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Non-linear effects of fiscal stimulus on fiscal sustainability Indicators in Turkey*

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Abstract

This study aims at investigating the non-linear effects of government spending shocks on fiscal sustainability indicators in Turkey for the period of 2001:q1 – 2020:q4. Using the local projection method and separating government spending into two main components, namely public consumption and public investment, we examine the effects of a fiscal stimulus shock on debt-to-GDP ratio, Treasury interest rates, CDS risk premiums, output and inflation under two different debt regimes. The debt regimes (high and low) are determined by a logistic transition function regarding with debt-to-GDP ratio. We find some evidence on state-dependent features of fiscal stimulus on macro variables (output and inflation) and fiscal sustainability indicators. Particularly, we conclude that the implementation of expansionary fiscal policy via an increase in government spending in a low-debt regime would help to improve fiscal sustainability as well as the effectiveness of the fiscal policy. On the other hand, an increase in government spending in a high-debt regime generally produces lower output gains and higher budgetary costs. As a result, this study highlights the fact that the timing of fiscal actions, accurate assessment of debt regimes and composition of government spending matters.

* We would like to thank the anonymous referee for his/her valuable comments and suggestions. The paper represents the views and analysis of the authors only and does not represent those of the Central Bank of the Republic of Turkey . Thus, any error is ours.

Non-technical Summary

The debt burdens of the world economy have rapidly accumulated during the COVID 19 pandemic. The need for supporting households and firms pushed the governments to implement an expansionary counter-cyclical fiscal policy as well as a loose monetary policy to alleviate the adverse effects of the pandemic on economic activity. This inevitable policy mix aiming at slowing down output losses and retaining jobs puts the countries at high risk of debt burden.

This study aims at investigating the non-linear effects of government spending shocks on fiscal sustainability indicators in Turkey for the period of 2001:q1 – 2020:q4. The relatively low level of public debt-to-GDP ratio, the increasing trend in government spending and highly volatile output growth make it interesting to investigate the effects of government spending shocks in Turkey. Using the local projection method and separating government spending into two main components, namely public consumption and public investment, we examine the effects of a fiscal stimulus shock on debt-to-GDP ratio, Treasury interest rates, CDS risk premiums, output and inflation under two different debt regimes. The debt regimes (high and low) are determined by a logistic transition function regarding with debt-to-GDP ratio.

Our work is related to several strands of the fiscal policy literature. First, we investigate the effects of fiscal policy shocks on main macro variables such as output and inflation. Second, we try to understand changing behavior of output (fiscal multiplier) and price responses under different regimes where fiscal pressure is high or low. Third, we research the effects of government spending shocks on indicators of fiscal sustainability such as public debt, borrowing cost and CDS risk premium. Fourth, we use disaggregated data to distinguish the fiscal stimulus effect of each type of government spending as well as their effects on fiscal sustainability variables under periods of low and high debt. Finding the answers to these questions helps to understand how to use existing fiscal space and the most appropriate time to change government spending.

We find some evidence on state-dependent features of fiscal stimulus on macro variables (output and inflation) and fiscal sustainability indicators. Particularly, we conclude that the implementation of expansionary fiscal policy via an increase in government spending in a low-debt regime would help to improve fiscal sustainability as well as the effectiveness of the fiscal policy. On the other hand, an increase in government spending in a high-debt regime generally produces lower output gains and higher budgetary costs.

I. Introduction

The debt burdens of the world economy have rapidly accumulated during the COVID 19 pandemic. The need for supporting households and firms pushed the governments to implement an expansionary counter-cyclical fiscal policy as well as a loose monetary policy to alleviate the adverse effects of the pandemic on economic activity. This inevitable policy mix aiming at slowing down output losses and retaining jobs puts the countries at high risk of debt burden. This fact is valid not only for advanced countries but also for developing countries. According to the latest IMF Fiscal Monitor (April 2021), the average value of general government gross debt-to-GDP ratio for advanced economies rose to 120.1% in 2020 from 103.8% in 2019. This ratio is expected to reach 122.5% in 2021. A similar upward trend is also observed for emerging markets, albeit a smaller degree, which resulted in an approximately 10 percentage point increase (from 54.7% in 2019 to 64.4% in 2020) in the average value of general government gross debt-to-GDP ratio between 2019 and 2020. According to IMF estimates, this ratio will continue to increase in 2021, by reaching 65.1%. As an emerging market economy, Turkey is no exception to this trend. EU-defined (European Union) general government debt-to-GDP ratio realized 39.5% in 2020, by showing around a 7-percentage point increase with respect to the previous year.

The rising trend of public debt raises concerns about fiscal sustainability. This situation directed academic interest to fiscal policy and its consequences on economic activity and fiscal sustainability. Therefore, several issues have gained great interest recently in the academic environment as follows: Is there fiscal space for countries to maintain fiscal support? What will be the debt limit and fiscal stimulus debt limit for a particular country? How would be the ideal way to apply the fiscal policy to achieve two aims at the same time: Increasing the effectiveness of fiscal policy and doing this without jeopardizing fiscal sustainability.

Enlightening these questions requires investigating the effects of fiscal expansion (an increase in government spending) on fiscal sustainability indicators. Due to the non-linear nature of fiscal policy, it would be useful to research the dynamic effects of fiscal expansion on debt-to-GDP ratio, risk premium and interest rates under different economic environments. Traditionally, the dependence of fiscal multipliers and fiscal sustainability on business cycles has been extensively investigated in the literature. Most recently, the level of debt-to-GDP (i.e. high-debt/low-debt) also arises as one of the interesting and significant aspects of evaluating the effects of fiscal policy on macroeconomic variables, such as output, inflation and debt to GDP ratio.

Academic literature on the non-linear effects of fiscal policy on output is mainly investigated through smooth transition VAR or local projection method. While there is no consensus about the size of the

fiscal multiplier in the literature, most of the studies end up with the different sizes of fiscal multiplier under different growth regimes (recessions/booms). Auerbach & Gorodnichenko (2012, 2013), Ramey & Zubairy (2014), Arin et al. (2015), Jorda & Taylor (2016) can be given as examples of this strand of the fiscal literature. Moreover, the other strand of fiscal literature examines non-linear features of fiscal multiplier under different debt regimes. For instance, Ilzetzki et al. (2013) and Huidrom et al. (2016) conclude that size of the fiscal multiplier increase (decrease) in the period of low (high) debt regime. On the other hand, Auerbach & Gorodnichenko (2017) do not find any evidence of the difference in output responses to the government spending shocks between two regimes.

Recently, Auerbach & Gorodnichenko (2017), apply the local projection methodology to investigate the effects of fiscal stimulus on fiscal sustainability. They conclude that different regimes in terms of both growth rate and level of debt-to-GDP ratio produce different effects on fiscal sustainability indicators.

This study aims at estimating the effects of an increase in government spending on fiscal sustainability indicators under different debt regimes (low/high debt-to-GDP ratio) in Turkey for the period of 2001:q1 -2020:q4. Although few studies are estimating the size of fiscal multipliers by taking into account different phases of business cycles in Turkey as in Cebi & Ozdemir (2019) and Ozlale & Yuksel (2016), we do not come across any work dealing with the effects of fiscal shocks on fiscal sustainability indicators under different debt regimes. The cross-country study of Auerbach & Gorodnichenko (2017) contains several countries except for Turkey due to data limitations.[1] We used the local projection method by closely following Auerbach & Gorodnichenko (2017) and Ramey & Zubairy (2014).

The motivations behind this paper can be summarized as follows: Although the level of public debt-to-GDP ratio is relatively low in Turkey according to international comparison, Turkey has experienced a rising public debt trend after 2017. It seems that this trend will continue to augment in the coming years, which might raise some concerns about debt sustainability. Second, as stated in some studies, there might be a fiscal stimulus debt limit, which may discourage the governments to apply an expansionary fiscal policy due to adverse effects on output. Approaching the edge of this limit and then exceeding it reveals the fact that output gains (small positive or negative fiscal multiplier) may diminish and debt loss (high debt-to-GDP ratio) may increase. This requires efficient use of available fiscal space to maximize the output gains and minimize the budgetary costs. Third, finding a different response of fiscal sustainability indicators to a government consumption shock under different debt regimes require to apply different fiscal policy choice at different times. This might enable

[1] They did not include Slovakia, Slovenia and Turkey in their analysis because there are too few observations for these countries.

