

# A Regime-Based Effect of Fiscal Policy

Evidence from an Emerging Economy

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Compensation and Performance Department

November 2017

## Abstract

In recent years, few authors have attempted to address the question of whether the state of the economy influences the impact of fiscal policy on the economy. Key findings have often indicated that expansionary fiscal intervention tends to be more effective when the economy is in a downturn. This favorable impact is more pronounced with an increase in government spending as opposed to a tax reduction. Despite several empirical attempts, the findings on the state-dependent nonlinear relationship of fiscal policy and output growth are often limited to developed economies. Building on the current research trend of using the threshold vector autoregression methodology, this paper bridges this gap and extends the empirical body to estimate the nonlinear relationship for an emerging economy, Tunisia. The paper provides empirical evidence

that fiscal policy has a different impact on economic activity depending on the business cycle, the instrument of the fiscal policy used, and the intensity of the shock. The paper argues that in a downturn phase, government spending should be privileged particularly in the short run, with a gradual increase in the tax base to reduce the risk of worsening the budget deficit. Further, the monetary authority should be less inclined to raise its policy rate in the early stage of the recessionary period, as this intervention could have an adverse impact on economic growth. In the expansion phase, a tax cut intervention appears on the contrary to have a stronger positive impact on economic activity, especially in the short run, as the monetary authority is expected to introduce gradual policy hikes more rapidly to control for the inflationary expectations.

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**A Regime-Based Effect of Fiscal Policy:  
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JEL classification : E62, E63, H30, O23, E32

Keywords: Fiscal Policy, Economic Cycle, Policy Mix, TVAR. Emerging Economies

## Introduction

Several studies have estimated the impact of fiscal policy on economic growth either from a neoclassical or a Keynesian perspective. While the former assumes that fiscal intervention can have a real effect only in the short run before wages and prices start to adjust to bring the real economy to its equilibrium, the latter has often praised government intervention to reduce any dysfunction of the free market and thus foster economic growth over the long run but more importantly in the short term. Most of these theoretical and empirical contributions have nevertheless considered this impact from a linear relationship standpoint particularly with the extensive use of the linear DSGE models. Fiscal policy was often assumed to positively (or negatively) impact economic activity regardless of the phase of the business cycle.

More recently, a few authors have attempted to address the question of whether the state of the economy matters in determining the impact of fiscal policy on the economy. Baum et al. (2012) argued that fiscal multipliers can be higher in downturns than in expansion phases of the business cycle. Using the output gap as an indicator to determine the position of the economy in the business cycle, they noted that because of excess capacities (i.e., abundance of unused factors of production) during downturns, the neoclassical argument that is built into the standard Real Business Cycle model of a crowding-out effect is less applicable. Analyzing the nonlinear impact of fiscal policy for selected G7 countries, they found that such an impact varies with the business cycle. The multipliers are on average higher in periods of negative output gap compared to periods of positive output gap. Following the same threshold VAR (TVAR) approach but using the output growth as the threshold variable, Batini, Callegari and Malina (2012) estimated a fiscal model that accounts for monetary policy as an additional dimension. The overall findings of their paper confirm previous studies. The results indicate that expansionary fiscal intervention in countries like the United States, Japan and the euro zone tends to be more effective when the economy is in a downturn. This favorable effect on economic activity is more pronounced in the case of an increase of government spending as opposed to tax reduction. Overall, they showed strong empirical evidence for their argument that fiscal policy has a different impact on economic activity depending on the business cycle, the instrument of the fiscal policy used, and the intensity of the shock.

