Public infrastructure investment, output dynamics, and balanced budget fiscal rules ☆

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ABSTRACT

We study the dynamic macroeconomic effects of public infrastructure investment under a balanced budget fiscal rule, using an overlapping generations model of a small open economy. The government finances public investment by employing distortionary labor taxes. The balanced budget rule implies a negative short-run output multiplier that exceeds (in absolute terms) the positive long-run output multiplier. Larger public capital spillovers sharpen the intertemporal output tradeoff. In contrast to conventional results regarding public investment shocks, we obtain dampened cyclical responses for plausible parameter values. The cyclical dynamics arise from the interaction between the labor tax rate, the tax base, and the intergenerational spillover effects. We show that financing scenarios involving public debt creation can substantially reduce the short-run output contraction and the transitional macroeconomic fluctuations induced by public investment.

1. Introduction

The fraction of GDP devoted to public infrastructure investment has steadily fallen since the late 1970s in most OECD countries, raising concerns of public capital underprovision across researchers and policymakers alike. The OECD (2006, 2012), for instance, speaks of an 'infrastructure gap': at current levels, public infrastructure investment is unable to meet long-run infrastructure needs. The challenge to these countries is how to close the infrastructure gap in a time of fiscal restraint. In fact, severe fiscal imbalances in the aftermath of the recent global economic crisis have led many industrialized countries to adopt (or discuss the adoption of) some type of fiscal rule (Schaechter et al., 2013). In the European Union, for instance, the recently signed 'Fiscal Compact' requires member states to adopt national legislation prescribing structural budgets near balance (or in surplus).[2] In practice, a balanced budget fiscal rule implies distortionary tax financing of

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government spending. The questions arise as to how the balanced budget rule affects the dynamic macroeconomic responses to a permanent public investment impulse, and whether there is a case for exempting public investment from the balanced budget constraint. The present paper addresses these questions.

Following Aschauer (1989), who documented sizable output effects of public infrastructure capital in the United States, a few theoretical contributions emerged on the dynamic macroeconomic effects of public infrastructure. A first group of papers studies the real effects of permanent public investment shocks financed by lump-sum taxes. Prominent examples include Baxter and King (1993) and Turnovsky and Fisher (1995), who employ the standard infinitely lived representative agent framework of a closed economy; and Heijdra and Meijdam (2002), who study the intragenerational effects of public investment in an overlapping generations model of an open economy. A more recent strand of literature investigates the effectiveness of public investment as a countercyclical fiscal policy tool, allowing for temporary shocks and distortionary tax financing. In this vein, Leeper et al. (2010) study the implementation delays of public investment in an estimated neoclassical model, whereas Coenen et al. (2012, 2013) use New-Keynesian models to quantify the macroeconomic effects of fiscal stimulus packages.

This paper studies the dynamic macroeconomic effects of public infrastructure investment in the context of a balanced budget fiscal rule. We assess the real effects of a permanent public investment shock while focusing on the dynamic tax distortions implied by the balanced budget rule. We develop a dynamic general equilibrium model of a small open economy along the lines of Heijdra and Meijdam (2002), featuring private firms, a government, and Blanchard (1985)–Yaari (1965) overlapping generations of finitely lived households. In contrast to Heijdra and Meijdam (2002), we model endogenous labor supply and allow for nonseparable preferences over private consumption and leisure. The stock of public infrastructure capital provides nonexcludable and nonrival production services to private firms. The government invests in public infrastructure and, given the relative inefficiency of capital income taxes, satisfies the balanced budget requirement by taxing labor income.[3] As in Leeper et al. (2010), a key feature of the model is the tradeoff between the production spillovers of public infrastructure capital and the labor market distortions of labor income taxes.

We first derive a number of analytical results concerning the long-run effects of a permanent increase in public infrastructure investment financed by distortionary labor taxes. We show that the long-run output, private consumption, and aggregate welfare gains of public investment critically depend on the extent to which the output elasticity of public capital exceeds the public investment-to-GDP ratio. This difference may be currently large in OECD countries. While public investment ratios average at about three per cent of GDP (OECD, 2013), the meta-analysis by Bom and Ligthart (in press) suggests an output elasticity of public capital of 0.08. The long-run gains of a permanent public investment impulse are thus potentially sizable. Even for a conservative public investment ratio of five per cent, we find a long-run output multiplier of 2.25 and a long-run private consumption multiplier of 0.71.

We then solve for the dynamic macroeconomic responses to the public investment impulse, assuming that public capital is initially undersupplied. We show that the balanced budget fiscal rule gives rise to an intertemporal output tradeoff of public capital accumulation, whereby output expands in the long run but at the cost of a larger short-run contraction. Because public capital builds up only gradually over time, the tax base effects of public investment are initially small, inducing large short-run increases in the labor tax rate. Labor market distortions initially outweigh production spillovers, causing public investment to depress short-run employment, output, and private investment. We find an impact multiplier of output of -3.68 for benchmark parameter values. A larger output elasticity of public capital sharpens the intertemporal output tradeoff by increasing (in absolute value) both the impact and the long-run output multipliers.

Another key finding of the present paper is that balanced-budget permanent shocks to public investment induce substantial macroeconomic fluctuations during transition between steady states. In particular, we find long dampened cyclical responses of output and other key macroeconomic variables in the benchmark quantitative model. The cycles arise from the dynamic interaction between the (time-varying) labor tax rate, the tax base, and the intergenerational spillover effects, which feedback into the labor market through cohort-specific wealth effects on labor supply. Key for this result is a sufficiently large intertemporal elasticity of labor supply, such as the benchmark value of two. We examine how different values of the model's key parameters affect the impulse responses and conduct an extensive numerical search of the parameter regions yielding cyclical dynamics.

Fiscal rules that include public investment spending under the balanced budget constraint are commonly criticized on the grounds of economic efficiency and intergenerational equity.[4] On the efficiency side, the balanced budget rule generates dynamic distortions from tax rate changes. Because productive public spending expands the tax base, public debt financing could arguably be used to smooth the tax rate over time. On the intergenerational equity side, the balanced budget constraint imposes the entire financing burden of public infrastructure on current generations, despite the cross-generational nature of its benefits. Indeed, Heijdra and Meijdam (2002) show that future generations disproportionately benefit from public investment in a model of exogenous labor and lump-sum taxes. In a similar setup, Bassetto and Sargent (2006) demonstrate that current generations do not support the efficient provision of durable public goods, unless the balanced budget rule exempts public investment spending. In our model, labor market distortions and intergenerational

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[3] Source-based capital income taxes are more distortionary than labor income taxes in small open economies facing a perfectly elastic supply of capital (see Gordon and Hines, 2002; Sørensen, 2007).

[4] See Blanchard and Giavazzi (2004), Mintz and Smart (2006), and Servén (2007).