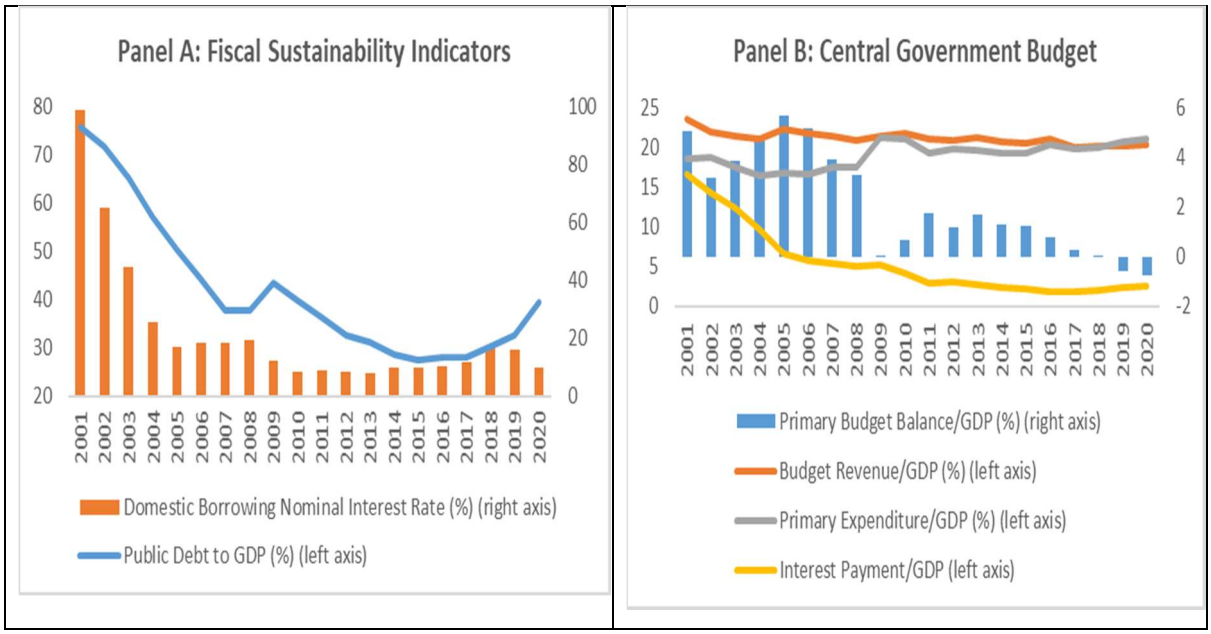
policymakers to understand the non-linear effects of fiscal policy and correspondingly implement an appropriate policy mix. Not only the size of the fiscal stimulus but also the timing of fiscal activity plays an important role in determining the effects on the economic activity and the variables related to fiscal sustainability. Finally, the composition of government spending might matter (i.e. public consumption or public investment) in terms of fiscal multiplier and fiscal sustainability. Making the right decision at right time would support the effectiveness of fiscal policy by maximizing benefits and minimizing costs.

The outline of the paper is as follows: Section II gives information about developments of fiscal policy in Turkey in the last two decades. In section III, we present an analytical framework and explain the features of econometric specification that we used in our work. In Section IV, we describe data. We present and evaluate the estimation results of the study in Section V. Section VI is devoted to robustness analysis. Finally, section VII summarizes the findings of the study and concludes.

II. Public Debt in Turkey

Panel A of Figure 1 shows the development of public debt in the last two decades in Turkey. This relatively long period can be split into different phases. The first period displayed a sharp decrease in public debt, from 75.5% in 2001 to 37.8% in 2007, accompanied by a decline in interest rates and an increase in primary budget balance. Having experienced the 2001 financial crisis, Turkey implemented a comprehensive economic program aiming at decreasing the inflation rate to single-digit from double-digit, providing fiscal discipline and strengthening the banking sector. Thanks to the successful implementation of the program, Turkey diminished the concerns on public debt sustainability, which was reflected in a relatively high level of the debt stock and borrowing cost as well as shorten the maturity of domestic borrowing. The program also helped to improve fiscal space, which creates room for fiscal maneuverer whenever necessary. This period witnessed a high level of the primary surplus to GDP ratio, on average 4.4% between 2001 and 2008 (Figure 1, Panel B).

Figure 1: Fiscal Indicators in Turkey



Source: Ministry of Treasury and Finance, Turkstat

Having been exposed to the 2009 global financial crisis, Turkey implemented a counter-cyclical expansionary fiscal policy to alleviate the adverse effects of the crisis on the domestic economy. A combined fiscal package, including an increase in public spending and a temporary cut in taxes, was accompanied by an expansionary monetary policy in 2009. This had led to a jump in the debt-to-GDP ratio to 43.5% by showing a 5.7 percentage point increase in 2009 while the economic contraction was -4.8%. Thanks to well-functioning coordination between fiscal and monetary policy Turkey displayed a quick recovery from the financial crises. Consequently, the economy grew by 8.4% and 11.2% in 2010 and 2011, respectively. Removing the temporary tax cuts and providing high growth rates resulted in a 3.8 percentage point decline in the debt-to-GDP ratio in 2010. This declining tendency continued until 2017: the debt-to-GDP ratio declined from 43.5% in 2009 to 28% in 2017, however, the primary surplus to GDP ratio decreased to on average 1% during this period. We observe a swift resurgence in public debt since 2018 due to expansionary fiscal policy. The debt-to-GDP ratio increased by more than 11 percentage points in three years : from 28% in 2017 to 39.5% in 2020 (Figure 1, Panel A). Additionally, the cost of domestic borrowing exhibited a rise in the period of 2017-2019: from 11.5% to 16.1%. Moreover, the primary surplus turned into a primary deficit in 2019 and 2020 (Figure 1, Panel B).

The last two decades can be divided into two main periods in terms of primary budget balance to GDP ratio. As shown in panel B of Figure 1 Turkey gave a high level of primary surplus between 2001 -2008 compared to the period of 2009 -2020. The tight fiscal policy framework implemented in this period was the main determinant of the sharp decline in the public debt-to-GDP ratio in the period of 2001-

2008. However, from 2010 through 2017 the pace of decrease in public debt-to-GDP ratio diminished in line with the low performance of primary surplus. On the other hand, the downward trend in the public debt-to-GDP ratio in this period was underpinned by the high growth performance of the economy.

The change in behavior of fiscal policy was observed not only in primary surplus performance but also in the composition of government spending (Figure 1, Panel B)). To put it clearly, the switch between primary expenditures and interest payments played an important role in terms of fiscal sustainability and effectiveness of the fiscal policy. While the primary expenditure to GDP ratio was under control and followed a relatively stable path in the period of 2001 – 2008, interest payments to GDP ratio displayed a sharp decline in the period range from 2001 to 2005 and a moderate reduction after 2005. However, this tendency changed following the 2009 global financial crisis. As a result of a discretionary expansionary fiscal policy primary expenditure to GDP ratio displayed a sudden upward shift by closing the gap between budget revenues.

As important elements of primary expenditures, public consumption and public investment followed a similar upward trend in line with primary expenditures. While the average value of Central Government's public consumption to GDP ratio increased from 8.2% from 2001 to 2008 to 8.5% from 2009 to 2020. Similarly, the average value of public investment to GDP ratio reached 2.6% from 2009 to 2020, from 1.9% in the previous period (2001-2008). The rising trend of public consumption and public investment expenditures makes it interesting to investigate their effects on growth, inflation and fiscal sustainability indicators.

III. Methodology

We used the local projection method developed by Jorda (2005) to estimate impulse responses. We closely followed the paper of Auerbach & Gorodnichenko (2017), who used a modified version of the local projection method.[2] We limit our study to qualitative presentations, i.e. impulse response analysis. We computed impulse response functions for each type of government spending under two different regimes, namely low-debt regime and high-debt regime. The main reason for preferring the local projection method is that it is flexible to allow a non-linear effect in the estimation process. Additionally, it is possible to track the dynamic responses when the shock term is exogenously determined outside the model.

[2] To estimate the local projection model we used "lpirfs-Version 0.2.0" package which was developed by Adämmer (2021) in R environment.

We presented a linear model, which represents the average value of two different regimes. A linear model specification is described as follows:

$$y_{t+h} = \sum_{n=0}^{N} \varphi_n^h \, shock_{t-n} + \sum_{n=1}^{N} \delta_n^h \, y_{t-n} + \sum_{n=1}^{N} \beta_n^h \, X_{t-n} + \varepsilon_{th} \quad (1)$$

Where t and h denote time and horizon, y is a variable of interest; shock represents a government spending shock that comes from outside the model. X is a vector of control variables. These variables are US real GDP growth rate (y-o-y), US 3-month Treasury interest rate and short-term interest rate of Turkey (overnight interest rates) and net capital inflows to GDP ratio. The six endogenous variables (y), which we focus on, are level of real GDP, level of real government consumption, price level (consumer price index), nominal interest rate (Treasury auctions), CDS premiums and public debt-to-GDP ratio. We include a constant and a linear trend in the model.

