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Government debt, inflation dynamics and the transmission of fiscal policy shocks

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ABSTRACT

We analyze the influence of the fiscal position on the transmission of government spending shocks in a New Keynesian model. We find that once we allow for positive levels of government debt in the steady state, the size of the fiscal multiplier depends strongly on the horizon at which the multiplier is evaluated. While the long-run effect of a fiscal policy innovation is typically of a similar order of magnitude as in Galí et al. (2007), short-run multipliers differ substantially. The reason for this non-monotonic behavior is the interaction between the dynamics of the inflation rate and the debt level in real terms for sufficiently high levels of government debt in the steady state.

1. Introduction

How does fiscal policy influence the business cycle? This question has received a tremendous amount of renewed interest in academic discussions as well as in policy debates in the aftermath of the global financial crisis (see e.g. Cwik and Wieland, 2011; Ramey, 2011, for recent surveys). Similarly, rising government debt levels have also attracted a lot of interest since debt-to-GDP ratios have been increasing strongly throughout the industrialized world. Fig. 1 shows that according to the OECD projections for debt-to-GDP ratios in 2013, 11 out of 34 OECD countries are expected to breech a debt-to-GDP level of 100% in 2013.

Nevertheless, the existing literature treats these two issues as being largely distinct and neglects potential interrelationships between the level of government debt and the effects of fiscal policy on the business cycle. Although a wide range of values is used to calibrate the steady state ratio of government debt-to-GDP in the literature, the potential sensitivity of the results with respect to different ratios of government debt-to-GDP in the steady state has not been explored.[3] In this paper, we contribute to the literature by analyzing if and how the steady state debt-to-GDP ratio influences the responses of macroeconomic variables to a government spending shock in a New Keynesian model in which a fraction of the household sector is characterized by rule-of-thumb behavior as in Galí et al. (2007).

We find that with increasing levels of government debt, the dynamics of the model become generally more persistent and less monotonic, albeit the long-run responses to a government spending shock are of a similar order of magnitude as in Galí et al. (2007). Put differently, the magnitude of the fiscal multiplier depends strongly on the horizon at which the multiplier is evaluated for sufficiently large levels of steady state government debt. The intuition goes as follows: an expansionary government spending shock, for instance, puts upward pressure on inflation and reduces government debt in real terms. For an empirically plausible calibration of the fiscal policy reaction function, taxes decline in response to the reduction in the real level of debt and therefore fiscal policy exerts an additional, expansionary effect via the increase in the disposable income of rule-of-thumb agents which ultimately results in an increase in aggregate consumption. Over the medium run, however,

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[3] For instance, Galí et al. (2007) analyze the responses to government spending shocks under the assumption that government debt is zero in the steady state. Forni et al. (2009) and Ratto et al. (2009) analyze euro area data and use a debt-to-GDP ratio of 60% in the steady state. For the US, Leeper et al. (2010) set the steady state debt-to-GDP ratio to roughly 33%.

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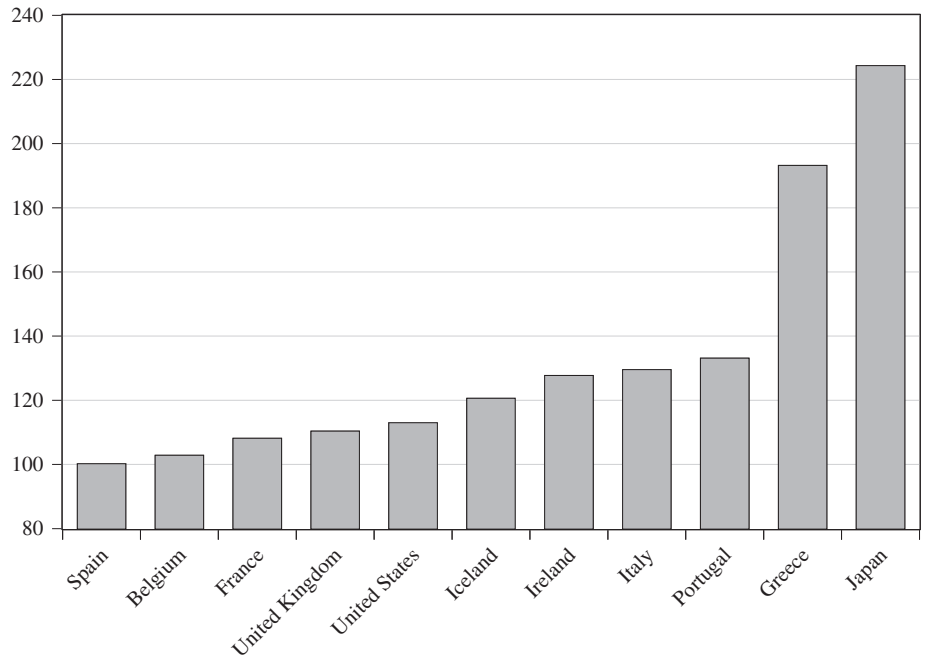

