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Linearly progressive income taxes and stabilization[☆]

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Abstract

It has been shown that progressive income taxes may lead to saddle-point convergence when the marginal tax rate is assumed to be a continuously increasing function of income. This note shows that *linearly progressive* taxes may also immunize the economy against indeterminacy and sunspot equilibria. Therefore, our analysis suggests that exemption thresholds, as featured by prevailing tax codes, may help to stabilize the economy.

Keywords: Business cycles; Progressive income taxes; Sunspots

1. Introduction

The recent literature has shown how progressive income taxes may reduce the likelihood of indeterminate equilibria and even lead to saddle-point stability (Christiano and Harrison, 1999; Guo and Lansing, 1998; Guo, 1999). Contributions in this area rely on the assumption of a *continuously* increasing marginal tax rate, which is not a feature that is shared by most actual tax schedules, as casual observation suggests.

In this note, we incorporate an alternative formulation of progressive taxation into the Benhabib and Farmer (1994) model, which captures an ubiquitous real-world aspect: it is assumed that a constant tax rate is applied to income only when the latter exceeds an exemption threshold. This seems to get closer to the tax codes with brackets that are prevailing, for instance, in most OECD countries. We prove that there exists a critical exemption threshold above which local indeterminacy is ruled out and saddle-point stability ensured. The basic mechanism behind this result seems straightforward. Assume that the laissez-faire economy without taxes exhibits indeterminacy and then introduce linearly progressive taxes. As shown below, increasing the exemption threshold leads to a lower average tax rate, which implies higher tax progressivity given the constant marginal tax rate. Therefore, a large enough exemption restores saddle-point stability by imposing a level of progressivity that is high enough to tax away the benefits of self-fulfilling expectations. This is reminiscent of the result that local determinacy is ensured when tax progressivity is sufficiently large (Guo and Lansing, 1998; Guo, 1999). However, our analysis further shows that this stabilizing effect does not

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rely on a continuously increasing marginal tax rate when linear progressivity is considered, which complements the existing conclusions. Our result also complements some recent conclusions underlining that flat-rate taxation without exemption does *not* promote macroeconomic stability (e.g. Dromel and Pintus (2006)).

In summary, one may interpret our results in the following way. Our model is in between Guo and Lansing (1998) and an extended version of Guo and Harrison (2004) with increasing returns to scale. In such an economy with a fiscal policy that captures an important aspect of actual tax codes, we show that linearly progressive income taxes may rule out sunspot equilibria, which suggests that exemption thresholds, as featured by tax codes prevailing in many countries, may help to stabilize the economy.

The rest of the paper is organized as follows. The next section presents the economy with linearly progressive income taxes while Section 3 studies the local dynamics and shows how progressivity may lead to saddle-point stability. Some concluding remarks are gathered in Section 4.

2. The economy

This paper introduces linearly progressive income taxes into a benchmark growth model. To ease comparison with results by Guo and Lansing (1998), Christiano and Harrison (1999) and Guo (1999), we focus on the one-sector version with constant capital utilization studied by Benhabib and Farmer (1994). However, our analysis could be easily adapted to richer assumptions and is expected to yield similar results, for instance in a slightly different formulation with variable capital utilization and smaller externalities (by building on the Wen (1998) insight).

2.1. Firms, households and government

Following Benhabib and Farmer (1994), we assume that a unique final good y is produced by using capital k and labor l, according to the following (aggregate) technology:

$$y = k^{\alpha} l^{\beta}, \tag{1}$$

where $\alpha, \beta \geq 0$ and $\alpha + \beta > 1$. For simplicity, we assume increasing returns due to the presence of externalities. It would be straightforward to modify the analysis to cover the case with imperfect competition.

The Ramsey households have preferences represented by:

$$\int_0^{\infty} \mathrm{e}^{-\rho t} \left\{ \log[c(t)] - A \frac{[l(t)]^{1+\gamma}}{1+\gamma} \right\} \mathrm{d}t, \tag{2}$$

where, at each date $t \geq 0$, $c > 0$ is consumption, $l > 0$ is labor supply, while $A > 0$ is a scaling parameter, $1/\gamma \geq 0$ is the labor supply elasticity to the real wage, and $\rho > 0$ is the discount rate. The representative consumer owns the inputs and rents them to firms through competitive markets. Therefore, we can write down, for sake of brevity, the consolidated budget constraint as[1]:

$$\dot{k} = y - \tau(y - E) - \delta k - c, \tag{3}$$

where $1 > \tau \geq 0$ is the tax rate that is imposed on that part of income which exceeds the exemption threshold $E \geq 0$. On the other hand, $\tau = 0$ when $E \geq y$. Both τ and E are assumed to be constant through time. In the sequel, we will assume that parameter values are such that $y > E$ in steady state so that taxes are strictly positive.

As is usual, government is assumed to finance public expenditures g that do not affect private decisions by taxing output in a progressive way, when the latter exceeds the exemption threshold, i.e. $g = \tau(y - E)$ when $y \geq E$.

2.2. Intertemporal equilibria

Households' decisions follow from maximizing (2) subject to the budget constraint (3), given the initial stock $k(0) \geq 0$. Straightforward computations yield the following first-order conditions:

$$\begin{aligned} \dot{c}/c &= a(1-\tau)y/k - \rho - \delta, \\ Acl^{\gamma} &= b(1-\tau)y/l, \end{aligned} \tag{4}$$

[1] From now on, we omit the time dependence of all variables to save on notation.