Applying a regime-switch SVAR model, Auerbach and Gorodnichenko (2012) found that the fiscal multiplier varies depending on the state of the economy. The authors argue that such a regime-based impact depends also on the nature of the fiscal policy instrument. Defense spending and investment (in contrast to non-defense and consumption spending, respectively) have much stronger and faster positive impact on output in a recession. Baum and Koester (2011) used the same approach to allow for asymmetries in the fiscal shocks as a function of size, direction and timing relative to the business cycle. In addition to the argument of a small crowding-out effect in times of recession described above, the authors argued that in contrast to the period of economic expansion, in times of crisis (negative output gap and high unemployment), economic agents face an additional financial burden resulting from the tightening of credit policy by the financial institutions. Under these circumstances, credit-constrained borrowers are often inclined to adjust their spending more drastically and rapidly than in a situation of financial ease. The authors showed that for a developed country like Germany, the impact of the fiscal policy varies depending on the state of the economy with a larger government spending multiplier in times of negative output gap. Conversely, tax policy will have more impact in periods of economic expansion. Afonso et al., (2011) consider the impact of fiscal development in times of financial disruption. Using financial instability as a threshold to distinguish between periods of financial development and periods of market distress in selected OECD countries, the authors confirm that the fiscal multiplier was higher on average during the recent financial crisis of 2009 relative to the rest of the study period.

As can be seen from this literature review, all the empirical studies that have estimated the state-dependent nonlinear relationship of fiscal policy and output growth have only used advanced economies as the benchmark. In this paper, building on the current research trend using the TVAR methodology, we attempt to bridge this gap and extend the empirical body to estimate the nonlinear relationship for an emerging economy, Tunisia.

This paper is structured as follows. In the next section, we describe the methodology used to estimate the differentiated impact of the fiscal policy. Section 3 presents the findings of our study. Key policy implications and concluding remarks are included in the last section.

### **Identification Method**

Similar to the recent trend in the literature, we adopt the Threshold Vector autoregression (TVAR) method to estimate our model. Baum et al. (2012) define TVAR as a

“simple method to model changing dynamics for a set of variables over two or more distinct regimes”.

In its standard form, the TVAR can be written as follows;

$$Y_t = A^1 Y_t + B^1(L)Y_{t-1} + (A^2 Y_t + B^2(L)Y_{t-1})I(C_{t-d} > \delta) + U_t \quad (\text{eq. 1})$$

Where  $Y_t$  is the vector of covariates composed of total government spending defined as the sum of government consumption and investment, net taxes calculated as total tax revenues less current transfers and interest payments, GDP growth rate and central bank policy rate (which is included only in the augmented SVAR model).  $B(L)$  is the lag polynomial matrices and  $C_{t-d}$  is the threshold variable (Balke, 2000).  $A^1$  and  $A^2$  capture the contemporaneous relationship between variables, which has a recursive structure following the Cholesky decomposition ordering, i.e., government spending, real GDP and tax revenues. The intuition behind this ordering is that (i) because it is unrelated to the business cycle, government spending does not react instantly to shocks to other economic aggregates but only with certain lags (Caldara and Kamps, 2008), (ii) output is affected contemporaneously by government spending’s shocks but only with a lagged shock to tax policy, (iii) tax revenue responds instantly to all other shocks in the benchmark model. Notice that, in the augmented model, the interest rate is ordered last to capture the reaction function of the Tunisian central bank (Bouزيد, 2016).

All variables included in the model, except for the policy rate, are expressed in annual growth rate of the log values. The period under study in this paper spans from year 2000:Q4 to 2015:Q4.

Similar to Batini et al. (2012), we use output growth as the threshold variable, with one major difference. In contrast to the authors, who set the threshold value at 0 to distinguish between positive and negative growth, we determine the value of the threshold endogenously as advised by Baum et al (2012). We adopt two distinct techniques widely used in the literature to estimate the threshold value. First, we follow Balke’s (2000) approach to estimate the threshold by the least squares method for all possible values and then test the hypothesis of no differences between the two regimes, i.e., upper regime (defined by output growth above the threshold value)

and lower regime (defined by output growth being below the threshold value). We use the Wald-Statistic with three separate tests: Sup-Wald, Avg-Wald and Exp-Wald.<sup>1</sup>