Obtaining structural fiscal shocks is a significant part of this study. The literature uses three different ways to identify fiscal shocks: these are narrative approach (case-study) based on news about future defense spending, forecast error for a growth rate of government spending approach and an SVAR-based identification approach.[3] In this study, we follow the last approach establishing a three-variable (real government spending, real tax revenues and real GDP) VAR model as in Blanchard & Perotti (2002).[4] We estimated two different VAR models for each type of government spending. The lack of data and information on the first two approaches forces us to use VAR-based fiscal shocks. Additionally, we investigated statistical properties of the data that we used to obtain fiscal shocks. We find that all variables have I (1) process. Furthermore, we checked the existence of co-integration relationship among three variables, government spending, tax and GDP, using the Johansen co-integration test. Since we find at least one a co-integration relationship among three variables, we also estimated a Vector Error Correction Model (VECM) to produce fiscal shocks. Comparison of fiscal shocks received from different models (a standard VAR and a VECM) reveals that they are very similar. Therefore, we identified the fiscal shocks using a standard VAR model in this work.

Having obtained structural fiscal shocks at the first stage, we estimated the effects of these shocks on macro and fiscal sustainability variables at the second stage by following equation (1). The impulse responses are constructed by estimating a sequence of OLS regression for forecast horizon starts from time zero to time H (10 periods ahead). The impact response is given by $\varphi_0^{(0)}$. We use the Newey-West (1987) method to overcome autocorrelation and heteroscedasticity in the error terms in the

[3] See Ramey (2011) for detailed information about constructing government spending shocks using narrative and forecast error approaches.

[4] We prefer recursive ordering (Cholesky decomposition) where government spending comes first, tax comes second and GDP comes third. We use seasonally adjusted quarterly data to get fiscal shocks. Appropriate lag length for the VAR is selected 1 based on information criteria.

models. We choose the appropriate lag length for each forecast horizon based on corrected Akaike information criteria (AICc).

The linear model described above does not allow changes in the coefficients according to the state of the economy. Hence, we also estimate the non-linear model, defined below, to reveal changing behavior of macro variables under different regimes.

$$y_{t+h} = \sum_{n=0}^{N} \varphi_n^h \, shock_{t-n} + \sum_{n=1}^{N} \delta_n^h \, y_{t-n} + \sum_{n=1}^{N} \beta_n^h \, X_{t-n} + \sum_{n=0}^{N} \gamma_n^h \, shock_{t-n} * F(z_{t-1}) + \sum_{n=1}^{N} \mu_n^h \, y_{t-n} * F(z_{t-1}) + \sum_{n=1}^{N} \alpha_n^h \, X_{t-n} * F(z_{t-1}) + \varepsilon_{th}$$

Where z_t corresponds to the debt-to-GDP ratio. Following Auerbach and Gorodnichenko (2013) we define state probabilities as $\mathrm{F(z_t)} = \frac{\exp(-\gamma z_t)}{1+\exp(-\gamma z_t)}$ in which z_t are normalized with variance 1 and mean 0.[5] We set $\gamma = 3$.[6] Therefore, the values of the transition function vary between zero and 1. When $F(z_t)$ approaches 0 it indicates the economy is in a high-debt regime while values close to 1 indicate a low-debt regime.

IV. Data

Our model consists of macro variables as well as fiscal sustainability indicators. We have six endogenous variables that we investigate the effects of a government spending shock on each of them. These variables are real GDP, consumer price index (CPI), public consumption (public investment), public debt-to-GDP ratio, nominal interest rates and CDS risk premiums. We used quarterly and seasonally adjusted data except for interest rate and CDS risk premium.[7] The sample period of the model includes 80 observations from 2001:q1 to 2020:q4.

We used real GDP (2009=100) as a measure of economic activity and received it from Turkstat. We collected CPI data from the Central Bank of Turkey (CBRT) database (EVDS). Fiscal sustainability indicators used in this study are public debt-to-GDP ratio, nominal interest rates and CDS risk premium. We collected EU_defined (European Union) public debt stock and nominal Treasury auction

[5] Our preference to determine regime switch differs from the study of Ramey & Zubairy (2014), who used a dummy variable that takes value of 1 or 0. Additionally, we also differ from Auerbach & Gorodnichenko (2017)´s methodology to find debt threshold. They defined debt state as $D_{it}^{*} = \frac{D_{it} - D_i^{min}}{D_i^{max} - D_i^{min}}$, where D_{it} is debt-to-GDP ratio for country i at time t, and D_i^{min} and D_i^{max} represent the minimum and maximum values of the ratio over the sample period. Instead of this definition, we use a logistic transition function to discern debt regimes.

[6] By doing this we assume that the probability of a high debt regime is F(z) > 0.67, which implies that the number of periods passing through a high-debt regime accounts for 33% of all periods in the economy. This coincides with a threshold of approximately 44%. Alternatively, we chose different values (for example 1.5 and 5) for gamma parameter to decide probability of high/low debt regimes. Estimation results reveal the fact that sensitivity of impulse responses to different values of gamma parameter is very low. Results are available upon request.

[7] Real GDP data is seasonally adjusted by source (Turkstat). Real government spending, real tax revenues and CPI are seasonally adjusted by the authors via X12-(Multiplicative) method using Eviews.

interest rates from the Ministry of Treasury and Finance.[8] CDS (5 years) data are obtained from Turkey Data Monitor.

We use two alternative public expenditure measures in our model to examine the effects of fiscal shocks both on the economy and the fiscal sustainability indicators. It matters because a stimulus to these components of government spending may be transmitted to the economy in different ways. Government spending data can be obtained from two different sources. First, it is possible to collect it from Turkstat as a component of GDP. The second one can use budgetary data published by the Ministry of Treasury and Finance. We preferred to use central government budget figures for public expenditure data. The main reason behind this choice is that the lack of separate quarterly public investment data in Turkstat database. Since Turkstat publishes gross-fixed investment as a combined series that consists of public and private components we cannot separate investment data into two elements. Therefore, we selected budgetary government consumption as a sum of personnel expenditures and purchases of goods and services and budgetary investment data as a sum of capital expenditure and capital transfers. We transformed government spending data into real values using the GDP deflator.

We added four control variables in the model, namely US real GDP growth rate, US 3-month Treasury interest rate, a short-term interest rate of Turkey (over-night interest rates) and net capital inflows to GDP ratio. The macro variables belong to US represent foreign demand and foreign interest rate. We added short-term interest rates of Turkey to control monetary policy. As one of the main driving forces of output performance and volatility in Turkey, we also included net capital inflows to the model as another control variable.[9] Moreover, to measure the sensitivity of the results with different control variables, we replaced the ratio of net capital inflows to GDP with the ratio of the current account balance to GDP. We do not observe a notable qualitative difference between impulse responses.[10]

V. Estimation Results

This section is devoted to impulse response analysis. Impulse responses and 90% confidence intervals (shaded areas) are displayed in Figures 2 and 3. Each Figure shows the dynamic effects of a unit (one standard deviation) fiscal policy shock (public consumption or public investment) on growth, inflation, interest rate, CDS risk premium and public debt-to-GDP ratio under two different debt regimes.

[8] Public debt-to-GDP ratio was obtained by dividing nominal debt stock to annualized nominal GDP for each quarter.
[9] This ratio is the sum of four quarters of net capital inflows divided by the sum of four quarters of GDP. Net capital inflow is calculated by summing foreign direct investment, portfolio investment and other investment and subtracting net acquisition of financial assets of other investment from the sum.
[10] Results are available upon request.

Moreover, we present the results of the linear model, which represents the average values of two different regimes.

