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Distortionary taxes and public investment when government promises are not enforceable

Marina Azzimonti [a], Pierre-Daniel Sarte [b,*], Jorge Soares [c]

[a] University of Texas at Austin, USA
[b] Research Department, Federal Reserve Bank of Richmond, P.O. Box 27622, Richmond, VA 23261, USA
[c] University of Delaware, USA

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ABSTRACT

We characterize the optimal financing of productive public capital and compute the welfare loss from being unable to commit to the Ramsey policy. Because this calculation ultimately relies on numerical approximations, we contrast alternative approaches. While perturbation and linear quadratic methods deliver accurate steady states, the latter can yield misleading policy implications during transitions. We find that moving from a regime with commitment to one with discretion implies only a small welfare loss. Although Markov-perfect consumption falls noticeably short of its Ramsey counterpart in steady-state, consumption under discretion is higher in the short-run which largely offsets this long-run loss.

1. Introduction

The notion that governments cannot always commit to a sequence of actions is a subject of increasing interest for economists in general and policymakers in particular. To this point, the literature on time-consistent fiscal policy has confined itself to simple environments where taxes are used to finance a flow of public goods or services that are rapidly exhausted. In contrast, the benefits of government spending have been mainly documented for durable public goods that can be accumulated over time.[1] This fact is ignored in recent studies because introducing public capital (an additional state variable) significantly complicates the characterization of the optimal discretionary policy. This paper, therefore, tackles the problem of understanding how the absence of government commitment affects the provision of public infrastructure, as well as the implied welfare effects over an economy's transition to its long-run equilibrium. We solve for Markov-perfect equilibria and provide a quantitative assessment of the value of commitment, which we define as the welfare loss incurred when governments cannot commit to the sequence of actions that produce second-best allocations. In doing so, we evaluate the performance of different numerical methods used in approximating time-consistent policy.

* Corresponding author. Tel.: +1 804 697 8217; fax: +1 804 697 8217.
E-mail address: pierre.sarte@rich.frb.org (P.-D. Sarte).

[1] See Fernald (1999), or Haughwout (2002), for example.

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Previous work on optimal public investment, including Glomm and Ravikumar (1994, 1997), or Turnovsky (1997), characterize optimal policy under full commitment only. More recently, several papers have analyzed optimal fiscal policy absent commitment, but in environments where public goods cannot be accumulated. These include, among others, Klein et al. (2008), who analyze the trade off between providing a consumable public goods and its financing, Hassler et al. (2007), sswho study time-consistent redistribution under repeated voting, and Azzimonti et al. (2006), who explore the distortionary effects of income taxes on the evolution of wealth inequality. In contrast to these papers, our analysis focuses on the provision of a durable public goods that expands the production frontier. Thus, we contribute to the literature on public investment and discretionary policy in mainly three ways.

First, at a theoretical level, we show that governments following a Markov-perfect policy choose a tax rate such that they trade off marginal inefficiencies arising in private savings with those arising in the provision of public infrastructure over two consecutive periods only. The derivation of the government Euler equation (GEE) with two state variables is substantially more involved than those developed in the previous work but remains analytically tractable. More importantly, we show that this derivation allows for the application of numerical methods that efficiently and accurately describe transition dynamics.

Second, in computing the Markov-perfect policy problem, we compare numerical solutions obtained using GEE-based perturbation methods recently suggested in Krusell et al. (2002), with those that emerge under a global method (GM) that does not require derivation of the GEE. We further gauge the more common linear quadratic (LQ) approximation approach developed in Klein and Rios-Rull (2003), as well as Svensson and Woodford (2004), against this global method. We know of no other papers in the literature that compare these numerical methods for a single problem. While both the perturbation and LQ approaches deliver accurate steady-state allocations, we find that the approximation errors associated with the latter can yield misleading policy recommendations in response to changes in the state variables. In contrast, an application of the perturbation method is able to generate decision and policy rules that differ minimally from those delivered by the global method.

Finally, our analysis indicates that while Markov-perfect and Ramsey policies can lead to considerably different allocations in the long-run, moving from an economy with government commitment to one with discretion implies only a small welfare loss. This finding stems from the greater emphasis that Markov governments place on short-run gains relative to a Ramsey planner. In particular, although the economy with discretion achieves noticeably lower long-run consumption relative to the regime with commitment, the tax policy chosen under discretion implies higher consumption in the transition that largely offsets this long-run loss. Ultimately, the absence of government commitment results in lower tax rates and, therefore, less public infrastructure being developed. Because a lower level of infrastructure reduces the marginal product of private capital, the economy operating under discretion gives rise to lower private investment and lower consumption in the long-run despite its lower taxes.

This paper is organized as follows. Section 2 describes the basic economic environment. In Section 3, we define the competitive equilibrium given a stationary policy rule. Section 4 characterizes the Markov-perfect equilibrium that yields the optimal policy. Section 5 contrasts numerical solution methods, and we calculate the value of government commitment in Section 6. Section 7 offers some concluding remarks.

2. Environment

Consider an economy populated by infinitely many households whose preferences are given by

$$\mathscr{U} = \sum_{t=0}^{\infty} \beta^t u(c_t),$$

where $0<\beta<1$ is a subjective discount rate, and households' period utility, $u(c_t)$, satisfies $u_c>0$, $u_{cc}<0$, and the usual Inada conditions. The size of the population is normalized to one.

A single consumption good is produced using the technology

$$y_t = F(k_t, l_t, k_{gt}),$$

where k_t and k_{gt} denote the date t stocks of aggregate capital in the private and public sectors, respectively. Labor input is denoted by l_t, and we assume that F exhibits constant returns to scale with respect to private capital and labor. We denote the public capital elasticity of output, $F_{k_g}(k_g/y)$, by $\theta \in (0,1)$, and assume that $F_{kk_g}>0$. These assumptions follow along the lines of earlier work, notably by Glomm and Ravikumar (1994, 1997). Since leisure is non-valued, we assume that agents supply labor inelastically and set $l_t = 1\ \forall t$.[2] To simplify notation, we define $f(k_t, k_{gt}) \equiv F(k_t, 1, k_{gt})$.

Both types of capital can be accumulated over time and evolve according to

$$k_{t+1} = i_{kt} + (1-\delta_k)k_t \tag{1}$$

[2] This assumption is made for simplicity, and helps keep the derivation of the GEE below somewhat concise despite the additional state variable. See Klein et al. (2008) for an extension with endogenous labor in a setting without public capital.