Based on this procedure, the value of the threshold ( $\delta$  in equation (1)) that is found to maximize the log determinant of the structural residuals is estimated at 0.191. The second technique we rely upon to determine the value of the threshold value is the multivariate procedure as developed by Tsay (1998). This procedure assumes a null hypothesis of linearity in the data throughout the entire period. Table 1 presents the results of this analysis for various lags of the VAR model and the threshold. For our model, we select a threshold lag of 1 and lag VAR of 2.<sup>2</sup> The threshold value we use to estimate our model as determined by the Tsay procedure is equal to 0.1603, which is close to the threshold determined by the Balke (2000) procedure as mentioned above.

We use a nonlinear impulse response function (NIRF) to analyze the reaction of the model's variables to various shocks.<sup>3</sup> The NIRF is very useful for this type of analysis, as it allows for measuring the size, the direction, and the initial condition of the shock under each of the two regimes. The impulse function is constructed by assuming that the reaction of the model to various shocks is nonlinear between the two states of the economy (as separated by the threshold variable), while full linearity is assumed within each regime.

*Table1: Tsay Threshold Test for linearity*

<b>VAR lag</b>	<b>Threshold value</b>	<b>Threshold lags</b>	<b>Test Statistics</b>	<b>P-value</b>
1	0.1603	0	73.07	0.0000
	0.1603	1	37.18	0.0000
	0.1603	2	7.63	0.8132
2	0.1603	0	72.03	0.0000
	0.1603	1	35.01	0.0282
	0.1603	2	18.91	0.5909

<sup>1</sup> For additional explanations of this approach and the simulation method used to conduct the inference, please refer to the pioneering work of Balke (2000) and Baum and Koester (2011).

<sup>2</sup> Similar to other studies, the threshold variable is defined as the two-quarter moving average of the series.

<sup>3</sup> Refer to the work of Batini, Callegari and Melina (2012) for further clarifications on the construction of the NIRF.

## Empirical Results

Figures 1-4 below plot the nonlinear impulse responses of the variables conditional on the history of the model and the size and direction of the shocks (Balke, 2000). Each figure reports the results of positive and negative 1 and 2 standard deviation (SD) shocks of the endogenous variables. This approach assesses the asymmetric nature and the proportionality of the impact resulting from various shocks under each regime (Batini, Callegari and Melina (2012) and Balke (2010)).

Figures 1-A and 1-B display the nonlinear impulse reaction functions to government spending shock conditional on initially being in the upper or lower regime, respectively. The solid black line corresponds to a positive 1SD shock while the solid green, blue and red lines correspond to -1SD, 2SD and -2SD, respectively.

In line with previous research on developed economies, the reaction of output growth to a positive shock of government spending appears to be more pronounced (positive reaction) in the lower regime, with the economy moving in the downturn phase of the business cycle. This positive response of output tends to increase over time, starting from the first quarter with a pickup around the 4<sup>th</sup> quarter. The effect is relatively consistent and does not fade away before the 7<sup>th</sup> quarter. This finding confirms the limited crowding-out effect of government spending particularly in the downturn as argued by Baum and Koester (2011) and Auerbach and Gorodnichenko (2012). In contrast, under the upper regime (the expansion phase), the NIRF of output growth appears to be negative for the first 3 quarters before it increases slightly, albeit still negative, in the longer run. This finding indicates the crowding-out effect of private initiatives during the expansion period. The government spending cut (green line) appears to have an expansionary effect in the upper regime. This positive effect drops starting from the third quarter but remains marginally positive for the entire period. Similar results can also be found in advanced economies such as the United States, Japan and the euro zone. Authors such as Batini, Callegari and Melina (2012) explain this finding using the “confidence effect” theory. Because the economic agents anticipate a drop of tax burden in periods of economic booming when local government is favoring a spending cut policy, they are more motivated to invest and create wealth. Overall, our finding confirms the nonlinearity of the fiscal policy shock on economic activity and provides additional support to similar work conducted on other developed economies.

