Vol. 88 (2006), No. 2, pp. 103–129
DOI 10.1007/s00712-006-0185-7

Journal of Economics
Printed in Austria

Relative Wealth, Consumption Taxation, and Economic Growth

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Received June 26, 2004; revised version received December 3, 2005
Published online: April 18, 2006

This paper examines the role of the relative wealth-induced status motive in affecting the neutrality of consumption taxation in an optimizing growth model. It is found that a key factor determining the validity of the neutrality of consumption taxation in both the level sense and the growth rate sense is the desire for relative wealth-induced social status. When individuals care about their relative wealth, a rise in consumption tax enhances the steady-state level of capital stock and consumption. Furthermore, if the production function takes a linear technology form as the engine of sustained growth, then increases in consumption taxation raise the economy's long-run growth rate. In addition, an optimal consumption tax policy provides full subsidies to consumption so as to induce the economy to achieve the social optimum and the optimal growth rate.

Keywords: relative wealth, social status, consumption taxation, endogenous growth.

JEL Classification: D90, O40, E62, P10.

1 Introduction

The effect of a consumption tax on an economy has long been discussed among economic policy makers and academic economists. The supporting argument for consumption taxation says that a proportional consumption tax does not directly distort intertemporal consumption-savings behavior. In the standard neoclassical growth model without labor-leisure choice, Schenone (1975), Summers (1981), Abel and Blanchard (1983), Auerbach and Kotlikoff (1987), and Itaya (1991) establish the well-known conclusion that consumption taxation affects neither the capital stock nor consumption in the transition process as well as in the stationary state if the tax revenue collected is fully rebated to consumers as a lump-sum transfer. This result is dubbed the neutrality of consumption taxation. These studies have all paid attention to the analysis of the *level* effect of consumption taxation. More recently, Stokey and Rebelo (1995), and Milesi-Ferretti and Roubini (1998) extend the study of consumption taxation to the Lucas (1988)-type endogenous growth framework in which the growth process is driven by the joint accumulation of physical and human capital. In particular, Milesi-Ferretti and Roubini (1998, p. 733) consider the case whereby there is no labor-leisure choice and the tax revenue generated by the consumption tax is rebated in a lump-sum fashion to consumers. They find that a consumption tax has no growth effects.[1] That is, the neutrality of consumption taxation in the *growth rate* sense is valid.

A common feature in the existing literature mentioned above is that they do not consider the linkage between the accumulated stocks of wealth (in terms of capital) and an agent's preferences. As pointed out by Corneo and Jeanne (1997, p. 87), "This policy analysis, however, neglects the possibility that the human need for social status may influence the extent to which individuals perform growth-enhancing activities." In the real world, individuals accumulate wealth not just for its implied consumption reward, but also for its induced social status. This is exactly the role of the spirit of capitalism, as emphasized by Weber (1958), which motivates the continual accumulation of wealth not only for the material rewards that it can serve to bring, but also for its own sake.[2] As a result, the agent's preference should depend on one's wealth holdings as well as one's consumption. Kurz (1968) first establishes such a linkage and names it "wealth effects".

Corneo and Jeanne (1997) develop a model of endogenous growth in which the technological factor depends on the aggregate stock of capital, all agents are identical, and all individuals care about their relative wealth-induced social status. They find that the presence of status seeking

1 Stokey and Rebelo (1995, pp. 534–36) consider the case in which there exists a labor-leisure choice and the tax revenue generated by the consumption tax is *not* rebated in a lump-sum manner to consumers. They find that changes in consumption taxes have no growth effects.

2 A detailed description for the status concern in both the history of economic thought and modern analysis of economic growth is provided by Zou (1994).

leads to a faster steady-state growth rate and the economy's steady-state growth rate is socially optimal if the desire for social status is sufficiently important. Futagami and Shibata (1998, p. 110) clearly state that "an agent's utility depends on its relative position in the society rather than the absolute level of its own wealth."[3] Furthermore, they employ a generalized specification of preferences and consider two cases: symmetric agents and heterogeneous agents. They show that an increase in the status preference enhances the steady-state growth rate if the agents are symmetric, but an increase in the status preference may reduce the steady-state growth rate if the agents are heterogeneous. Long and Shimomura (2004) extend the Corneo and Jeanne (1997) model to consider asymmetric agents. They show that catching-up arises under optimal savings if individuals strongly care about their relative wealth.

