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Low public debt as a commitment device for fiscal policy

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Abstract

This paper studies the time-inconsistency issue in a setting where the present government pre-announces a tax rate on labor income, and output is a resource exploited by the government and privates' jointly.

The present government is tempted to increase its consumption by implementing a tax rate higher than what it had announced and privates had agreed upon. When confronted with this temptation, it must take account of a threat of privates enacting trigger strategies that will eventually confine present and next governments to low consumption levels. The comparison between benefits and costs from defection also depends on the extent the present government discounts next governments welfare. In particular, the trade-off between continuation and defection is as follows: defection entails an immediate and temporary increase in the utility enjoyed by the present government. As a consequence of privates enacting trigger strategies, a utility loss is suffered directly by the present government until the next government starts, and indirectly as a consequence of every successive government being confined to low levels of consumption.

By ensuring the value of continuation exceeds the value of defection, a sufficiently low level of public debt acts as a commitment device for continuation of the pre-announced tax policy even when the utility loss suffered from the enactment of trigger strategies across the

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present government time horizon does not outweigh the benefits that the present government directly enjoys from defection.

1 Introduction

This paper studies the time-inconsistency problem for a government that pre-announces a tax rate on labor income.

The analysis is cast inside a setting where all income is from labor and taxation makes it a resource exploited by the government and the privates' jointly. It thus departs from the standard infinitely-lived representative agent framework in which public debt is a device to smooth out the excess burden across time, and in the case of a favorable net debt position the government would optimally set steady state tax rates on raw labor (i.e. its flow component) income to zero (see, on this point, [8]). Unlike the benevolent government setting, it is here assumed that governments are interested in the maximization of their own utility they derive from consumption.

Incentives for the present government to be time consistent arise out of the possibility for privates to enact trigger strategies (and the delay occurring from deviation and enactment of trigger strategies) and depend on the extent that the present government discounts future governments welfare. More exactly, the present government faces a trade-off between continuation and defection. If it defects, its utility increases until privates enact trigger strategies. This utility gain has to be weighted against the utility loss that trigger strategies determine until the government ends, plus the welfare reduction suffered by every successive government.

By ensuring the value of continuation exceeds the value of defection, a sufficiently low level of public debt acts as a commitment device for continuation of the pre-announced tax policy even when the utility loss suffered from the enactment of trigger strategies across the present government time horizon does not outweigh the benefits that the present government directly enjoys from defection.

The plan of the paper is as follows: Section 2 puts forth the model according to the joint exploitation framework of [6] and [7]. Section 3 studies the game between the present government and the public. Section 4 adds the intertemporal game between successive governments. Section 5 ends the paper with a summary of the results.

2 The model

The government imposes taxes on labor and uses fiscal revenue to finance its consumption and service debt. Private agents are willing to pay labor income taxes according to the pre-announced tax rate ω. In case they perceive the government levies more than the rate it committed to, they will subsequently enact a *trigger strategy*.

Let the government's instantaneous utility be given by the concave and continuous at 0 utility function u. Newly produced output can either be consumed or saved. The saved portion becomes productive capital via a transformation m, and depends on households' choices over consumption, c, and leisure, l, as well as government's choices over G and ω, i.e. government consumption and the tax rate on labor income. Thus we may write

$$\dot{k} = m\left(k, l, c, G, \omega\right)$$

As regards to m, we make the following assumptions (see [19] for the case in which productive capital can be consumed):

$(A1)$ $m : \mathbb{R}^5 \to \mathbb{R}$ is concave, with $m\left(0, \cdot, \cdot, \cdot, \cdot\right) = 0$;
$(A2)$ $\left|m\left(x_1, \cdot, \cdot, \cdot, \cdot\right) - m\left(x_2, \cdot, \cdot, \cdot, \cdot\right)\right| \leq M\left|x_1 - x_2\right|$ for all $x_1, x_2 \in \mathbb{R}_+$.

For simplicity, we assume that both households and the government have agreed upon a consumption path (c, G) which is consistent with market equilibrium conditions, and that $\frac{\partial c}{\partial \omega} < 0$, $\frac{\partial (1-L)}{\partial \omega} > 0$, i.e. an increase in labor-income tax reduces private consumption and increases leisure. In accordance with [7] framework, it is assumed that the net effect of a higher labor income tax rate on households' utility is negative.