We are particularly interested in the effects of fiscal policy shocks on fiscal sustainability indicators. Besides that, we focus on whether the response of macro and fiscal variables to the government spending shock varies under different debt regimes.[11]

a- Public Consumption

As shown in Figure 2, the reaction of public the debt-to-GDP ratio varies depending on the debt regime. While the debt-to-GDP ratio declines on impact and the coefficient of it take a negative value throughout two years in the low-debt regime, it quickly passes a positive territory after the initial decline in the high-debt regime. We also observe a similar tendency for other fiscal stress variables, namely nominal interest rates and CDS risk premiums. While the response of borrowing cost of domestic debt seems to be insensitive staying at negative territory (but close to zero) for a while after a positive fiscal shock, it starts to fall after the second quarter in the low-debt regime. On the other hand, the response of the nominal interest rate starts to increase after the initial decline in the high-debt regime. Another variable, CDS risk premium, follows a similar trend in both regimes but with some differences in the size of its response. Following the initial decline, CDS risk premiums start to soar immediately after the impact in high-debt, observing a larger increase at the peak level in the high-debt regime compared to the low-debt regime.[12]

Turning to the responses of macro variables to a government spending shock, the sign and size of the response of output to a unit public consumption shock change depending on debt regimes. While the output soars following a positive fiscal shock in a low-debt regime, it decreases when the economy is in a high-debt regime, implying a negative fiscal multiplier on impact. In line with the findings of Ilzetzki et al. (2013) and Hidroum et al. (2016), we find some evidence on the weakness of the effectiveness of fiscal policy at the time of high-debt regime.[13] However, our results contradict the findings of the

[11] It would be also interesting to understand the impact of fiscal stimulus on debt sustainability in a weak economy. This kind of analysis requires distinguishing the regimes according to economic growth performance. Hence, we also described low and high growth regimes in line with the study of Auerbach & Gorodnichenko (2012). Since the preliminary focus of this work is to investigate the effects of fiscal stimulus in the different debt regimes, we have left the examination of this issue in the Appendix. Please see Appendix D for further discussion about this issue.

[12] It can be said that the positive outcome in terms of output and inflation after an expansionary fiscal policy in low-debt regime may reduce the risks in public finance and contribute to the improvements in fiscal sustainability indicators.

[13] Although the confidence bands so wide to include zero at some horizons, we observe some evidence on positive and statistically significant output responses (for example h=1 and h=8) in low-debt regime and a negative and statistically significant output response (for example h=8) in high-debt regime. Even though these results do not seem to provide strong evidence, we can still support the idea that output response to a fiscal expansion shock in low-debt regime yields relatively good results in terms of output gains compared to the same shock in high-debt regime.

Auerbach & Gorodnichenko (2017) model, which found no obvious difference under two different debt regimes.

It would be also useful to discuss the findings of the linear model, which resembles the model with a low-debt regime. As shown in the left column of Figure 2, the output reacts positively to a government spending shock. Following a one standard deviation government consumption shock, the output rises 0.7% on impact in the linear model. However, the output response of the linear model and the low-debt regime model differs in magnitude: The former model has produced a lower positive multiplier effect with respect to the latter.[14] On the other hand, the difference between the linear model and the high-debt regime model is not restricted only with the size of the output effect, but also the sign of the output response: While the impact multiplier is positive in the former, it is negative in the high-debt regime.[15] We conclude that the linear model masks the fact that different output response emerges under different debt regimes. Hence, the policymakers should take into account the timing of fiscal policy actions.

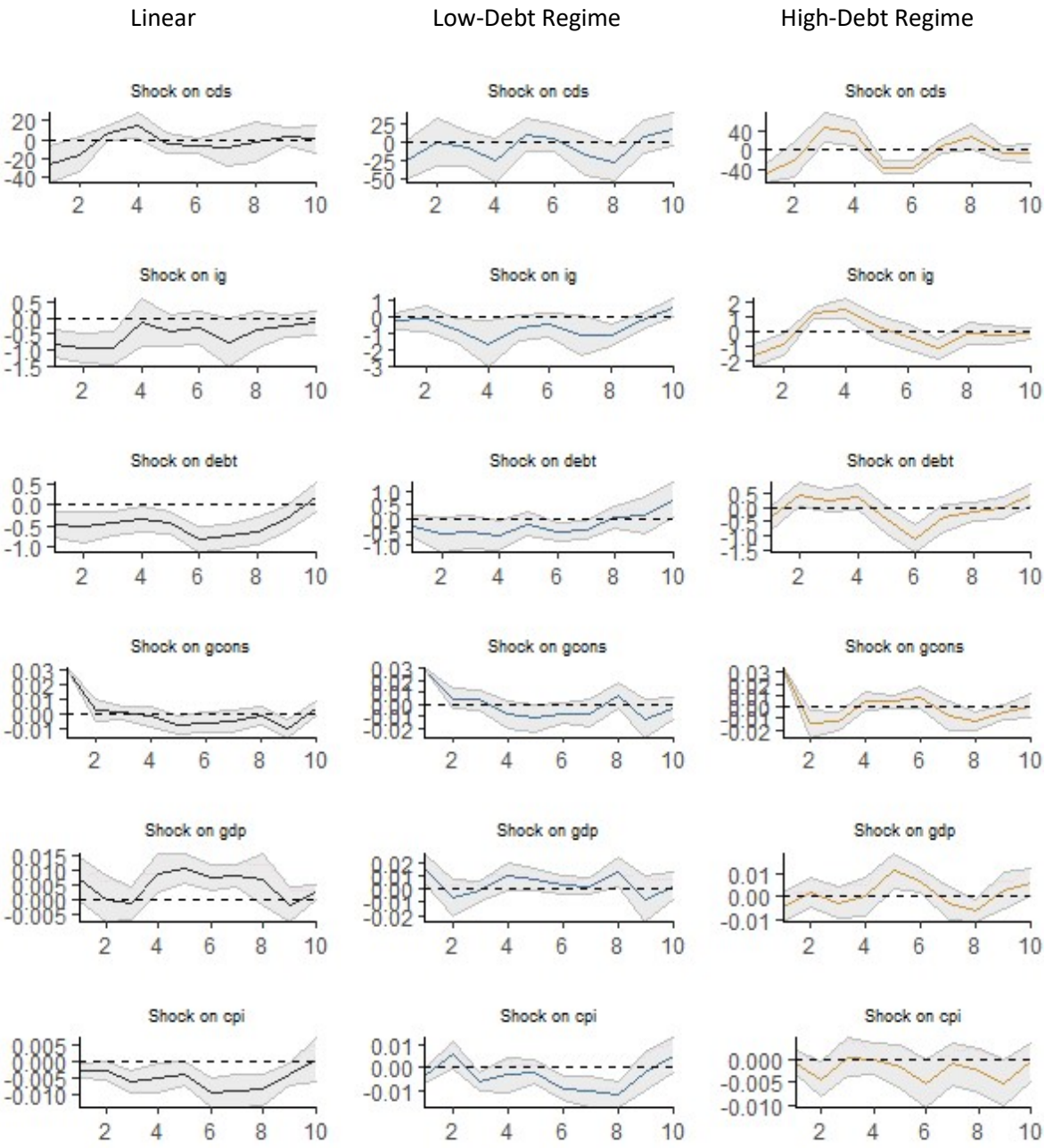
The consumer price index (CPI) is another variable whose effect differs under different debt regimes. Particularly, we find that CPI falls on impact following a positive public consumption shock under a low-debt regime and the coefficient is statistically significant. However, the decline in CPI in a high-debt regime, following a government consumption shock, is statistically insignificant. Although the responses of CPI fluctuates beneath the zero in the high-debt regime, they are all statistically insignificant except the second quarter. As a result, we conclude that an expansionary fiscal policy shock through public consumption improves output and inflation when the debt-to-GDP ratio is relatively low. However, high-debt periods prove that the reverse of this argument is valid.

Combining all previous results reveals the fact that an increase in public consumption in the high-debt regime lowers the gains from fiscal stimulus in terms of higher costs (hurting public finance) and lower benefits (small or even negative fiscal multiplier with high inflation). Contrary, applying an expansionary fiscal policy in the low-debt regime results in higher output growth and lower inflation, lower public debt to GDP ratio and lower interest rates and CDS risk premiums. These results emphasize the importance of the timing of fiscal actions and require an accurate assessment of the debt regime.

[14] While output increases 0.7% in the linear model, it displays 1.6% increase on impact in the low-debt regime. (See Table B1 in Appendix B)

[15] One possible explanation for a negative fiscal multiplier (i.e. crowding out effect) on impact in high-debt regime can be attributed an increase in uncertainty and adverse perception, which might postpone firms´ investment and consumers´ consumptions decisions.

Figure 2: The Effects of Public Consumption Shocks



b- Public Investment

One may wonder whether the response of the economy under different debt regimes changes when a fiscal shock comes from another fiscal instrument: public investment. The answer is yes. Our findings confirm that the responses of macro variables and fiscal sustainability indicators to an increase in public investment differ in both debt regimes, although this difference is not as pronounced as in public consumption.