In line with these studies, using both exogenous and endogenous growth models, this paper attempts to examine the role of relative wealth-induced social status on the validity of the neutrality of consumption taxation in an intertemporal optimizing growth model in which the tax revenue generated by the consumption tax is fully rebated in a lump sum fashion to consumers. It can be shown that the neutrality of consumption taxation in both the *level* sense and the *growth rate* sense is not tenable when the desire for relative wealth-induced social status is present in the utility function. Furthermore, when individuals care about their relative wealth-induced social status, the optimal consumption tax policy is to

3 A competing way to model a preference for social status is to specify that the agent's preference depends on *relative consumption*. Among the literature, Galí (1994) introduces relative consumption into an asset pricing model and shows that relative consumption affects the optimal risky share. Harbaugh (1996) uses a relative consumption model and finds that concern for relative consumption can lead to an increase in precautionary savings. Rauscher (1997) demonstrates that relative consumption is not an engine of growth, but may lead to an acceleration of economic growth and that taxes can be used to correct the externalities of status competition. By using the generalized specifications of preferences, Fisher and Hof (2000) introduce the concept of the effective intertemporal elasticity of substitution into the analysis. They not only provide conditions for the observational equivalence between economies with consumption externalities and externality-free economies, but also characterize and enrich the Rauscher (1997) results. More recently, Liu and Turnovsky (2005) consider both consumption and production externalities in a model of capital accumulation with endogenous labor and study the consequences of both externalities for capital accumulation. In particular, they show that the effects of consumption externalities on the steady-state equilibrium depend crucially on the elasticity of labor supply.

provide full subsidies to consumption so as to induce the economy to achieve the social optimum and the optimal growth rate.

The rest of the paper is organized as follows. The basic framework is outlined in Sect. 2. Section 3 examines the dynamic properties of the system, the steady-state and short-run effects of consumption taxation on capital stock and consumption, and the welfare implication in the context of an exogenous growth model. Section 4 studies the effects of consumption taxation on the economy's steady-state growth rate and the optimal consumption tax policy for the optimal growth rate in the context of an endogenous growth model. Finally, Sect. 5 concludes the main findings of our analysis.

2 The Model

The model we use is an amended framework of Kurz (1968), and Corneo and Jeanne (1997). The economy consists of a continuum of infinitely-lived identical agents with unit mass and a government. All agents have common preferences, share the technology of production that is commonly available, and are endowed with the same positive amount of wealth. Consider a continuous-time, perfect-foresight model of optimizing growth in which individuals may care about their social status. For simplicity, labor is inelastically supplied and normalized to unity.

A representative agent's optimization problem can be expressed as

$$\max \int_0^\infty [U(c) + \theta V(k/\bar{k})] \exp(-\rho t) dt, \tag{1}$$

subject to

$$\dot{k} = f(k) + R - (1 + \tau_c)c, \tag{2}$$

where $c =$ real consumption, $\theta =$ a nonnegative parameter reflecting the desire for social status and the strength of status preference, $k =$ an agent's capital stock, $\bar{k} =$ the average level of capital stock in the economy, $R =$ real lump-sum transfers from the government, $\tau_c =$ a proportional consumption tax rate, $\rho =$ a constant rate of time preference, t denotes time, and an overdot denotes the time derivative. The instantaneous utility functions U and V are assumed to be well-behaved, satisfying $U' > 0$, $V' > 0$, $U''< 0$, $V''< 0$, and the Inada conditions. In addition, output y is produced using a stock of productive capital k according to a neoclassical production function $f(k)$ which satisfies $f' > 0, f''< 0$, and the Inada conditions in an exogenous growth model. On the other hand, if the production function takes a linear technology form of Rebelo (1991) as the engine of sustained growth, then $f' > 0$ and $f'' = 0$ prevail.

When an individual cares about relative wealth-induced social standards ($\theta > 0$), the utility function in Eq. (1) embodies the feature of direct benefits stemming from an agent's wealth relative to the economy's average wealth, as proposed by Corneo and Jeanne (1997) and Futagami and Shibata (1998). However, when the motive of status seeking is absent ($\theta = 0$), the utility function in Eq. (1) reduces to the standard form in an optimizing growth model. Equation (2) is the familiar budget constraint with k being given at its initial values k_0.

