) | Per CapitaGDP (%)

Source: Authors' elaboration based on the World Bank - WDI database

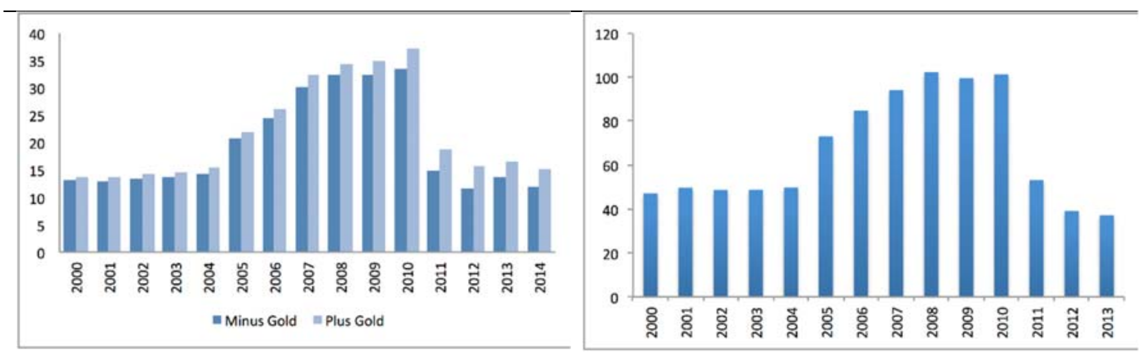
Figure 2: Egypt: Budget Deficit 2000-2012



percentage of GDP | billions of Egyptian Pounds

Source: Authors' elaboration based on the World Bank - WDI database

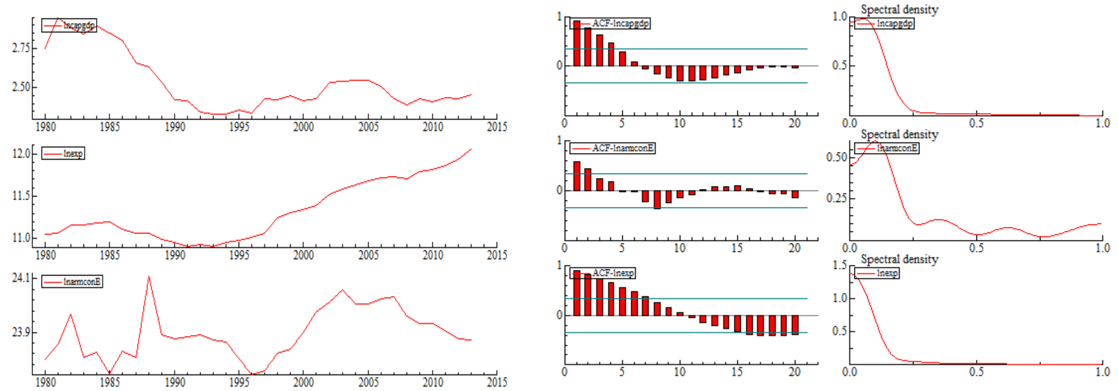
Figure 3: Total Reserves 2000-2014



billions of dollars | percentage of external debt

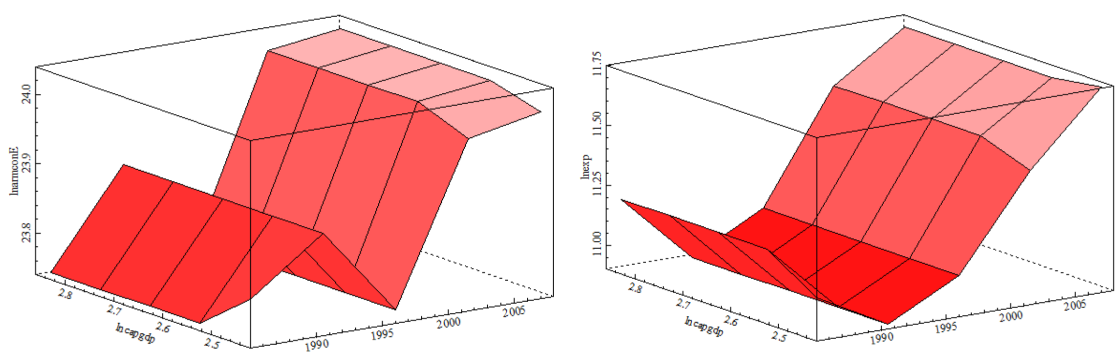
Source: Authors' elaboration based on the World Bank - WDI database