The tax variable has slightly different reactions to government spending shocks depending on where the position of the economy is. Under the lower regime, the tax return reacts instantly and positively to the spending shock for the first 2 quarters before it becomes negative in the following 4 quarters. Local government tends to increase contemporaneously its tax base to reduce the fiscal deficit that may arise from a government spending intervention. Further, the automatic response of tax revenue to the government spending cut can be explained by the reduction of the aggregate domestic taxable income that results from the drop of the output growth. In the upper regime however, the tax reaction appears to revert its direction almost immediately starting from quarter 1 and become marginally positive over the long run. This reaction accompanies the limited increase of output in the expansion phase. The frontloaded fiscal consolidation in the upper regime, compared to a more gradual approach when the economy is in downturn (spread over the first 3 quarters) has no noticeable impact on output. One interesting finding worth noticing is that figure 1 A-B does not provide strong evidence for asymmetries between small (1SD) and large (2SD) shocks, particularly with respect to the response of output to a spending shock.

Figure 1-A: Government spending Shock (*lower regime*)

Figure 1-B: Government Spending Shock (*upper regime*)

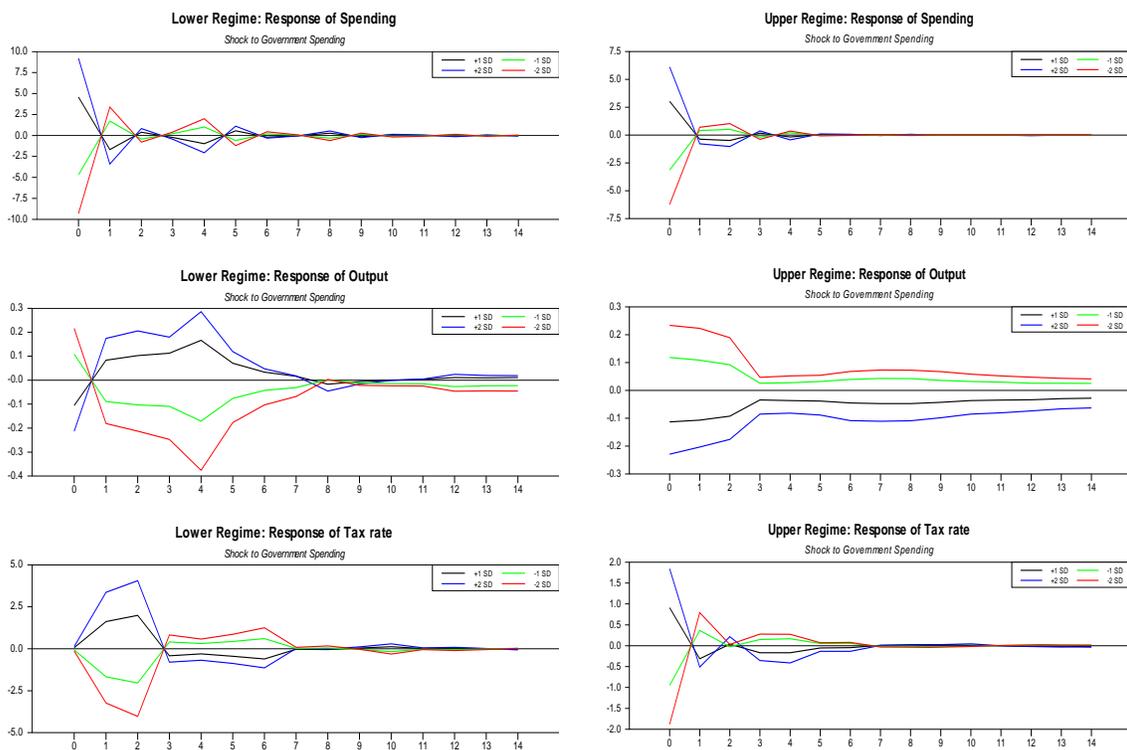


Figure 2 A-b depicts the reaction functions to the tax shocks. In the lower regime, the output appears to reverse course after an initial positive reaction to a 1 SD negative shock of the tax policy (tax reduction), with a negative response starting from the end of the first quarter through quarter 5. In contrast, the reaction of output to a discretionary tax cut remains positive throughout the period under study for the case of the upper regime. This finding provides support to the conclusion of Baum and Koester (2011). Government spending retains a relatively similar response under both regimes, with an initial decrease during 2 quarters (with a more pronounced effect under the upper regime) before the response turns positive and fades away around quarter 6.