The response of fiscal sustainability indicators to an investment shock under low and high-debt regimes is worth mentioning. When a positive investment shock hits the economy, the indicators of fiscal sustainability improve in the low-debt regime to a different degree (Figure 3). For example, following a positive investment shock CDS risk premiums and nominal interest rates fall 46 basis points and 0.9 percentage points, respectively on impact. Similarly, the debt-to-GDP ratio declines 0.2 percentage points on impact in the low-debt regime. On the other hand, we received opposite results for debt-to-GDP ratio and CDS risk premiums, which increased 0.1 percentage points and 12 basis points, respectively on impact in the high-debt regime.[16]

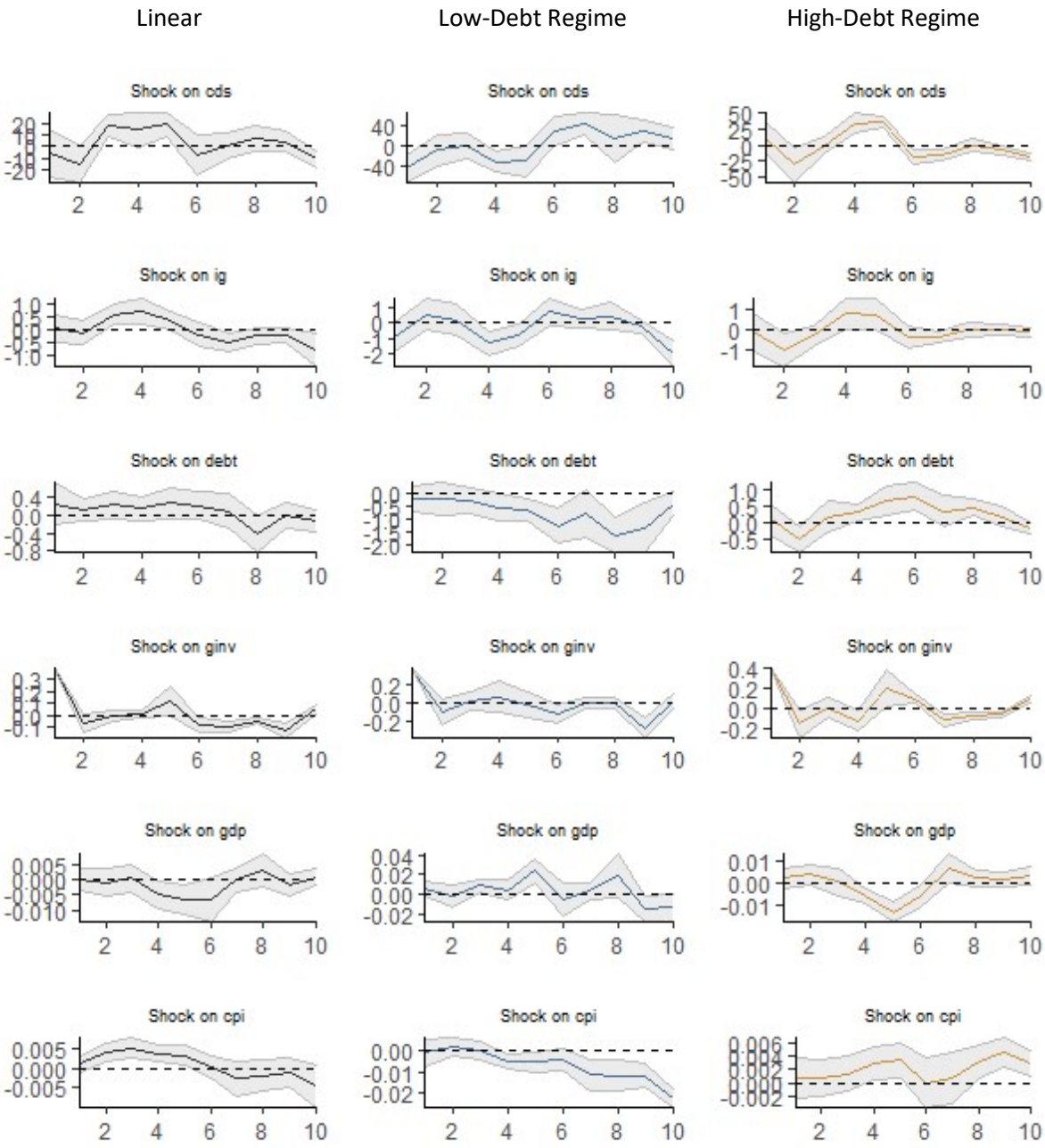
The medium-run behavior of responses of fiscal indicators to a public investment shock also differs under different debt regimes. While the debt-to-GDP ratio maintains a declining trend throughout two years under the low-debt regime, it strikingly increases after the temporary decline in the second quarter in the high-debt regime. Similarly, the behavior of CPI follows different paths under two different regimes: while it continues to fall throughout two years and a half period in the low-debt regime, it follows an increasing trend in the high-debt regime.

Output reacts positively to an expansionary investment shock on impact in both debt regimes, but the coefficients are statistically insignificant (Figure 3). Medium to long run, while we observe mostly a positive output response in the low-debt regime, we encounter a relatively deep output decline in the period between the fourth and sixth quarters in the high-debt regime.

As a conclusion, we find some evidence to underpin the idea that raising government investment expenditures in the low-debt regimes would be better in terms of output gains, inflation costs, debt and borrowing costs.

[16] See Table B2 in Appendix B.

Figure 3: The Effects of Public Investment Shocks

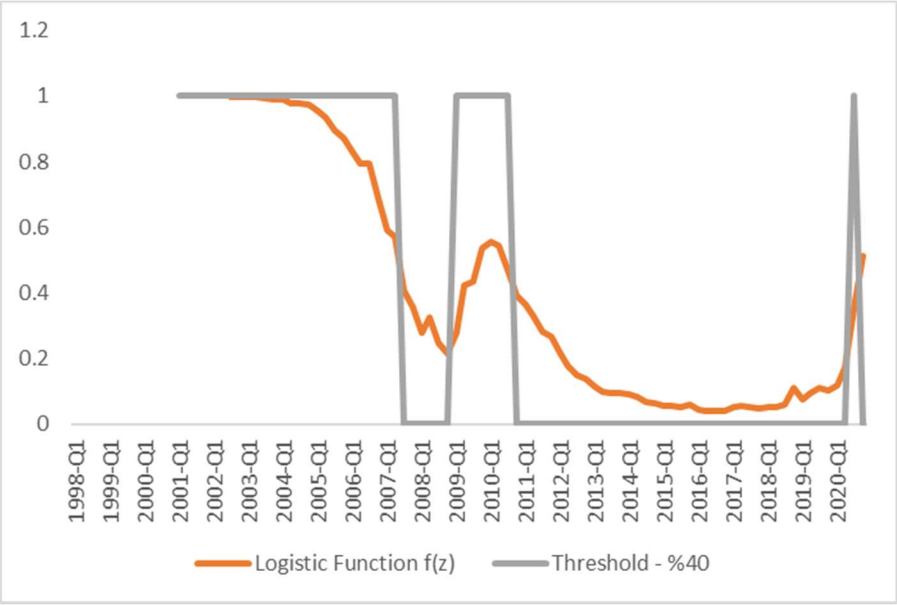


VI. Robustness Analysis

In this section, we used a different mechanism to distinguish low and high-debt regimes, by replacing a logistic transition function with a certain threshold value. We explore the sensitivity of our results by using different threshold values (debt-to-GDP ratio) for different fiscal instruments. We detected a reasonable threshold value for the debt-to-GDP ratio by referring to the previous studies related to Turkey (Kose et al. (2017), Ozatay (2019)).[17] Due to the different sensitivity of public consumption and public investment, we established a diverse threshold value for each of them, 40% and 45%, respectively (Cebi & Ozdemir (2020), mimeo).

Figure 4 illustrates the comparison of logistic transition function and a certain threshold value (40%) to distinguish debt regimes. In the latter specification, the high (low) debt regimes are detected if the debt-to-GDP ratio for a particular quarter is above (below) 40%. As shown in the grey line in Figure 4, while high-debt periods take the value of 1, low debt periods are represented by 0. However, in the first specification, determining the characteristic of debt regime is based on a logistic transition function, which allows a soft passing between high and low-debt regimes as displayed in the orange line in Figure 4.

Figure 4: Logistic Transition Function & Threshold



[17] Ozatay (2019) calculated different fiscal stimulus debt limit for Turkey, ranging from 27% - 44%, depending on the fiscal instrument used. Kose et al. (2017) accepted reasonable debt-to-GDP ratio as 45.2% (median value) for developing countries by investigating historical averages of country groups.

Impulse responses for a government consumption shock and a government investment shock are shown in Figure C1 and Figure C2, respectively, in Appendix C. These results confirm our previous results explained in Section IV. We do not observe a big qualitative difference between the two models although there is some quantitative differences. One of the striking differences between the two models emerges in terms of output response to a public investment shock in the low-debt regime. While the model with logistic transition function produces a small (0.5%) and statistically insignificant output response on impact, the model with a certain threshold value (45%) results in a relatively large (0.8%) and significant positive response on impact (Figure C2).