Letting λ be the co-state variable of the current value Hamiltonian associated with equation (2), the optimum conditions necessary for an agent are

$$U'(c) = \lambda(1 + \tau_c), \tag{3}$$

$$\theta V'(k/\bar{k})/\bar{k} + \lambda f'(k) = -\dot{\lambda} + \lambda\rho, \tag{4}$$

together with Eq. (2) and the transversality condition of k,

$$\lim_{t\to\infty} \exp(-\rho t)\lambda k = 0.$$

Since the agents are assumed to be identical, in a symmetric equilibrium all agents own the same amount of capital. Thus, $k = \bar{k}$ is true in equilibrium. Equation (4) is accordingly rewritten as

$$\theta V'(1)/k + \lambda f'(k) = -\dot{\lambda} + \lambda\rho, \tag{4a}$$

where $V'(1)$ is the marginal utility of relative wealth-induced social status in equilibrium. Equation (4a) is the Euler condition determining the optimal accumulation of capital based on the effective rate of returns. The effective rate of returns of capital consists of the rewards from a relative wealth-induced social status due to newly-increased capital plus the marginal product of capital.

The government collects its tax revenues from consumption taxation and fully redistributes tax revenues to taxpayers in lump-sum rebates. That is

$$\tau_c c = R. \tag{5}$$

Since the focus of our analysis is on the effect of consumption taxation, we assume that the government balances its budget by adjusting continuously lump-sum transfer payments. Specifically, the consumption tax rate, τ_c, is treated as a policy parameter while a lump-sum transfer payment, R, is an endogenous variable.

Putting Eqs. (2) and (5) together, the goods market equilibrium is

$$\dot{k} = f(k) - c. \tag{6}$$

3 Consumption Taxation and Exogenous Growth

Based on the exogenous growth model, this section investigates whether an increase in the consumption tax rate will affect the level of capital stock and consumption in the steady state and the short run. At the long-run equilibrium, the economy is characterized by $\dot{\lambda} = \dot{k} = 0$. As a consequence, manipulating Eqs. (3), (4a), and (6), one obtains:

$$U'(c^*) = \lambda^*(1 + \tau_c), \tag{7}$$

$$\theta V'(1)/k^* + \lambda^* f'(k^*) = \lambda^* \rho, \tag{8}$$

$$f(k^*) = c^*, \tag{9}$$

where c^*, λ^*, and k^* respectively denote the stationary values of c, λ, and k.

Before we conduct the steady-state analysis, we should examine the dynamic property of the system constituting Eqs. (3), (4a), and (6). As we focus on the effect of a permanent increase in consumption tax on the capital stock and consumption, differentiating Eq. (3) with respect to time and substituting Eq. (4a) into the resulting equation give

$$\dot{c} = [U'(c)(\rho - f'(k)) - (1 + \tau_c)\theta V'(1)/k]/U''. \tag{10}$$

The phase diagram is illustrated in Figs. 1 and 2. From Eq. (6), we take the combinations of k and c that satisfy $\dot{k} = 0$ and call it the $\dot{k} = 0$ locus. If $k = 0$, then output is zero and hence consumption is zero. The $\dot{k} = 0$ locus begins at the origin. When $k > 0$, the slope of the $\dot{k} = 0$ locus and the curvature of its slope are, respectively,

$$\frac{\partial c}{\partial k}\Big|_{\dot{k}=0} = f' > 0, \tag{11a}$$

$$\frac{\partial\left(\frac{\partial c}{\partial k}\Big|_{\dot{k}=0}\right)}{\partial k} = f''<0. \tag{11b}$$

Furthermore, as $\partial\dot{k}/\partial k = f' > 0$ from Eq. (6), k increases (decreases) when the economy lies to the right (left) of the $\dot{k} = 0$ curve.

The $\dot{c} = 0$. locus is similarly the combination of k and c that will satisfy $\dot{c} = 0$ in Eq. (10) for a given positive value of τ_c and θ. Equation (10) with $\dot{c} = 0$ gives:

$$U'(c)(\rho - f'(k)) = (1 + \tau_c)\theta V'(1)/k. \tag{12}$$

If $k = 0$, then Eq. (12) cannot be satisfied since $\rho - f'(0) \to -\infty$ violates $\rho - f'(k) > 0$ in Eq. (12). As a consequence, the $\dot{c} = 0$ locus does not include the c-axis. When $k > 0$, the slope of the $\dot{c} = 0$ locus is

$$\frac{\partial c}{\partial k}\Bigg|_{\dot{c}=0} = [U'f'' - (1 + \tau_c)\theta V'(1)/k^2]/(\rho - f')U'' > 0. \tag{13}$$

It is clear that the $\dot{c} = 0$ locus can be either convex or concave. Moreover, since $\partial\dot{c}/\partial c = \rho - f' > 0$ from Eq. (10), c increases (decreases) when the economy lies above (below) the $\dot{c} = 0$ curve.