From a policy perspective, figures 1 and 2 indicate that in a recession period, government spending policy seems to have higher positive impact on economic activity than a tax reduction. This impact is more pronounced over the long run than in the short-term period. This finding, Baum et al. (2012) argued, followed the Keynesian theory where government spending is more effective in boosting economic activity than tax cuts, since households, under the latter intervention, may choose to save a portion of the additional after-tax income. Conversely, in the upper regime, a tax reduction will maintain economic growth over the long run, while an increase in government spending is ineffective at best.

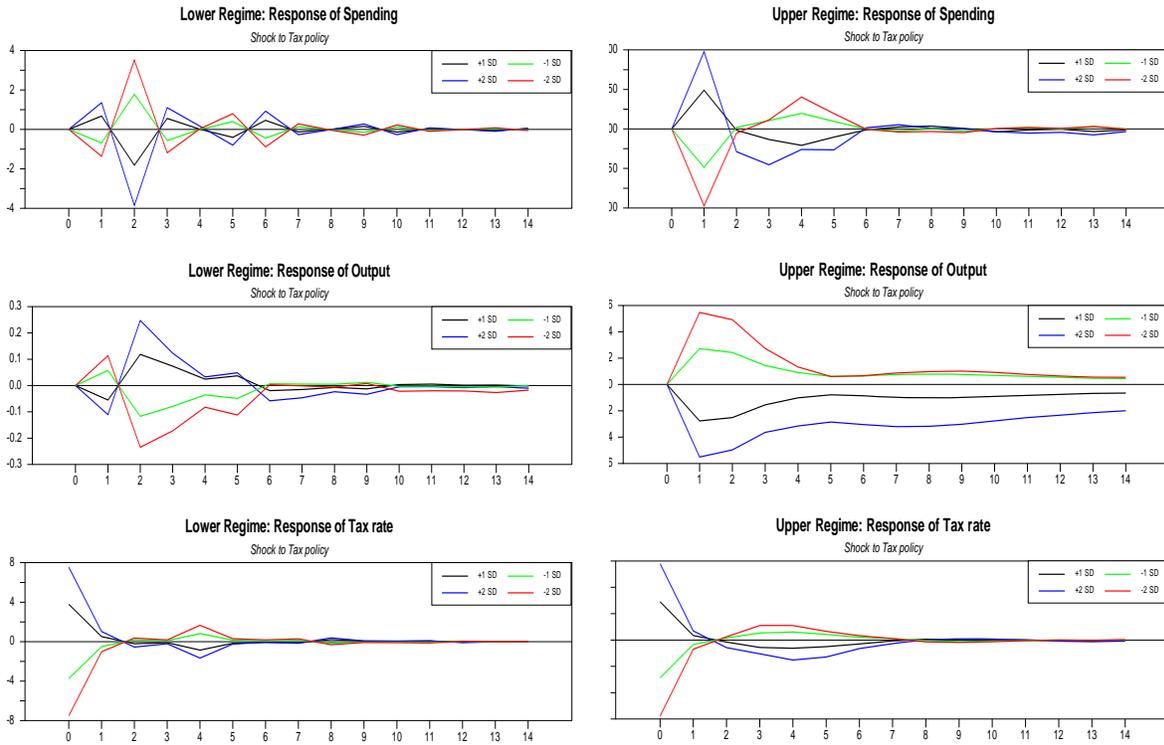
In contrast to the findings above, figure 2 A-B, provides some evidence for asymmetries between small and large shocks with, for instance, the response of output to a negative 1SD and 2SD of tax shock coinciding after 5 quarters in the upper regime. Further, over the long run, a positive shock of tax policy in the upper regime appears to have a more proportional impact on output than the corresponding negative impact.<sup>4</sup> This finding is reversed in the case of the lower regime, with a larger effect for negative shocks. Evidence of asymmetries between small and large shocks can also be depicted in the response of government spending in the upper regime starting from quarter 3.