It is assumed the pre-announced path where taxes on labor income are ω and G is consistent with the public sector budget constraint, e.g. $G + \rho B = \omega L$, where B is the given level of public debt. The analysis is restricted to steady state with net interest rate equal to the time preference rate ρ, as taxes on capital income are inefficient (see, among many others, [1].) The next Section characterizes the set of equilibria in this dynamic game and, hence, the optimal strategies for the players.

3 A game between the present government and the private agents

The incentives for the present government to stick to the pre-announced tax rate ω can be investigated with reference to the recursive structure of its decision process. At every instant of time, the government evaluates whether it is best for it to continue complying with the pre-announced policy or not. It will not defect if the value of continuation of the pre-announced strategy is higher than the value of defection, i.e. if $V_c > V_d$. The value of defection depends on the possibility of households playing *trigger strategies* as a consequence of the government defecting. If households were unable to enact trigger strategies, the government would find it optimal defecting the pre-announced tax rate by playing a constant upper level $\bar{G} > G$. Of course, the government may accomplish this by levying a tax rate greater than ω. The assumption of an upper bound on government's consumption is consistent with [6]. In what follows, $\bar{G} < Y$.

If, instead, households can play trigger strategies, the government must take account of their reaction when evaluating the benefits from defection. If it plays $\bar{G}$, by use of $\bar{\omega} > \omega$ at any instant, the households will play $\omega_d < \omega$ from sometime in the future onwards. The value of defection depends on $\left(\bar{G} - G\right)$ positively, and on $(\omega - \omega_d)$ negatively. Furthermore, we assume that households perceive the government's defection with a delay τ.

The important difference w.r.t. the literature on the joint-exploitation of a productive asset is that newly produced output is an asset that is not exhausted under *fast consumption,* rather it keeps constant. This implies a difference in the calculation of the value function under defection. Namely, the value function will be calculated under constant capital (since there is no investment) and constant B, since households will be paying taxes only to the extent of servicing public debt from the instant the defection is perceived onwards. Hence, the government will be enjoying only a constant lower (possibly zero) level $G^d < \bar{G}$.

Then, the value function at time t under defection is

$$V_d = \int_t^{t+\tau} e^{-\rho s} u\left(\bar{G}\right) ds + \int_{t+\tau}^{T} e^{-\rho s} u\left(G^d\right) ds$$

while the value of continuation is

$$V_c = \int_t^{t+\tau} e^{-\rho s} u\left(G\right) ds + \int_{t+\tau}^{T} e^{-\rho s} u\left(G\right) ds$$

where T is the government's horizon.

Following [6], we assume linear utility and get

$$V_d - V_c = \int_t^{t+\tau} e^{-\rho s} \left[\bar{G} - G\right] ds + \int_{t+\tau}^{T} e^{-\rho s} \left[G^d - G\right] ds$$

or

$$V_d - V_c = \frac{e^{-\rho t}}{\rho} \left[1 - e^{-\rho \tau}\right] \left[\bar{G} - G\right] + \frac{1}{\rho} \left(e^{-\rho t} e^{-\rho \tau} - e^{-\rho T}\right) \left[G^d - G\right] \quad (1)$$

It is clear that for all $\tau > 0$, the first term is an incentive to defect. It measures the benefits the government enjoys from both the existence of the informational lag and the fact that households will not be able to implement trigger strategies any sooner than $t + \tau$. As given an agreed upon tax rate, higher debt implies lower G, this incentive is greater the larger B, and the greater τ. When governments have a short horizon, this incentive is dominant.

The second-term is a disincentive to defect and measures the government's welfare loss caused by the enactment of the trigger strategy on the part of households.

A low level of public debt acts as a commitment device in the sense that with both a high level of B and a low labor-income tax rate ω, the government is tempted to defect from the policy it had previously announced. This temptation is stronger the longer the informational lag τ and the shorter the government's horizon T.

4 An intertemporal differential game between governments and privates

In this Section we investigate how the incentives for defection/continuation of the pre-announced fiscal policy change when the present government is not only involved in a game with the private sector, but also takes into account the effects of its actions on the welfare of next governments when their choices over tax rates (and deficit/surplus) are not constrained by previous

government's choices. We now assume that $G + \rho B < \omega L$ so that, under continuation $\dot{B} < 0 \Longrightarrow B_T \leq B_t$.