VII. Conclusion

Our work is related to several strands of the fiscal policy literature. First, we investigate the effects of fiscal policy shocks on main macro variables such as output and inflation. Second, we try to understand changing behavior of output (fiscal multiplier) and price responses under different regimes where fiscal pressure is high or low. Third, we research the effects of government spending shocks on indicators of fiscal sustainability such as public debt, borrowing cost and CDS risk premium. Fourth, we use disaggregated data to distinguish the fiscal stimulus effect of each type of government spending as well as their effects on fiscal sustainability variables under periods of low and high-debt. Finding the answers to these questions helps to understand how to use existing fiscal space and the most appropriate time to change government spending.

By focusing on Turkey, this study mainly examining the effects of two types of government spending shocks on public debt, interest rate, CDS risk premium, inflation and output under low and high-debt periods. The relatively low level of public debt-to-GDP ratio, the increasing trend in government spending and highly volatile output growth make it interesting to investigate the effects of government spending shocks in Turkey. Two fiscal tools are considered in this study: public consumption and public investment, which are directly and also indirectly affect the output. We chose two different debt regimes, low and high-debt regimes, determined by a logistic transition function. We applied the local projection method for the non-linear estimation process.

The main conclusions obtained from the study are as follows:

Implementing an expansionary fiscal policy in a low-debt regime would increase output gain without hampering public debt sustainability. On the other hand, high-debt regimes do not provide a suitable environment to introduce an expansionary fiscal policy due to low output and inflation gains and high budgetary costs. Therefore, the first lesson that we draw from this study is that timing of fiscal movement matters.

The sources of fiscal shocks matter in terms of their effects on macro variables and fiscal sustainability indicators. We believe that public investment is perceived more positively among economic agents compared to public consumption. The complementary nature of public investment to private investment, its importance for augmenting employment and potential output make it a significant device for managing both aggregate demand in the short-run and aggregate supply in the long run.[18] Therefore, the second lesson that we received from this study is that allocating resources to productive investment areas contributes long-run prospects for the country. This argument is very important especially when the existing fiscal space erodes and the state of the economy approaches the debt threshold.

Two things, giving wrong messages to readers, may emerge from the conclusions of this study. First, one should keep in mind that this study does not imply that continuous fiscal stimulus would support economic growth without jeopardizing fiscal sustainability forever. Secondly, our suggestion to give priority to public investment instead of other types of government expenditure would be valid in normal times. In abnormal times such as a pandemic, it would be better to increase public consumption and particularly transfer expenditures to the households whose incomes are below subsistence level, and firms, which need support. Under these circumstances, one may even support the idea that decreasing flexible public investment expenditures to open a space for other expenditure items (i.e. replacing public investment with transfer expenditures) would be a better strategy to provide a quick recovery from the adverse effects of the pandemic.

We left a particular issue as future work to research. How does a change in government transfer expenditures affect the economy under different debt regimes? Which fiscal instrument (government consumption, investment or transfer expenditures) works better in terms of fiscal sustainability and output performance?

[18] Public investment is a kind of spending which affects both aggregate demand in short-term and aggregate supply in medium to long-term. If resources allocated for productive investment, this may help to increase potential level of output and employment in the future. Additionally, the increase in public investment may also contribute private investment. Therefore, the increase in public investment may increase budgetary cost today but, it also increases production and employment in the long run. Additionally, future tax revenues will be positively affected, thereby resulting in a decrease in the initial budgetary cost of public investment (self-financing).

References

Adämmer, Philipp, 2021. “lpirfs: An R Package to Estimate Impulse Response Functions by Local Projections” The R Journal Vol.11(2), 421-438

Arin, K.P.; F. Koray; and N. Spagnolo. 2015. "Fiscal multipliers in good times and bad times." *Journal of Macroeconomics* 44, 303-311.

Auerbach, A.J., and Y. Gorodnichenko. 2012. "Measuring the output responses to fiscal policy." *American Economic Journal: Economic Policy* 4, no. 2: 1-27.

Auerbach, A.J., and Y. Gorodnichenko. 2013. "Fiscal multipliers in recession and expansion." In *Fiscal Policy after the Financial Crisis*, ed. A. Alesina and F. Giavazzi, 63-98. Chicago: University of Chicago Press.

Auerbach, A.J., and Y. Gorodnichenko. 2017. "Fiscal stimulus and fiscal sustainability” *NBER Working Paper*, No: 23789.

Blanchard, O., and R. Perotti. 2002. "An empirical characterization of the dynamic effects of changes in government spending and taxes on output." *The Quarterly Journal of Economics* 117, no. 4: 1329-1368.

Çebi, C., and A. Ozdemir. 2021. "Cyclical variation of the fiscal multiplier in Turkey." *Emerging Markets Finance and Trade* 57, no.2: 495-509. *(Published online 4 April 2019)*.

Huidrom, R., M. A. Kose, J. J. Lim, ve F. L. Ohnsorge. 2016. “Do fiscal multipliers depend on fiscal positions?” *World Bank Policy Research Working Paper* 7724, World Bank, Washington, DC.

Ilzetzki, E.; E.G. Mendoza; and C.A. Végh. 2011. "How big (small?) are fiscal multipliers?" *IMF Working Paper*, no. 11/52.

Jordà, O. 2005. "Estimation and inference of impulse responses by local projections." *The American Economic Review* 95, no.1: 161-182.

Jordà, O., and A.M. Taylor. 2016. “The time for austerity: estimating the average treatment effect of fiscal policy." *Economic Journal* 126, no.590: 219-255.

Kose, M. A., S. Kurlat, F.L. Ohnsorge and N. Sugawara. 2017. “A cross-country database of fiscal space” *World Bank Policy Research Working Paper* 8157, World Bank, Washington, DC.

Newey, W.K.; and K.D. West. 1987. "A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix." *Econometrica* 55, no.3: 703-708.

Özatay, F. 2019. “Mind the gap: debt limit and fiscal stimulus debt limit” *The Economic Policy Research Foundation of Turkey Working Paper*, No: WP201901, Ankara.

Özlale, Ü., and M. K. Yüksel. 2016. “Türkiye’de bütçe harcamalari: farkli dağilimlarin ekonomik büyümeye etkisi.” *Koç University-TÜSİAD Economic Research Forum Working Paper*, no. 1603.

Ramey, V.A. 2011. "Identifying government spending shocks: It´s all in the timing." *The Quarterly Journal of Economics* 126, no.1: 1-50.

Ramey, V.A., and S. Zubairy. 2014. "Government spending multipliers in good times and in bad: evidence from U.S. historical data." *NBER Working Paper*, No: 20719.

Appendix A: Data

Table A1: Data Description			
Variable	**Description**	**Transformation**	**Source**
A. Variable of Interest			
Output	GDP	Real, Seasonally Adjusted	TurkStat
Price Level	CPI	Seasonally Adjusted	CBRT
Government Consumption	Personnel + Purchases of Goods and Services	Real, Seasonally Adjusted	Ministry of Treasury and Finance
Government Investment	Capital Investment + Capital Transfers	Real, Seasonally Adjusted	Ministry of Treasury and Finance
Debt to GDP Ratio	EU-defined Gross Debt Stock/GDP	%	Ministry of Treasury and Finance
Nominal Interest Rate	Treasury Interest Rates	%	Ministry of Treasury and Finance
Risk Premium	CDS	basis points	Turkish Data Monitor
B. Control Variables			
Net Capital Inflow to GDP Ratio	Foreign Direct + Portfolio + Other - Net Acquisition of Financial Assets of Other	%	CBRT, TurkStat
US Output Growth Rate	GDP	Real, y-o-y, %	FRED
US Nominal Interest Rate	3-month Treasury Interest Rates	%	FRED
Turkey Short-Term Interest Rate	Over-night Interest Rates	%	CBRT

Appendix B: Impulse Responses to a Government Spending Shock

Table B1: Impulse Responses to a Government Consumption Shock						
	Linear		**Low-Debt**		**High-Debt**	
	h=1	h=4	h=1	h=4	h=1	h=4
CDS risk premium	-25.5*	15.0*	-23.2	-23.3	-46.3*	34.2*
Nominal Interest Rate	-0.80*	-0.13	-0.25	-1.65*	-1.63*	1.58*
Debt-to-GDP Ratio	-0.44*	-0.32*	-0.31	-0.67*	-0.38	0.36
Government Consumption	0.030*	-0.001	0.029*	-0.008	0.032*	0.005
Output	0.007	0.009*	0.016*	0.010	-0.005	0.000
Price Level	-0.003*	-0.005*	-0.004*	-0.003	-0.001	0.000