Based on the above information, we may have two possible outcomes on the analytical argument. If the $\dot{c} = 0$ curve is positively sloping and convex, then as is exhibited in Fig. 1, the $\dot{c} = 0$ locus cuts the $\dot{k} = 0$ locus from *below* and the $\dot{c} = 0$ locus intersects the $\dot{k} = 0$ locus once. A unique equilibrium is established at point E and shows a saddlepoint stability. If the $\dot{c} = 0$ curve is positively sloping and concave, then as is illustrated in Fig. 2, the $\dot{c} = 0$ locus intersects the $\dot{k} = 0$ locus twice and hence

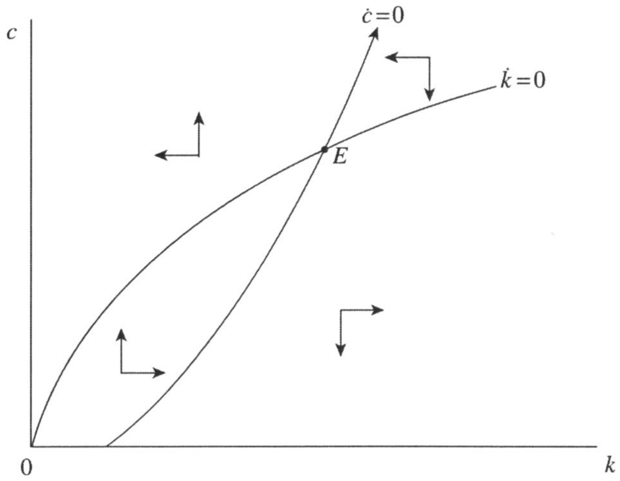

Fig. 1.

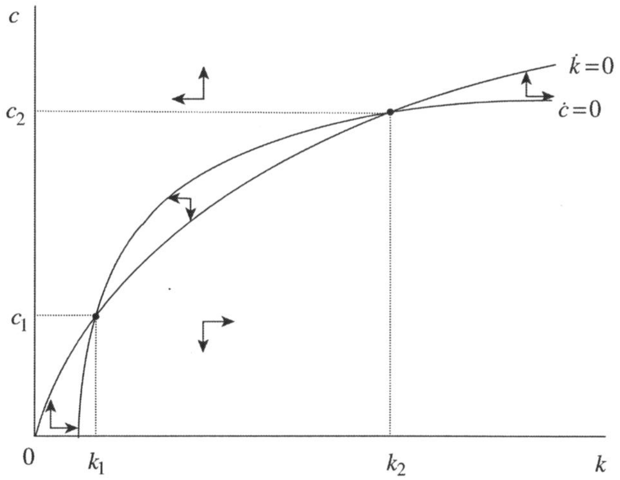

Fig. 2.

multiple steady-state equilibria are obtained. The equilibrium at (k_1, c_1) in which the $\dot{c} = 0$ locus cuts the $\dot{k} = 0$ locus from *below* corresponds to a saddlepoint. The other equilibrium at (k_2, c_2) in which the $\dot{c} = 0$ locus cuts the $\dot{k} = 0$ locus from *above* yields an unstable node. From Figs. 1 and 2, the saddlepoint stability requires $\partial c/\partial k|_{\dot{c}=0} > \partial c/\partial k|_{\dot{k}=0}$. Therefore, we establish the following proposition:

Proposition 1: If a desire for relative wealth-induced social status is present, then the economy may have a unique saddlepoint equilibrium or multiple steady-state equilibria, whereby one equilibrium is a saddlepoint and the other one is an unstable node.

In order to assess the relevance of the above inference, this paper provides a numerical simulation. We begin with setting reasonable functional forms. The instantaneous utility is assumed as $U(c) + \theta V(k/\bar{k}) = (c^{1-\sigma} - 1)/(1-\sigma) + \theta(k/\bar{k})^{\beta}$, $\sigma > 0$, $\theta > 0$, and $0 < \beta < 1$. When $\sigma = 1$, the instantaneous utility reduces to $\log(c) + \theta(k/\bar{k})^{\beta}$ as proposed by Corneo and Jeanne (1997). The production function is taken to be Cobb-Douglas, $f(k) = Ak^{\alpha}$, $0 < \alpha < 1$, since inelastic supplied labor is normalized to be unity. We first use this parameterized version of the model to discuss the slope and the curvature of both the $\dot{k} = 0$ locus and the $\dot{c} = 0$ locus and the accompanying issue of whether or not there exist multiple equilibria.