The problem can be formalized as a differential game where the objective for the present government is

$$\hat{J}(B_t, t) = \max \int_t^T e^{-\rho s} u(G_s)\, ds + V_T(G(B_T))$$

$$s.t.\ \dot{B} = \rho B - \omega L + G$$

where

$$V_T(G(B_T)) = \int_T^\infty e^{-\rho s} u(G_s(B_s))\, ds$$

is the utility that accrues to the present government from the bequest of B_T to the next government.

The value function under defection is now

$$V_d = \int_t^{t+\tau} e^{-\rho s} u\left(\bar{G}\right) ds + \int_{t+\tau}^T e^{-\rho s} u\left(G^d\right) ds + V_T\left(G\left(B_T^d\right)\right)$$

while under continuation it is

$$V_c = \int_t^{t+\tau} e^{-\rho s} u(G)\, ds + \int_{t+\tau}^T e^{-\rho s} u(G)\, ds + V_T(G(B_T^c))$$

with B_T^d and B_T^c denoting public debt under defection and continuation, respectively. As seen before, the shorter T the greater the incentive to defect for the present government. On the other side, the differential game between governments introduces an additional incentive for the present government to stick to the announced policy. The reason is simple: if the present government does not defect, i.e. $G_t + \rho B_t < \omega L$, $t \leq T$, then B decreases and $G_\tau \geq G_t$ $\tau > T$ becomes feasible for next government (without any need for it to defect.) Hence, next government will not enjoy a lower utility.

It seems reasonable to conjecture that, given the stationarity of preferences, if the present government does not defect, every successive government will be faced with fading incentives for defection.

In other words, the utility that accrues along the time horizon of the present government is determined by the game between the government and the private agents. The subsequent utility $V_T(G(B_T))$ is determined by the

game between governments. Even though the present government cannot commit the next government not to reschedule the optimal path in view of the new current state B_T, it is clear how, given both stationarity of preferences and existence of trigger strategies, every next government will be acting just as the present government does. Hence, in the present setting, the time inconsistency problem is an issue only to the present government.

A low level of public debt acts as a commitment device that ensures the continuation of the pre-announced policy even when the utility loss suffered from the enactment of trigger strategies does not outweigh the benefits that the present government directly enjoys from defection.

If we assume the government has an horizon that does not extend beyond the glimpse of a time instant, then the game between the present government and the privates does not matter. In this case, only the differential game between governments is of importance, and the analysis becomes a straightforward application of the results by [16]. The reason for this is that the present government does not fear any trigger strategy, since any such strategy will necessarily take place after its time horizon has elapsed, and thus will target next governments.

When the time horizon is not too short, new incentives emerge as the game between governments and privates becomes relevant too. In particular, the threat of trigger strategies heavily influences the present government's choice between defection and continuation. To the extent that this threat is sufficient to drive the present government's choice to continuation, it plays the role of a substitute for an anchor to an ethic of sound finance.

Summing up, governments may be led to act in accordance with a pre-announced tax policy because of the threat imposed by the private sector enacting trigger strategies that confine the government (either at present or in the future) to a low consumption equilibrium. This threat operates both through the game between present government and the private sector (to the extent given by (1)), and through the game between governments (to the extent $V_T\left(G\left(B_T^d\right)\right) - V_T\left(G\left(B_T^c\right)\right)$.)

5 Conclusions

This paper studied the time-inconsistency issue in a setting where the present government pre-announces a tax rate on labor income, and output is a resource jointly exploited by the government and the privates'.

The present government faces incentives to behave in a time consistent manner that consist of the threat put by the possibility for privates to enact trigger strategies (and the delay occurring from deviation and enactment of trigger strategies), and depend on the extent to which it discounts future governments welfare. More exactly, the present government faces a trade-off between continuation and defection as follows: if it defects, its utility increases until privates enact trigger strategies. This utility gain has to be weighted off against the utility loss that trigger strategies determine until the government ends, plus the welfare reduction suffered by every successive government.

In particular, governments may be led to act in accordance with a pre-announced tax rate because of the threat imposed by the private sector enacting trigger strategies that confine the government (either at present or in the future) to a low consumption equilibrium.

By ensuring the value of continuation exceeds the value of defection, a sufficiently low level of public debt acts as a commitment device for continuation of the pre-announced tax policy even when the utility loss suffered from the enactment of trigger strategies across the present government time horizon does not outweigh the benefits that the present government directly enjoys from defection.

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