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<sup>4</sup> This finding confirms Mountford and Uhlig's (2005) results using the sign restriction approach.

Figure 2-A: Tax Policy Shock (*lower regime*)

Figure 2-B: Tax Policy Shock (*upper regime*)



As a robustness check of our findings above, we now estimate an augmented TVAR by adding a monetary policy variable to the model. Similar to Batinni, Callegari and Melina (2012), we add the policy rate equation to our recursive structural VAR. The policy rate is assumed to react contemporaneously to all variables of the model, while it enters with at least one lag in all other VAR equations. The results are shown in Figures 3 A-B. The response of key variables to government spending shocks do not appear to change drastically compared to the reference model. Output continues to exhibit a significant positive response under the lower regime compared to the upper regime in response to expansionary fiscal policy. The effect appears to be consistent throughout the studied period. In contrast to figure 1-B above, tax reaction does not become negative beyond the contemporaneous influence in periods of expansion. In a downturn phase, the reaction of the tax base to a government spending shock is similar under both the reference and the augmented models.

Like other studies, we find strong evidence for a policy mix intervention under both regimes. A positive government spending shock is associated with a relatively slightly delayed

increase of the policy rate. This positive reaction is more persistent in the case of the lower regime as opposed to the upper regime where the policy rate tends to return to its steady state after about 6 quarters. The local authorities appear to offset the fiscal expansionary intervention with a gradual increase of the policy rate when the economy is in recession, allowing for full fiscal impact in the first 2 quarters before raising the rate to counter any inflationary pressures that could result from this intervention. The policy rate appears to pick up at 5/6 quarters into the initial shock before it moves back down at the start of the third year and remains relatively stable thereafter. The monetary intervention in time of economic expansion is different. As shown in figure 3-B, the policy rate increases contemporaneously in response to expansionary government spending. This reaction reaches its highest level early in the first quarter and starts to decay continuously before it returns to its steady state in quarter 7. As expected, monetary authorities are more concerned with the heating up of the economy in periods of economic growth and choose to use the monetary policy instantaneously to reduce any inflationary expectations resulting from the fiscal policy. This cushioning effect of the monetary effect following the fiscal expansion shock has a more drastic effect on output in the upper regime. Unlike the benchmark model (figure 1-B) where the reaction function of output growth slightly trends upward after an initial drop, in the case of the augmented model, the intervention of the monetary authorities causes further contractionary effect on output growth between the first and third quarters.

In general, similar to advanced economy central banks, the monetary authorities tend to be less proactive in responding to the increase of government spending in periods of recession as opposed to expansionary periods.

Figure 3-A: Government Spending Shock (*lower regime*)

