Progressive taxation and macroeconomic (In) stability with productive government spending

Shu-Hua Chen [a], Jang-Ting Guo [b],*

[a] Department of Economics, National Taipei University, Taiwan
[b] Department of Economics, University of California, 3133 Sproul Hall, Riverside, CA 92521, USA

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ABSTRACT

This paper systematically examines the interrelations between a progressive income tax schedule and macroeconomic (in)stability in an otherwise standard one-sector real business model with productive government spending. We analytically show that the economy exhibits indeterminacy and sunspots if and only if the equilibrium after-tax wage-hours locus is positively sloped and steeper than the household's labor supply curve. Unlike in the framework with useless public expenditures, a less progressive tax policy may operate like an automatic stabilizer that mitigates belief-driven cyclical fluctuations. Moreover, our quantitative analysis shows that this result is able to provide a theoretically plausible explanation for the discernible reduction in US output volatility after the Tax Reform Act of 1986 was implemented.

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1. Introduction

Traditional Keynesian macroeconomics stipulates that progressive income taxation works as an automatic stabilizer in mitigating the magnitude of fluctuations in disposable income and consumption. It follows that *ceteris paribus* the cyclical volatility of output is smaller when the economy is subject to a more progressive tax policy. As it turns out, this result continues to hold in the context of one-sector real business cycle (RBC) models. Schmitt-Grohé and Uribe (1997) show that standard one-sector RBC models with a constant returns-to-scale production technology may exhibit indeterminacy and sunspots under a balanced-budget rule where fixed public expenditures are financed by proportional taxation on labor or total income. Therefore, when agents' optimism leads to higher investment and hours worked, the government is forced to lower the tax rates as total output rises. This countercyclical fiscal formulation is qualitatively equivalent to regressive income taxation. By contrast, Guo and Lansing (1998) incorporate a progressive income tax schedule, whereby the household's marginal tax rate is increasing in its own level of taxable income, into Benhabib and Farmer's (1994) indeterminate one-sector no-sustained-growth RBC model with aggregate increasing returns-to-scale in production. These authors find that a sufficiently strong tax progressivity can stabilize the economy against business cycle fluctuations driven by agents' animal spirits.[1]

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* Corresponding author. Tel.: +1 951 827 1588; fax: +1 951 827 5685.
  E-mail address: guojt@ucr.edu (J.-T. Guo).
  [1] Christiano and Harrison (1999) obtain the same qualitative finding that progressive taxation on agents' labor effort is an automatic stabilizer within the endogenous growth version of Benhabib and Farmer's (1994) one-sector real business cycle model.

In the above-referenced work and other related previous studies, government purchases are postulated to generate no substitution effects in that they do not affect the marginal conditions for the household's consumption/savings or the firm's production decisions. However, the assumption of wasteful or useless public spending, although commonly adopted in the academic literature for analytical simplicity, is not necessarily the most realistic—at least for developed countries. In this paper, we systematically explore the stability effects of Guo and Lansing's (1998) progressive tax formulation in an otherwise standard one-sector RBC model with indivisible labor and productive public expenditures. Specifically, as in Barro (1990), government spending enters the firm's Cobb–Douglas production technology as an input that is complementary to private capital and labor services.

Our theoretical analysis demonstrates that the interrelations between the government's tax policy rule and macroeconomic (in)stability depend crucially on (i) the labor share of national income, (ii) the degree of positive external effects that public spending exerts on the firm's production process, (iii) the level parameter of the tax schedule, which also governs the government size measured by the steady-state ratio of government purchases to GDP, and (iv) the slope parameter of the tax schedule that characterizes its progressivity feature. Under the assumption that households take into account the taxation impact of their economic decisions, we first derive the analytical expression of the model's Jacobian matrix, and show that the *necessary and sufficient* condition for our model economy to exhibit local indeterminacy is an upward-sloping equilibrium after-tax wage-hours locus which is steeper than the labor supply curve.[2] It follows that endogenous belief-driven macroeconomic booms and downturns may occur as self-fulfilling equilibria. This turns out to be the same (necessary and sufficient) condition for indeterminacy and sunspot in Benhabib and Farmer's (1994) laissez-faire one-sector RBC model with a social technology that displays increasing returns in private capital and labor inputs.

