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Public debt and the limits of fiscal policy to increase economic growth

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ABSTRACT

This study proposes a theoretical model of endogenous growth that demonstrates that the level of the public debt-to-gross domestic product (GDP) ratio should negatively impact the effect of fiscal policy on growth. This effect occurs because government indebtedness extracts a portion of young people's savings to pay interest on the debts. Therefore, the payment of debt interest requires an allocation exchange system across generations that is similar to a pay-as-you-go pension system, which results in changes in the savings rate of the economy. The major conclusions of the theoretical model were verified using an econometric model that provides evidence of the validity of this conclusion. Our empirical analysis controls for time-invariant, country-specific heterogeneity in growth rates. We also address endogeneity issues and allow for heterogeneity across countries in the model parameters and for cross-sectional dependence.

1. Introduction

This paper examines how the size of the public debt-to-GDP ratio limits the effects of productive government expenditures on long-term growth. We conduct this analysis by proposing a model with overlapping generations and endogenous growth, wherein the government can go into debt to increase its productive expenditures. Various studies present models in which public expenditures affect growth within a framework of endogenous growth (Chen, 2006; Devarajan et al., 1996; Glomm and Ravikumar, 1997; Barro, 1990). The effect of these expenditures varies according to their nature, their composition, and the size of the tax burden. Other studies demonstrate that public debt can negatively affect growth (Saint-Paul, 1992; Brauninger, 2005). In this paper, we establish a link between these two classes of models and demonstrate that the effect of productive expenditures on growth is limited not only by the size of the tax burden and the rate of indebtedness, as predicted by these models, but also by the debt-to-GDP ratio.

Like the models of Barro (1990) and Saint-Paul (1992), the model that we propose demonstrates that an increase in public expenditures can have three direct effects on growth. An increase in public expenditures positively affects economic productivity but also has negative effects in that it increases the tax burden and public indebtedness as necessary to finance the expenditures, which results in a decrease in savings. Furthermore, as we will demonstrate here, there is an additional indirect effect. An increase in productive expenditures results in an increase in the equilibrium interest rate due to the increase in productivity. This increase, in turn, results in an increase in expenditures for interest on public debt and an additional reduction in savings because government indebtedness extracts a portion of young people's savings to pay interest on the debts of the older generation, which is no longer saving. Therefore, the payment of debt interest requires an

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allocation exchange system across generations that is similar to a pay-as-you-go pension system, which results in changes in the savings rate of the economy.

In the second part of the paper, we estimate a growth equation using the specifications proposed by the theoretical model for a panel of countries to provide valid evidence for the theoretical model's conclusions. Our empirical analysis controls for time-invariant, country-specific heterogeneity in growth rates. We also address endogeneity issues and allow for heterogeneity across countries in the model parameters and for cross-sectional dependence.

Various studies have found empirical evidence that the allocation of public funds to education, health, and infrastructure expenses positively impacts economic growth (Aschauer, 1989; Easterly and Rebelo, 1993; Gupta et al., 2005). However, there is no consensus regarding this issue, as many studies have yielded insignificant results (Devarajan et al., 1996; Agell et al., 2006). We suggest that the disagreement among these studies can be reconciled if we more closely examine the theory. We use a specified theoretical model that clarifies the proper non-linear specification of our growth regression and allows us to disregard the role of public debt in this relationship. In addition, we find evidence that the magnitude of the effect of public debt in this context is significant.

2. Theoretical model

In this section, a simple overlapping-generations model (OLG) of endogenous economic growth is developed, wherein it is established that public expenditures can affect economic productivity. The model is an extension of the work of Barro (1990) and Glomm and Ravikumar (1997) in that the government can incur debt to increase its productive expenditures.

We closely follow Brauninger (2005) in the sense that we use an AK overlapping-generations model with public debt, but we allow for productive government expenditures. We also follow Brauninger (2005) in the sense that we assume that unproductive government spending is given exogenously, so the government has two options to meet its budgetary restrictions. The first one is the case where the government fix the deficit ratio, so the tax rate becomes endogenous. The second one is the case where the government fix the tax rate, so the adjusting variable is the deficit ratio.

Our model is complementary to that of Adam and Bevan (2005), which is an overlapping-generation model in which public spending can be productive and may be financed by debt. Thus, it has a structure that is very similar to that of the model used here. However, whereas Adam and Bevan (2005) focus on a subject other than the balanced growth path and assess the immediate impacts (in one period) of fiscal deficits on growth, we focus on the long term, examining how the size of the debt-to-GDP ratio limits the effects of productive spending on long-term growth and how the predictions of endogenous growth models using fiscal policy may be affected.

2.1. Individuals

Consider an overlapping-generations model in which each generation lives for two periods and consists of a continuum of identical individuals within the interval $(0,1)$. The utility function of an agent who is born in the period $t=0,1,\ldots$ is defined as follows:

$$U=\ln c_t^t+\beta \ln c_{t+1}^t, \tag{1}$$

where c_i^t is the consumption in period i of an individual who is born in t and $0<\beta<1$. The initial generation of older people is endowed with k_0 units of capital. The following generations are each endowed with one unit of labour. The young people of generation t have the following restrictions:

$$c_t^t+s_t^t\leq(1-\tau)w_t, \tag{2}$$

$$c_{t+1}^t\leq(1+r_{t+1})s_t^t, \tag{3}$$

$$(c_t^t,c_{t+1}^t)\geq 0, \tag{4}$$

where $s_t^t=k_{t+1}+d_{t+1}$ is savings and d_t are government bonds that are owned by private agents. Each individual takes the wage rate, w_t, the real interest rate, r_{t+1}, and the tax rate, τ, as given. Clearly, one unit of labour is inelastically supplied by each young individual, and no older individual wishes to save.

2.2. Firms

There is a representative firm that seeks to maximise its profits in an environment of perfect competition, and it has the following production function:

$$y_t=Az_t^{1-\alpha}k_t^{\alpha}l_t^{1-\alpha}, \tag{5}$$

where y_t is the output, z_t are the productive government expenditures that is, the expenditures that affect the marginal product of capital l_t is the labour force, and k_t is the capital stock that is rented by the firm following the law of accumulation $k_{t+1}=(1-\delta)k_t+i_t$, where δ is the depreciation rate and i_t is the level of investment. For the sake of simplicity, let us assume $\delta=1$. This production function is identical to Barro's (1990) if we assume that the labour supply is the same as the size of the