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Consumption taxes and precautionary savings

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HIGHLIGHTS

- We consider the effects of consumption taxes on capital in an Aiyagari economy.
- We prove that consumption taxes do not affect capital under certain conditions.
- The conditions coincide with utility conditions that allow for balanced growth.
- Effects of consumption taxes are compared with those of lump sum taxes.
- Effects of consumption taxes with GHH preferences are also considered.

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ABSTRACT

Financing government spending through lump sum taxes does not distort capital when markets are complete but tends to increase precautionary savings under market incompleteness. Using flat consumption taxes instead leaves precautionary savings unaffected, provided certain conditions on utility are met.

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1. Introduction

Proposals for tax reforms which incorporate a shift away from income taxes towards consumption taxes are a recurrent theme in tax policy discussions. Such proposals often receive intellectual support from, and are sometimes directly put forward by, academic economists.[1] This support is based on a body of theoretical work suggesting that a flat consumption tax is efficient in the sense of not distorting aggregate capital formation. A lucid review of the literature on consumption taxation, along with important qualifications to this result, is provided by Coleman (2000). A common feature in this literature is the assumption of market completeness. Under this assumption, the long-run after-tax return to capital is pinned down by an exogenous rate of time preference. Since a flat consumption tax does not alter this after-tax return, the implication is that aggregate capital in the long run is not affected by such a tax. When markets are incomplete, the long-run after-tax return to capital does not only depend on the exogenous rate of time preference. The (endogenous) intertemporal marginal rate of substitution also plays a role. As shown in Aiyagari (1994), a precautionary savings motive acts to increase the equilibrium capital stock relative to the first best. This note considers the effect of flat consumption taxes on precautionary savings and, hence, aggregate capital formation under incomplete markets.[2]

We provide conditions on utility such that a change in the flat consumption tax rate does not affect the capital. The conditions have a straightforward economic interpretation and are analogous to the restrictions on preferences required for balanced growth. These restrictions consist of a constant elasticity of intertemporal substitution in consumption and a marginal rate of substitution between consumption and leisure that is proportional to consumption. This result is of independent theoretical interest.

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1 Hall and Rabushka (1995) is, perhaps, the best-known example.

2 We assume throughout an infinite lifetime, hence abstracting from life-cycle considerations. Taxation models under incomplete markets which incorporate such considerations can be found in Imrohoroglu (1998) and Conesa et al. (2009). Browning and Burbidge (1990) and Ventura (1999) also provide such models, specifically focusing on consumption taxes.

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In addition, it contributes to a growing literature which aims to evaluate specific tax reforms in the presence of incomplete markets, in the following sense. The effects of reducing one type of tax (e.g. a capital income tax) are often evaluated while government budget balance is maintained by raising some other tax.[3] In a complete market framework, there is a natural way to balance the budget, namely by using lump-sum taxes. Since lump-sum taxes are not distortionary in that setup, they have the desirable property that they do not bring any additional effects on equilibrium variables over and above the effects of the tax reduction under consideration. This allows one to interpret the reform effects on equilibrium variables as arising purely from the reduction in the specific tax one is considering. With incomplete markets, however, lump-sum taxation does not have this neutrality property, because lump-sum taxes can have effects on precautionary savings. To put it differently, if one is interested in the pure effects of a reduction in some type of tax (say capital income taxes), then balancing the budget using lump-sum taxes will not be the best way to achieve this. Our result suggests that, for certain utility specifications, flat consumption taxes can play this role.

The model is briefly described in Section 2, the main result along with intuition is presented in Section 3, additional insights arising from numerical computations are discussed in Section 4, and concluding remarks are given in Section 5.

2. Model

The model used is a standard Aiyagari (1994) economy augmented with a government. Since this is a well-known model that has become a workhorse model in the study of incomplete markets and heterogeneity, it is only briefly presented here.

We consider an infinite-horizon, discrete-time economy with endogenous production and uninsurable labor income risk. A continuum (of measure 1) of households is indexed by $i \in [0, 1]$, and time is indexed by $t = 0, 1, 2, \ldots$. A representative firm uses aggregate capital K_t and effective labor N_t to produce goods using a Cobb–Douglas production function,

$$Y_t = AK_t^{\alpha} N_t^{1-\alpha} \tag{1}$$

where $\alpha \in (0, 1)$ and $A > 0$ is a scaling factor. Capital and labor are rented from households at competitive prices r_t and w_t, respectively. The capital depreciates at a rate $\delta \in [0, 1]$ and the firm pays this depreciation before returning the principal plus return to households. Profit maximization yields the usual input demand functions:

$$r_t = \alpha AK_t^{\alpha-1} N_t^{1-\alpha} - \delta \tag{2}$$

$$w_t = (1-\alpha) AK_t^{\alpha} N_t^{-\alpha}. \tag{3}$$

Household i derives utility from consumption c_{it} and disutility from work n_{it}. Utility is assumed to be additively separable over time, identical across households, and given by

$$E_0 \sum_{t=0}^{\infty} \beta^t u\left(c_{it}, n_{it}\right), \tag{4}$$

where $\beta \in (0, 1)$ is the subjective discount factor and E_0 denotes the expectation conditional on information at date $t = 0$. The precise form of the period utility function $u(.)$ will be discussed in the following section.

In each period t, households can save $a_{i,t+1}$. These savings are rented to the firm at the rate r_t, generating asset income in the following period. When a_{it} is negative, the household is in debt. In addition to asset income, household i earns labor income $w_t \epsilon_{it} n_{it}$ from supplying labor n_{it} to the firm. Labor income depends on individual-specific productivity ϵ_{it}, which varies stochastically. This productivity is i.i.d. across households, and follows a Markov process with transition matrix $\Pi(\epsilon'|\epsilon)$.[4]

The government has an exogenous constant level of spending G to undertake which it finances using taxes. In order to focus on our main interest, namely consumption taxes, we only allow the government to raise taxes through a constant proportional tax on consumption τ^c or through lump-sum taxes T_t.

Putting all elements together, the household's budget is given by

$$\left(1+\tau^c\right) c_{it} + a_{i,t+1} = w_t \epsilon_{it} n_{it} + (1+r_t)\, a_{it} - T_t \tag{5}$$

$$a_{i,t+1} \geq \bar{a}, \qquad 0 \leq n_{it} \leq 1, \tag{6}$$

where $\bar{a}$ is an exogenous borrowing limit.[5] The government maintains a balanced budget,

$$G = \tau^c C_t + T_t, \tag{7}$$

where $C_t = \int_0^1 c_{it} di$ is aggregate consumption. In equilibrium, prices should be such that supply and demand for capital and effective labor are equalized. Market clearing for goods is given by

$$C_t + K_{t+1} - (1-\delta) K_t + G = AK_t^{\alpha} N_t^{1-\alpha}, \tag{8}$$

and there should be consistency in the sense that the law of motion for aggregate capital must be consistent with the household's individual savings decisions.

Equilibrium prices and allocations are characterized by firm demand functions (2)–(3), household and government budget constraints (5)–(7), market clearing conditions, and the consistency condition, as well as by the following household optimality conditions:

$$u_c(c_{i,t}, n_{i,t}) \geq \beta\,(1-\delta+r_{t+1})\, E_t u_c(c_{i,t+1}, n_{i,t+1}), \tag{9}$$

with equality when $a_{i,t+1} > \bar{a}$, and

$$-u_n(c_{i,t}, n_{i,t}) \geq \frac{\varepsilon_i w_t}{1+\tau_c} u_c(c_{i,t}, n_{i,t}), \tag{10}$$

with equality when $n_{it} > 0$. These two describe the trade-offs from the household's perspective along the consumption–savings and the consumption–leisure margins, respectively.

3. Consumption tax effects

Consider an exogenous increase in G, financed by consumption taxes. Our main result states that aggregate capital and effective labor, and hence prices w_t and r_t, will not be affected as long as preferences satisfy two properties: a constant elasticity of intertemporal substitution in consumption and a marginal rate of substitution between consumption and leisure that is proportional to consumption levels. The following proposition proves this statement by constructing the changes in the tax rate τ^c and in individual consumption levels needed to ensure that all equilibrium conditions remain satisfied at the old levels of the aggregates.

Proposition 1. *In a standard Aiyagari (1994) model with a government, an exogenous increase in G, financed by an increase in τ^c, has no effect on aggregate capital accumulation provided that utility satisfies the following two conditions.* 1: *The elasticity of intertemporal substitution (EIS) in consumption is constant.* 2: *The marginal rate of substitution between consumption and leisure is proportional to consumption.*

[3] See, for example, Domeij and Heathcote (2004) and Anagnostopoulos et al. (2012).

[4] Although not crucial for our result, we make the simplifying assumption that there is no aggregate uncertainty, implying that wages and asset returns are certain.

[5] In what follows, we ignore the upper bound on n_{it} for simplicity. Our proposition does not rely on this simplification. In our numerical experiments, this constraint never binds.