Next, within the empirically plausible specification that capital's share of output is lower than that of labor, a comprehensive graphical investigation is undertaken to illustrate our model's local stability properties. Specifically, we are able to clearly divide the feasible parameter space into the regions of "saddle" and "sink" under three different configurations. In the benchmark parameterization, the steady-state public expenditures to GDP ratio is postulated to be lower than the capital share of national income, which in turn is smaller than the level parameter of the tax scheme. In sharp contrast to Schmitt-Grohé and Uribe (1997) and Guo and Lansing (1998) with useless government purchases, raising the tax progressivity may turn our model's steady state from a saddle point to a sink provided public spending is sufficiently productive. This implies that a more progressive tax schedule can *destabilize* the economy by causing endogenous cyclical fluctuations. By contrast, as in the existing studies, more progressive income taxation operates like an automatic stabilizer within the other two parametric formulations. In these frameworks, the economy is more susceptible to equilibrium indeterminacy when the tax policy rule becomes flatter or less progressive. Moreover, some recent findings in the RBC-based indeterminacy literature, such as those in Guo and Lansing (1998) and Guo and Harrison (2004, 2008), can be shown as special cases of our analytical and graphical results.

To obtain further insights, we carry out a quantitative analysis of macroeconomic (in)stability within a calibrated version of our model economy. Our benchmark calibration, which is consistent with post-war US data, turns out to be the empirically relevant formulation. With regard to calibrating the level and slope parameters of our postulated tax policy, we follow Cassou and Lansing's (2004) nonlinear least squares methodology and obtain year-by-year empirical estimates from the US federal individual income tax schedule for the 1966–2005 period. These estimations result in an average R-square of 0.867. We find that the estimated tax-level parameter displayed a slow downward trend during the 1966–1986 sub-sample period and remained stable after 1987; and that the average values of this parameter turn out to be very similar across the two subperiods. In addition, our estimated tax-slope parameter exhibits a discernible structural break because of the implementation of the Tax Reform Act of 1986 (TRA-86). In particular, the US tax code was more progressive prior to TRA-86, evidenced by the significant decrease of estimated progressivity between 1986 and 1987; and the average level of estimated tax progressivity has also shown a noticeable declining trend between the two sub-sample periods.

Given the estimated values of tax progressivity, together with the benchmark calibration of other model parameters, we find that the 1966–1986 subperiod is characterized by equilibrium indeterminacy, whereas saddle-path stability prevails for the 1987–2005 subperiod. It follows that the post-1986 economy *ceteris paribus* exhibits a lower cyclical volatility of output. This prediction turns out to be qualitatively consistent with the Great Moderation whereby the US business cycle has become less volatile since the mid 1980s. Our quantitative analysis thus provides a theoretically plausible explanation for the observed reduction in the magnitude of aggregate fluctuations after TRA-86, *i.e.* a less progressive tax schedule has operated like an automatic stabilizer that mitigates US output volatility through eliminating belief-driven business cycles.[3]

Finally, it is worth pointing out that our main quantitative finding, whereby the Great Moderation resulted from a fundamental change in the economy's dynamic structure, is obtained in a highly stylized model with two important caveats. First, although the fiscal policy under examination is progressive, households are postulated to be homogeneous. It follows that our analysis cannot account for the distributional effect of changes in the tax schedule. Second, the

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[2] The term "equilibrium after-tax wage-hours locus" can also be dubbed as "after-tax marginal productivity of labor curve". Thanks to an anonymous referee for pointing this out to us.

[3] Interestingly, the moderation of cyclical fluctuations in UK (Stock and Watson, 2005) also coincided with fiscal changes that have considerably reduced its tax progressivity since 1985 (Giles and Johnson, 1994).