Figure 4: Time Series Features of the Data



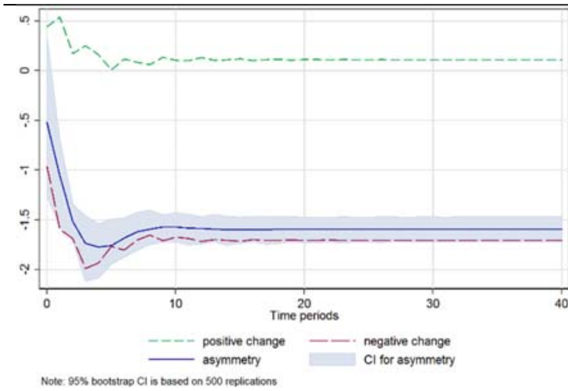
Time Series Plots Spectral density and ACF

Figure 5: Bivariate Density

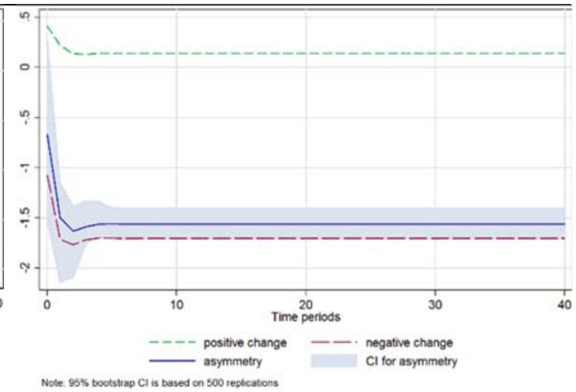


Bivariate density: GDP and government expenditure Bivariate density: GDP and armcon

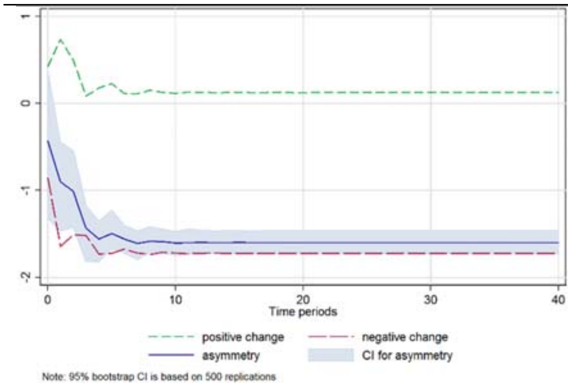
Figure 6: Dynamic Multiplier of Government Expenditure on Economic Growth



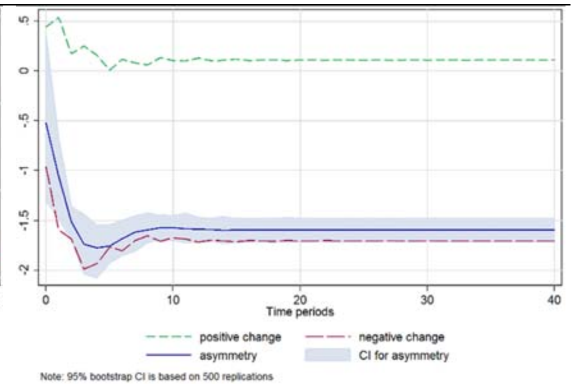
Model (1)



Model (2)

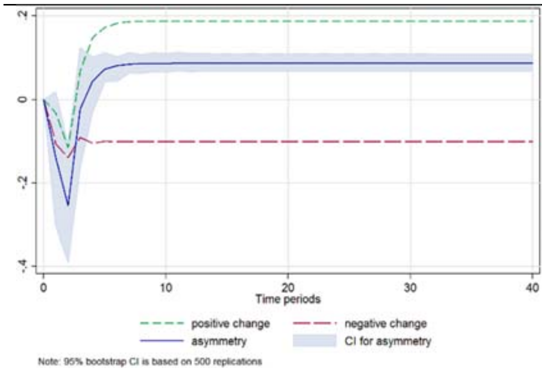


Model (3)