On the basis of the explicit forms of the instantaneous utility and the production function, the $\dot{k} = 0$ locus and the $\dot{c} = 0$ locus are, respectively,

$$c = Ak^{\alpha} \text{ and } c = [k(\rho - \alpha Ak^{\alpha-1})/(1+\tau_c)\eta]^{1/\sigma},$$

where $\eta \equiv \theta\beta$. From the above relationships, we have:

$\partial c/\partial k|_{\dot{k}=0} = \alpha Ak^{\alpha-1} > 0$, $\quad \partial(\partial c/\partial k|_{\dot{k}=0})/\partial k = \alpha(\alpha-1)Ak^{\alpha-2} < 0$, $\partial c/\partial k|_{\dot{c}=0} = c(\rho - \alpha^2 Ak^{\alpha-1})/\sigma k(\rho - \alpha Ak^{\alpha-1}) > 0$, and $\partial(\partial c/\partial k|_{\dot{c}=0})/\partial k = c\{(1/\sigma - 1)(\rho - \alpha^2 Ak^{\alpha-1})^2 + \alpha^2(1-\alpha)\, Ak^{\alpha-1}(\rho - \alpha Ak^{\alpha-1})\}/\sigma[k(\rho - \alpha Ak^{\alpha-1})]^2$.

Obviously, the curvature of the $\dot{c} = 0$ locus deserves further discussions. If $\sigma \leq 1$, then $\partial(\partial c/\partial k|_{\dot{c}=0})/\partial k > 0$ is true and the $\dot{c} = 0$ curve is convex. If $\sigma > 1$, then $\partial(\partial c/\partial k|_{\dot{c}=0})/\partial k \gtreqless 0$ depends on $1 - 1/\sigma \lesseqgtr \alpha^2(1-\alpha)Ak^{\alpha-1}(\rho - \alpha Ak^{\alpha-1})/(\rho - \alpha^2 Ak^{\alpha-1})^2$ and the $\dot{c} = 0$ curve may be either convex or a convex followed by a concave. Furthermore, comparing the slopes of both curves, we obtain:

$\partial c/\partial k|_{\dot{c}=0} - \partial c/\partial k|_{\dot{k}=0} = c[(1-\alpha\sigma)(\rho - \alpha Ak^{\alpha-1}) + \alpha(1-\alpha)\, Ak^{\alpha-1}]/\sigma k(\rho - \alpha Ak^{\alpha-1})$.

If $(1 - \alpha\sigma) \geq 0$, then $\sigma \leq 1/\alpha$ is true and hence both $\sigma \leq 1$ and $1 < \sigma \leq 1/\alpha$ satisfy such a condition. Hence, $\partial c/\partial k|_{\dot{c}=0} > \partial c/\partial k|_{\dot{k}=0}$

definitely holds. The $\dot{c} = 0$ locus cuts the $\dot{k} = 0$ locus from below and there is a unique equilibrium. If $(1 - \alpha\sigma) < 0$, then $\sigma > 1/\alpha$ is true and hence $\sigma > 1$ holds. In this case, $\partial c/\partial k|_{\dot{c}=0} \gtreqless \partial c/\partial k|_{\dot{k}=0}$ depends on $\sigma \lesseqgtr (\rho - \alpha^2 A k^{\alpha-1})/\alpha(\rho - \alpha A k^{\alpha-1})$. Since $(\rho - \alpha^2 A k^{\alpha-1})/\alpha(\rho - \alpha A k^{\alpha-1}) > 1/\alpha$, the $\dot{c} = 0$ locus cuts the $\dot{k} = 0$ locus from below when $1/\alpha < \sigma \leq (\rho - \alpha^2 A k^{\alpha-1})/\alpha(\rho - \alpha A k^{\alpha-1})$, and the $\dot{c} = 0$ locus intersects the $\dot{k} = 0$ locus twice and hence there exist multiple steady-state equilibria when $\sigma > (\rho - \alpha^2 A k^{\alpha-1})/\alpha(\rho - \alpha A k^{\alpha-1})$.