(*) indicates a significance level of 10%

Table B2: Impulse Responses to a Government Investment Shock						
	Linear		**Low-Debt**		**High-Debt**	
	h=1	h=4	h=1	h=4	h=1	h=4
CDS risk premium	-5.1	14.0	-46.6*	-32.4*	11.7	34.5*
Nominal Interest Rate	0.03	0.70*	-0.88	-1.26*	-0.12	0.79
Debt-to-GDP Ratio	0.26	0.15	-0.22	-0.56*	0.11	0.33*
Government Investment	0.39*	0.014	0.38*	0.076	0.40*	-0.131*
Output	0.000	-0.005*	0.005	0.004	0.002	-0.006*
Price Level	0.001	0.004*	-0.001	-0.005*	0.001	0.003*

(*) indicates a significance level of 10%

Appendix C: Impulse Responses (Threshold Values to Distinguish Debt Regimes)

Figure C1: The Effects of Public Consumption Shocks (Based on 40% Threshold)

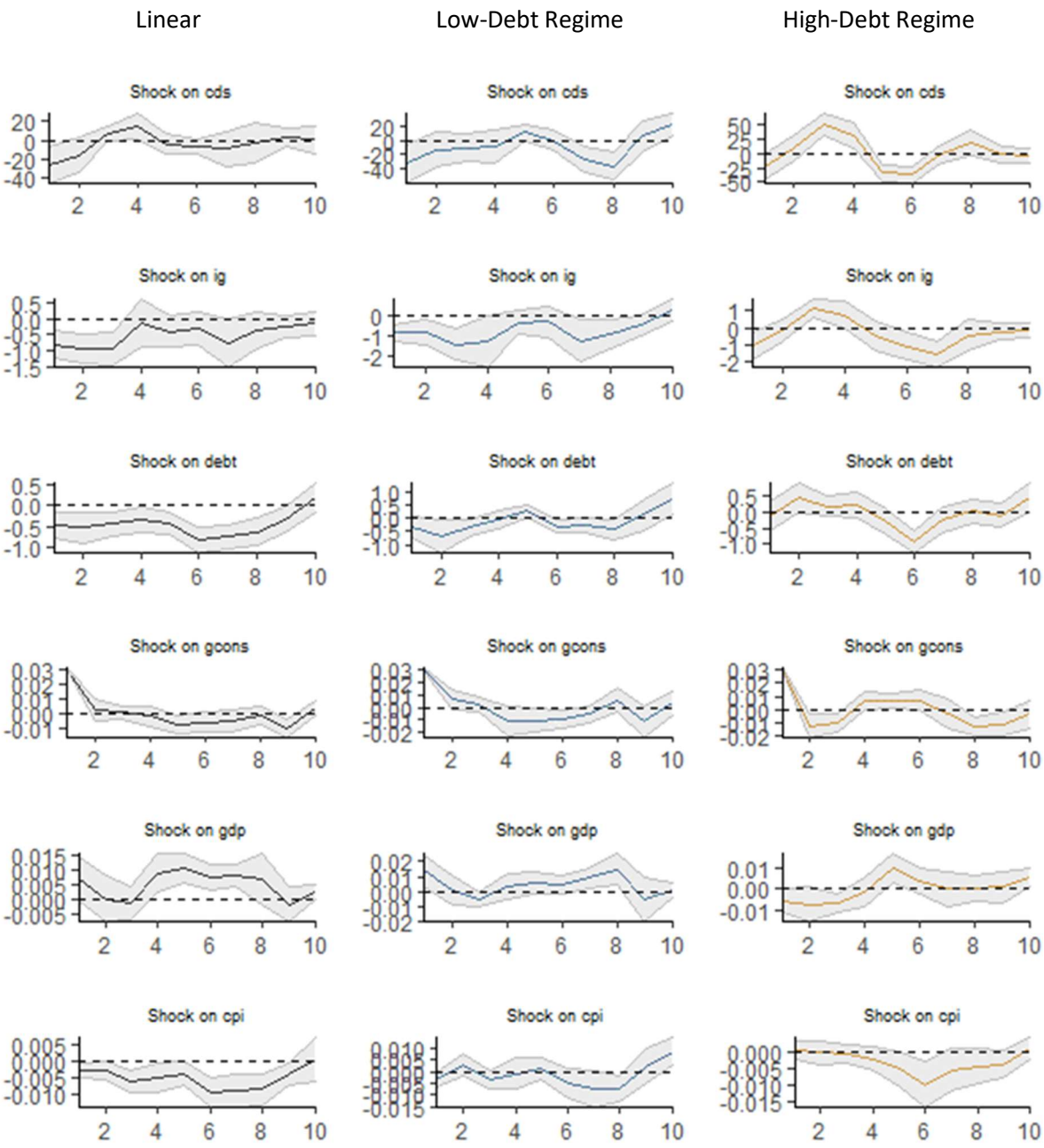
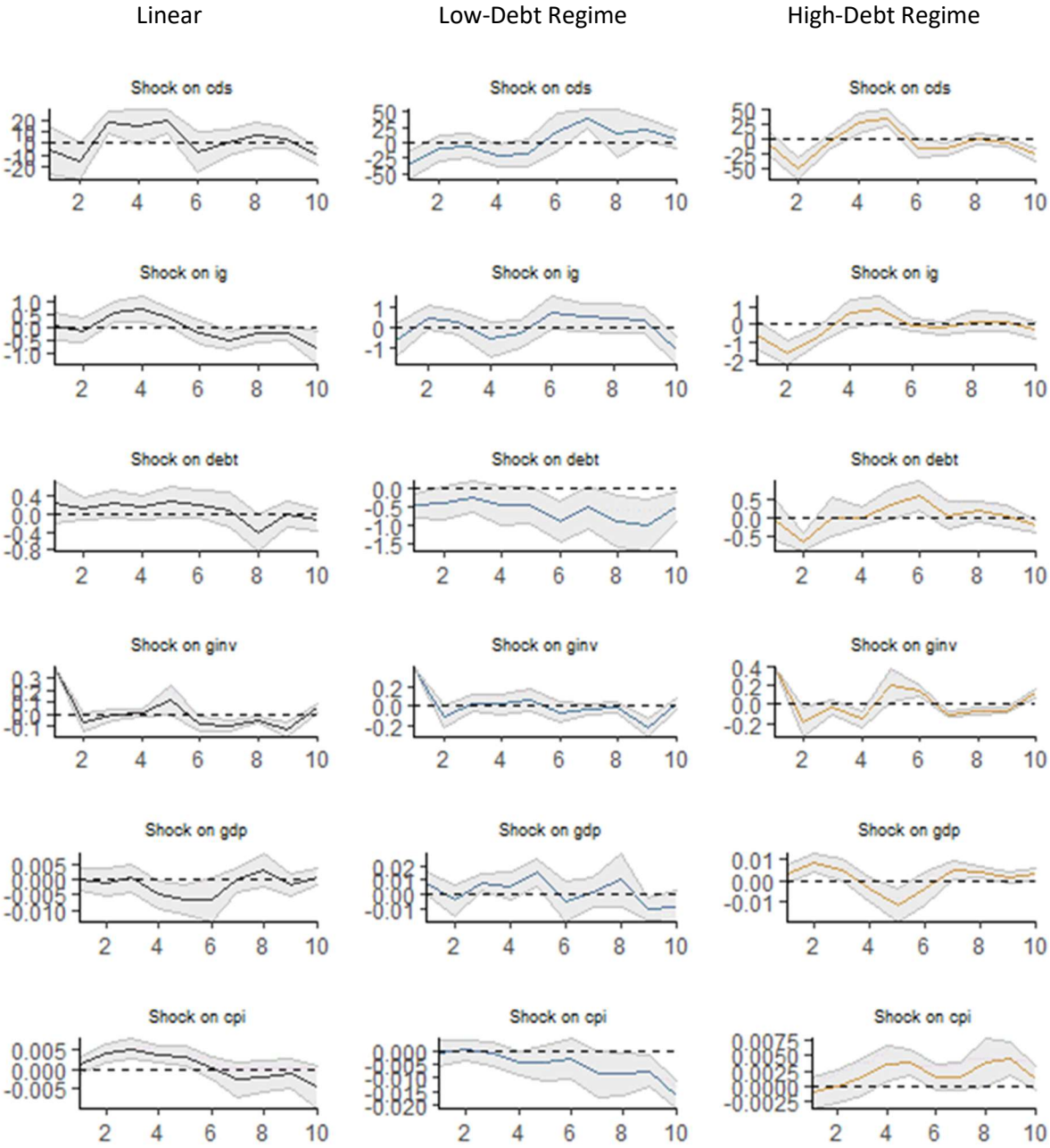