Fig. 1. Debt-to-GDP ratios in selected OECD countries. Notes: The figure shows the projected debt-to-GDP ratios, as measured by the general government gross financial liabilities, of selected OECD countries for 2013 in percent.
Data are taken from the OECD Economic Outlook 92 database.

the inflationary effects of the government spending shock lead to higher real interest rates via active monetary policy and therefore the real debt burden starts to increase. As a consequence, taxes increase and the initially expansionary effect is counteracted. Since these effects unfold slowly over time, the dynamics of the model become more persistent and the adjustment back to the steady state is less monotonic.

We also find that higher levels of steady state debt increase the regions of the parameter space associated with indeterminate equilibria. The intuition behind this result is again closely related to the interaction between the inflation rate and the real debt level which increases the volatility of disposable income such that the standard Taylor principle does no longer guarantee determinacy. Specifically, we show that even relatively low degrees of price stickiness may give rise to indeterminacy if the debt-to-GDP ratio is sufficiently high. In this sense our results extend the analysis of Galí et al. (2004) who show that rule-of-thumb behavior in conjunction with price stickiness increases indeterminacy regions.

Overall, our results suggest that when the government is permanently indebted, the effect of fiscal policy on macroeconomic variables becomes rather erratic over time. If, for instance, the debt level increases permanently due to a fiscal stimulus package implemented during a recession, then fiscal stabilization policy may become harder to implement during future downturns. Albeit somewhat related, this point is different from the argument that high debt levels leave little flexibility to use fiscal policy in times of economic downturns (see e.g. Fatás and Mihov, 2009).

Since our results follow from the interaction between the inflation rate and the real debt level, the paper is related to Aizenman and Marion (2011) and Krause and Moyen (2011) who also emphasize the effect of inflation on real debt. However, in contrast to these two contributions, we highlight the endogenous reaction of inflation without unexpected policy interventions which are the focus of these papers. Corsetti et al. (2010) analyze the implications of government debt in times of deep recessions. They show that anticipated spending reversals can have expansionary effects in the short-run. Our analysis differs from this paper in the sense that we look at debt dynamics more generally and not in the context of severe downturns.

The remainder of the paper is structured as follows: Section 2 describes the model and the calibration. Section 3 discusses the implications of a positive debt-to-GDP ratio for equilibrium determinacy and in Section 4 we demonstrate how the debt-to-GDP ratio influences the fiscal multiplier. In Section 5 we investigate the robustness of our results with respect to the calibration of policy rules and in Section 6 we allow for a more general maturity structure of government debt. Section 7 concludes the paper.

2. Model and calibration

In this section we describe the structure of a standard New Keynesian model which forms the basis for our analysis. Firms operate under monopolistic competition and each firm j hires labor $N_{j,t}$ and capital $K_{j,t}$ to produce a differentiated good $Y_{j,t}$ according to: $Y_{j,t} = N_{j,t}^{(1-\alpha)} K_{j,t}^{\alpha}$. The firm sells its output at a price $P_{j,t}$ and faces the demand curve $Y_{j,t}^{d} = (P_{j,t}/P_t)^{-\epsilon} Y_t$, where Y_t and P_t denote aggregate output and the price level respectively. The elasticity of substitution between differentiated goods is denoted by ϵ. As in Calvo (1983), each period, only a fraction $(1-\theta)$ of firms is able to adjust its price. The household sector consists of $(1-\lambda)$ optimizing households with access to capital markets and a fraction λ of rule-of-thumb consumers. Optimizing households maximize lifetime utility:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\log C_t^o - \frac{N_t^{o\,1+\varphi}}{1+\varphi} \right), \tag{1}$$

where C_t^o and N_t^o are consumption and labor supply of optimizing households. β is the discount factor and φ is the inverse of the Frisch elasticity of labor supply. The sequence of budget constraints reads:

$$P_t (C_t^o + I_t) + B_t = \left(W_t P_t N_t^o + Div_t + R_t^k P_t K_{t-1} \right) + B_{t-1} R_{t-1} - P_t T_t^o, \tag{2}$$

where I_t denotes investment and B_t are government bond holdings. These bonds yield a gross interest rate of R_t. The capital stock, K_t is owned by optimizing households and R_t^k is the rental rate of capital. Optimizing households draw income from labor $W_t P_t N_t^o$, capital $R_t^k P_t K_{t-1}$