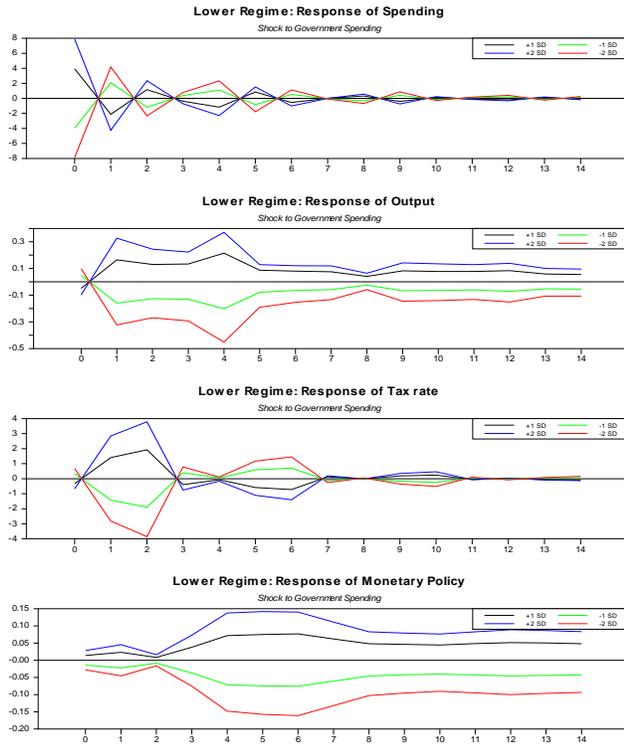
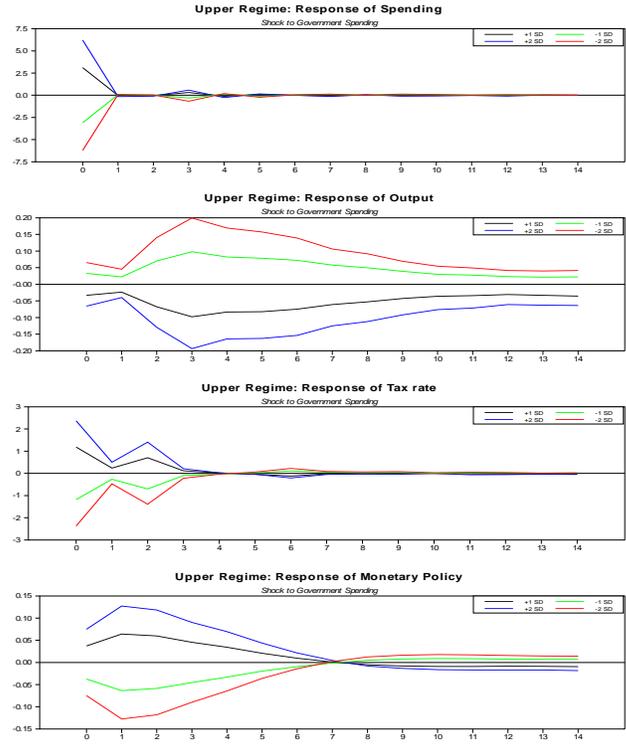


Figure 3-B: Government Spending Shock (*upper regime*)



The policy mix model shows similar results to the benchmark model in response to a tax revenue shock, with some interesting findings for the reaction of the monetary policy. As reported in Figure 4 A-B, the monetary authorities appear to be less proactive to an expansionary tax cut policy in both expansion and recession periods. For instance, in the expansion period, while the central bank intervenes almost instantly to offset the increased government spending by raising the policy rate, in the case of a tax cut policy, the policy rate starts to rise gradually only from quarter 3. Additionally, in contrast to the government spending intervention described above, where the policy rate tends to return to its steady state level after 7 quarters, the central bank appears to maintain a higher rate over the long run. These results may be explained by the fact that the authorities anticipate more rapid inflationary pressure occurring as a result of the government spending while at the same time expect the economy to heat up only after a certain delay (and with certain persistence) if the tax cut is used for the fiscal intervention.

Figure 4-A: Tax Revenue shock (*lower regime*)