Figure C2: The Effects of Public Investment Shocks (Based on 45% Threshold)



Appendix D: Impulse Responses (With Different Growth Regimes)

Figure D1: The Effects of Public Consumption Shocks

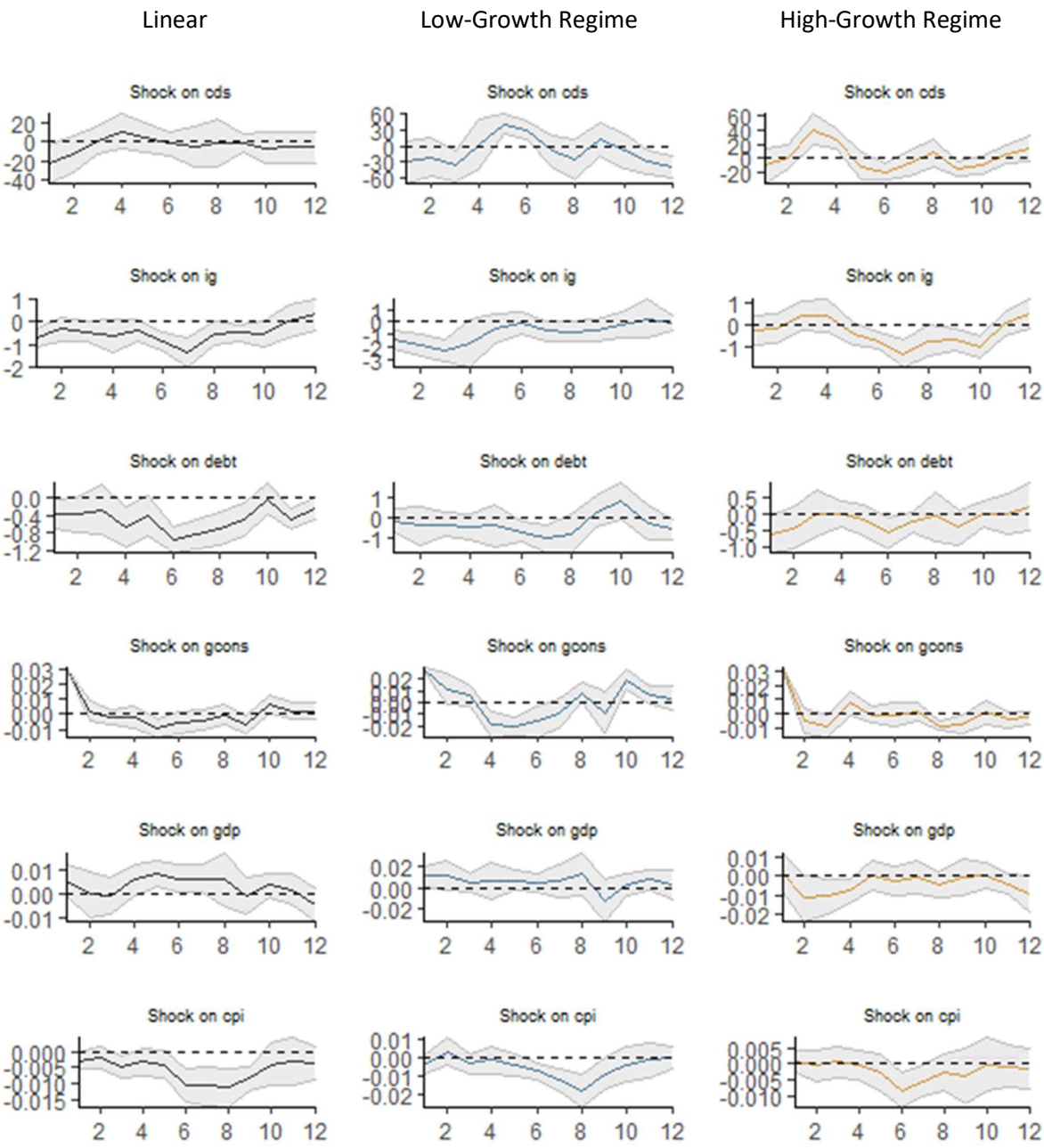
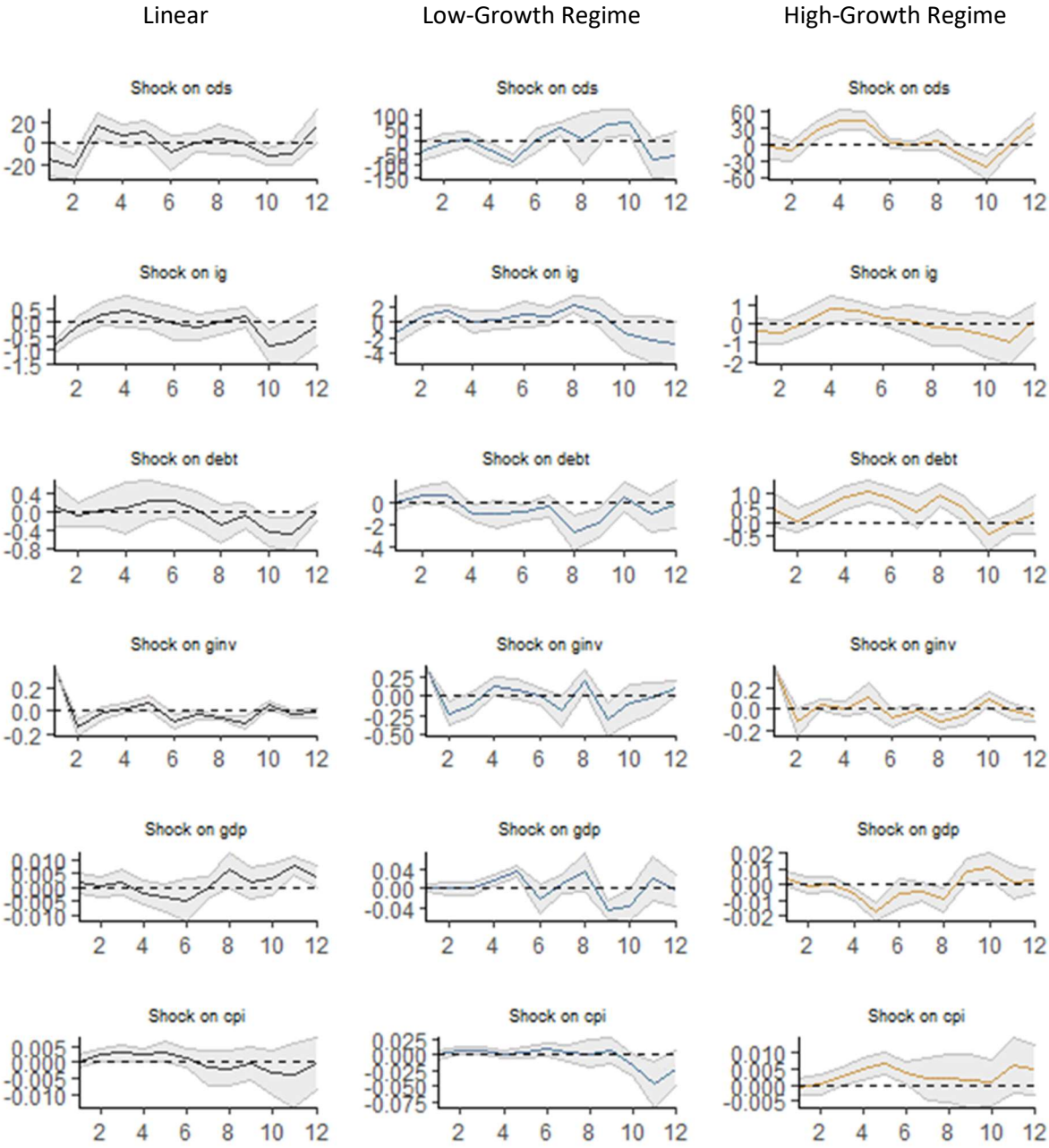


Figure D2: The Effects of Public Investment Shocks



We find some evidence that fiscal expansion in the economy under a low-growth regime yields good results in terms of debt sustainability. Particularly we observe lower debt-to-GDP ratio, risk premium and interest rates in the low-growth regime. On the other hand, fiscal stimulus in the economy under a high-growth regime jeopardize debt sustainability because of higher debt-to-GDP ratio, relatively higher risk premium and interest rate. These arguments are generally valid for fiscal expansion via public investment and public consumption. Additionally, output and CPI responses to a government spending shock change depending on the state of the business cycles. It seems to possible to conclude that implementing an expansionary fiscal policy via an increase in government spending in the high-growth regime yields adverse effects on the economy in terms of output and inflation.

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