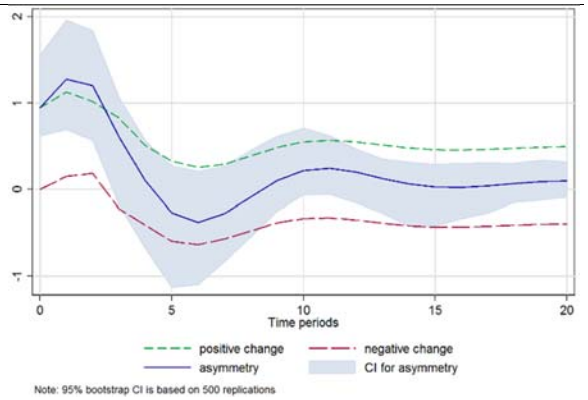


Model (4)

Figure 7: Dynamic Multiplier of Government Expenditure on Economic Growth



Model (5)



Model (6)

Table 1: Dynamic Asymmetric Estimation

Coefficient	(1)	(2)	(3)	(4)
ρ	-0.851***	-0.850***	-0.906***	-0.851***
	(-5.62)	(-4.14)	(-5.21)	(-5.62)
θ^{+}	0.094***	0.120***	0.111***	0.094***
	(2.90)	(2.89)	(3.16)	(2.90)
θ^{-}	1.451***	1.444***	1.557***	1.451***
	(5.39)	(4.01)	(5.08)	(5.39)
π_0^{+}	0.443**	0.410	0.422*	0.443**
	(2.38)	(1.57)	(2.04)	(2.38)
π_0^{-}	0.965**	1.077**	0.856**	0.965**
	(2.68)	(2.49)	(2.13)	(2.68)
$\sum_{j=1}^{q-1}\pi_j^{+}$	0.380*	0.000	0.584**	0.380*
	(1.96)	(.)	(2.36)	(1.96)
cons	2.474***	2.446***	2.590***	2.474***
	(5.66)	(4.10)	(5.16)	(5.66)
Symmetry tests				
$\beta^{+}=\beta^{-}$	492***	316.7***	454.1***	492***
$\pi_0^{+}=\pi_0^{-}$	0.074	1.408	0.762	0.074
Long-run effects				
β^{+}	0.111***	0.141***	0.123***	0.111***
β^{-}	-1.704***	-1.700***	1.719***	-1.704***
Cointegration				
F_{pss}	11.096***	5.726***	9.135***	11.096***
N	34	34	34	34
R^2				
(p,q)	(4,2)	(2,2)	(3,3)	(4,4)

Notes: *, **, *** indicate significance at 10%, 5% and 1% significance level, respectively.

Table 2: Dynamic Asymmetric Estimation - Disaggregated Level

Coefficient	(5)	(6)
ρ	-0.832***	-0.804***
	(-5.30)	(-3.90)
θ^{+}	0.156***	0.390*
	(4.96)	(2.13)
θ^{-}	0.084***	0.326
	(4.15)	(1.42)
π_0^{+}	0.000	0.945***
	(.)	(3.36)
π_0^{-}	0.000	0.000
	(.)	(.)
π_1^{+}	-0.188**	0.362*
	(-2.23)	(1.94)
π_2^{+}	-0.269***	0.000
	(-3.29)	(.)
π_1^{-}	0.022	-0.476*
	(0.56)	(-1.83)
π_2^{-}	0.048	-0.451**
	(1.23)	(-2.16)
cons	1.838***	1.789***
	(5.07)	(3.47)
Symmetry tests		
$\beta^{+} = \beta^{-}$	37.050***	0.470
$\pi^{+} = \pi^{-}$	7.661**	9.509***
Long-run effects		
β^{+}	0.188***	0.485***
β^{-}	-0.101***	-0.405***
Cointegration		
F_{pss}	10.491***	6.848***
N	34	34
R^2		
(p,q)	(2,4)	(4,3)