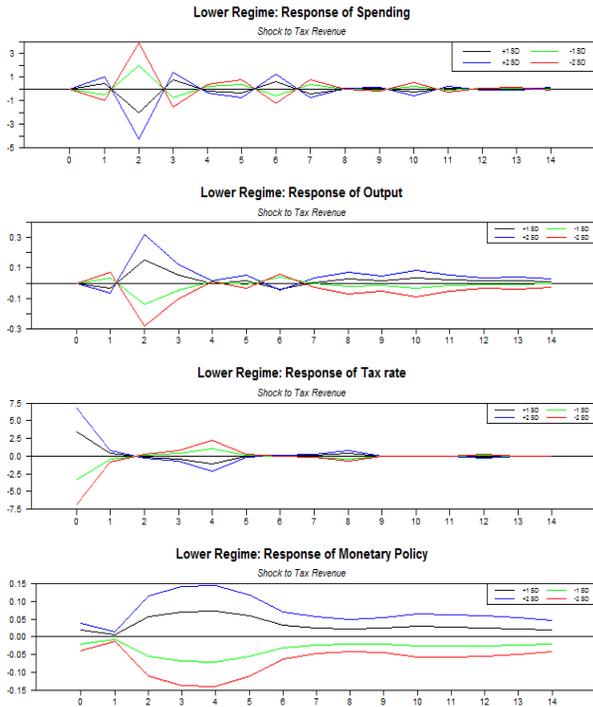
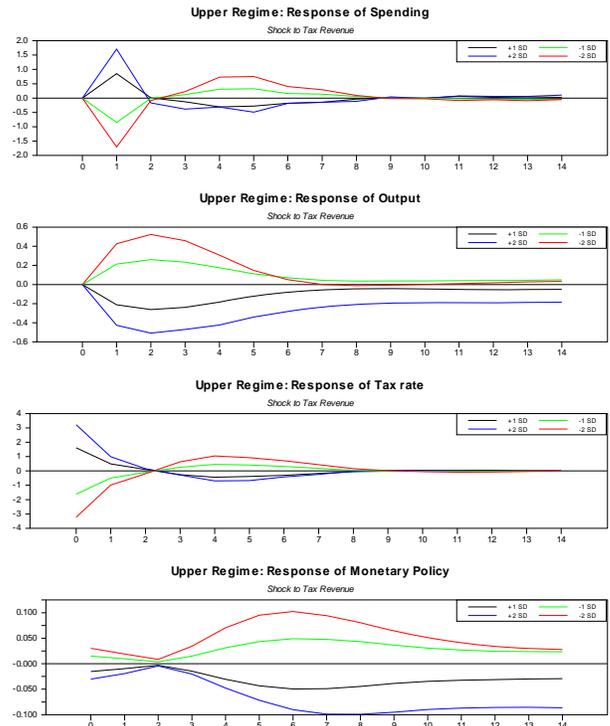


Figure 4-B: Tax Revenue Shock (*upper regime*)



### Policy Implications and Concluding Remarks

This paper attempts to analyze the nonlinear impact that fiscal policy may have on the economy based on various phases of the business cycle. Using a TVAR method, we demonstrate that the impact of a government intervention in our emerging market varies depending on the instrument used as well as the timing of such an intervention.

Overall, our paper suggests the following policy advice that local government would need to consider when formulating its fiscal policy;

- In the downturn phase, government spending as a vehicle for economic growth should be privileged, particularly in the short run. A gradual increase of the tax base starting from the second quarter following the expansionary spending intervention (when output impact reaches its maximum) can help limit any negative impact on the fiscal deficit. Further, our findings suggest that the monetary authority should be less inclined to raise its policy rate in the early stage of the recessionary period, as this intervention could have

an adverse impact on economic growth. Gradual increase of the policy rate starting from the second year of the fiscal intervention can be more effective in maintaining low inflationary expectations while at the same time ensuring that the fiscal policy reaches the peak of its positive impact at the end of the 4<sup>th</sup> quarter.

- In the expansion phase, our findings suggest a strong positive impact of a tax cut on output, particularly in the first year of the intervention. Frontloaded fiscal consolidation during this period should maintain positive economic growth with no adverse impact on the fiscal deficit. Overall government should be aware that in contrast to the recession period, the tax intervention appears relatively ineffective beyond the second year of implementation. In this phase, and in parallel to a tax cut policy, the monetary authority is expected to introduce gradual policy hikes more rapidly. This frontloaded policy mix should ensure more control on the inflationary pressure in the economy.

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