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Capital taxation and government debt policy with public discounting☆

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ABSTRACT

This paper characterizes capital taxation and public debt policy in a quantitative macroeconomic model with an impatient government and uncertainty. The government has access to linear taxes on capital and labor, and to non-state-contingent bonds. Government impatience generates positive and empirically realistic long-run levels of both capital taxes and public debt. Prior predictive analysis shows that the simulated model matches the distribution of both variables in a sample of 42 countries, alongside other statistics. The paper then presents econometric evidence that countries with higher political instability, used as an approximation of unobservable public discount rates, have both higher capital taxes and debt.

1. Introduction

Two prominent results in the theory of optimal fiscal policy are that in the long-run, or on average, (i) capital is not taxed and (ii) public debt is zero or negative.[1] Both prescriptions contrast strongly with fiscal policy around the globe. To bridge this gap, this paper builds a quantitative model of optimizing fiscal policy that matches the distribution of capital taxes and public debt in a sample of 42 countries, alongside other business cycle statistics. Specifically, it embeds a theoretical insight going back to Arrow and Kurz (1970) that government impatience can imply positive capital taxes into a quantitative state-of-the-art optimal taxation framework following Farhi (2010) to rationalize that long-run capital taxes and debt are positive. It thereby solves two puzzles in the literature simultaneously. The paper then presents novel econometric evidence that politically more unstable countries have higher capital taxes and debt, consistent with the predictions of the model.

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[1] For capital taxation see, for example, Judd (1985), Chamley (1986), Chari et al. (1994), Farhi (2010). For government debt see Aiyagari et al. (2002) and Adam (2011). The Chamley–Judd result is criticized on theoretical grounds by Straub and Werning (2014) who show that optimal long-run capital taxes are generally not zero.

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The model builds on Aiyagari et al. (2002), Kumhof and Yakadina (2007), and Farhi (2010). The first paper uses a representative-agent framework with a benevolent government that has access to linear labor taxes and to non-state-contingent bonds to finance a stochastic stream of expenditures, and which commits to future policy. The authors show that under certain assumptions long-run debt is negative. Into this setup, the second paper introduces government impatience and bond transactions costs. These two features combined imply that long-run debt is positive. The third study returns to the assumption of equal private and public discount rates but introduces capital. The author shows that capital taxes are roughly zero on average and that debt contains a unit root component.

In this paper, I introduce government impatience, bond transaction costs, and capital tax adjustment costs into a model with capital to study the joint behavior of capital taxes and non-state-contingent debt. I find that capital taxes and debt are both positive in the long-run. Intuitively, a government with stronger preferences for nearby consumption than households sets a positive tax on capital to drive a wedge between the intertemporal rate of substitution and the marginal rate of transformation of consumption to align the latter with its own time preferences. Moreover, it uses debt to shift labor taxes into the future up the point where the associated transaction costs equal the benefits of further debt-financed labor tax cuts. The long-run level of debt is thus determined jointly by government impatience and bond transaction costs as in Kumhof and Yakadina (2007), and uncertainty plays no role. This differs from Aiyagari et al. (2002) and Farhi (2010), who consider stochastic steady states.

In the first part of the paper, I analyze the quantitative properties of the model economy subject to shocks to government expenditures as well as to permanent and transitory technological progress. Using Bayesian prior predictive analysis, I show that the model replicates the distribution of capital taxes and debt in a sample of 42 (mainly advanced) economies for the period 1985–2014. In particular, it generates positive mean capital taxes and debt, and matches the variance of mean capital taxes and debt across countries. It also yields other moments that mostly conform with the data. I explain these findings by highlighting the relative contribution of the main model features–in particular government impatience–to the simulated moments and by studying impulse response functions. In the second part, I present robust econometric evidence for a positive relation between different measures of political instability, taken as approximations of governments' unobservable discount rates, and capital taxes and debt, consistent with the predictions of the model.

The analysis contributes to a line of research that provides explanations for non-zero capital taxation (Diamond and Spinnewijna, 2011; Hiraguchi and Shibata, 2015; Martin, 2010, among others). Aguiar et al. 2009 and Reis (2012) consider the case of limited commitment and show that government impatience then leads to positive capital taxation. More closely related to the present study are two papers which study the effects of higher public discounting for capital taxes under full commitment. First, Arrow and Kurz (1970) show that optimal financing of endogenous public investment implies positive capital taxes. Distinct from the present paper, they assume a constant private savings rate and focus on public investment, which is absent here. Second, Bonis and Spataro (2005) study optimal financing of wasteful exogenous government consumption. They obtain that capital taxes are positive along the path of transition to a steady state, but generally not in the steady state. Both studies are theoretical explorations based on deterministic continuous-time frameworks, whereas this paper focuses on the quantitative and stochastic properties of capital taxation and debt in a discrete-time setup. Finally, the paper also relates to a strand of literature that rationalizes positive levels of public debt. Amador (2004) develops a model of political instability where an incumbent government takes into account that it might loose office and therefore values the future less. Devereux and Wen (1998) show in an endogenous growth model that political instability implies positive levels of both public debt and capital taxes. Different to the analysis here, the first paper does not contain capital while the second paper does not include labor or economic shocks.

The paper is structured as follows. The next section lays out the model. Section 3 presents the calibration and Sections 4 and 5 contain the results. Section 6 concludes.

2. The model

This section first describes the economy and defines the competitive equilibrium for a given policy. Then, it sets up the policy problem and derives the equilibrium under optimizing fiscal policy. There are three sources of uncertainty: shocks to transitory and permanent productivity and to government expenditures. The shocks materialize at the beginning of each period and are observed by all agents when taking their decisions.

2.1. Households

The private sector consists of households and a financial intermediary. Households are identical, infinitely-lived, and of mass one. Following Farhi (2010), they produce output with a constant returns to scale production function $K_t + F(K_t, n_t, a_t, Z_t)$, using labor n_t and capital K_t as inputs. The production function allows for the depreciation of capital with the rate δ. The variable a_t is a stationary productivity shock which follows a first-order autoregressive process in logs: $\ln a_t = \rho_a \ln a_{t-1} + \varepsilon_t^a$ with i.i.d. innovations $\varepsilon_t^a \sim \mathcal{N}(0, \sigma^a)$. The shock Z_t is non-stationary technological progress. The stochastic growth rate of this variable is $z_t = Z_t/Z_{t-1}$ and evolves according to $\ln(z_t/z) = \rho_z \ln(z_{t-1}/z) + \varepsilon_t^z, \quad \varepsilon_t^z \sim \mathcal{N}(0, \sigma^z)$, where $z \geq 1$ is the deterministic gross growth rate. For future reference, I denote by $x_t = X_t/Z_{t-1}$ the detrended version of a generic trending variable X_t.