We now provide numerical examples. Consider an economy with $\rho = 0.25$, $\tau_c = 0.05$, $\sigma = 1$, $\eta = 0.2$, $A = 0.4$, $\alpha = 0.6$, and k_0 (the initial capital stock) = 0.1.[4] Figure 3 illustrates that the $\dot{k} = 0$ curve is concave while the $\dot{c} = 0$ locus is convex. There is a unique equilibrium, whereby the $\dot{c} = 0$ locus cuts the $\dot{k} = 0$ locus from below. We then vary the value of σ from 1 to 3 and 5, respectively. Figure 4 corresponds to $\sigma = 3$ and the result is similar to that of Fig. 3. The result of $\sigma = 5$ is shown in Fig. 5 and there are multiple steady-state equilibria, whereby the $\dot{c} = 0$ locus intersects the $\dot{k} = 0$ locus twice. One equilibrium is a saddlepoint and the other one is an unstable node. Finally, by using Fig. 5, we vary the value of τ_c for a given η and that of η for a given τ_c, respectively. When τ_c increases from 5% to 100%, Figure 6 shows the result which is similar to Fig. 5.[5,6] As is illustrated in Fig. 7, if η

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4 We could consider other numerical examples with $\rho = 0.05$, $\tau_c = 0.05$, $\eta = 2.5$, $A = 0.3$, $\alpha = 0.33$, $k_0 = 0.1$, and $\sigma = 1$, 3, and 5, respectively. The results of $\sigma = 1$ and $\sigma = 3$ are similar to those in the text. Although the result of $\sigma = 5$ also reveals that there exist multiple steady-state equilibria, the portion in the graph whereby the $\dot{c} = 0$ locus intersects the $\dot{k} = 0$ locus twice is not clear because both loci almost coincide with each other. The graphical presentation for a sensitivity analysis of varying τ_c and η in this case is not clear, either. Since our objective does not conduct a strict calibration analysis and only provides numerical examples to prove theoretical findings, we choose numerical examples in the text for presenting a clear graph. This point was raised by an anonymous referee, to whom I am grateful.

5 It is a reasonable assumption that τ_c cannot exceed unity.

6 It seems from Figs. 5 and 6 that raising the consumption tax from 5% to 100% leads to no visible change in the saddlepoint equilibrium values of capital and consumption. Our numerical example however, indicates that the equilibrium value of capital increases 1.7% and that of consumption increases 0.4%. Consumption tax is found to have only *small* effects on the stationary values of capital and consumption. This result in fact depends on the slope of the $\dot{k} = 0$ curve and the extent of a shift in the $\dot{c} = 0$ curve, which in turn hinge on the specified parameter values.

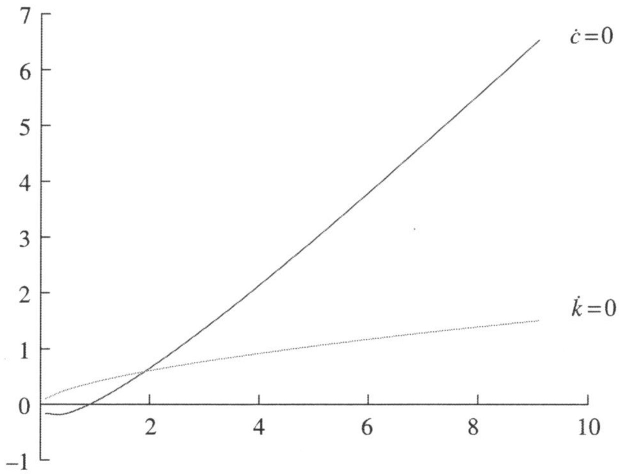

Fig. 3. $\sigma = 1$, $\tau_c = 0.05$, $\eta = 0.2$

increases from 0.2 to 1.9099728, then multiple steady-state equilibria in Fig. 5 reduce to one equilibrium, whereby the $\dot{c} = 0$ locus intersects the $\dot{k} = 0$ locus at a tangent point and it is an unstable one. For a saddlepoint, the value of the status parameter η must be smaller than 1.9099728.

Since this paper puts emphasis on the effectiveness of consumption taxation, a unique perfect-foresight path converging to the steady state is crucial for a rational-expectations economy. As documented by the literature of perfect-foresight models (for example, Buiter, 1984, and Turnovsky, 1995), if the number of unstable roots equals the number of jump variables, then there exists a *unique* perfect-foresight equilibrium solution. Since the dynamic system has one predetermined variable, k, and one jump variable, c, it must exhibit the regular saddlepoint property to ensure a unique stable trajectory leading to the steady state. As a consequence, the regular saddlepoint property requires that

$$\Delta = [U'f'' - (1+\tau_c)\theta V'(1)/k^2]/(\rho - f')U'' - f' > 0. \qquad (14)$$

Equation (14) guarantees that the $\dot{c} = 0$ locus cuts the $\dot{k} = 0$ locus from below.

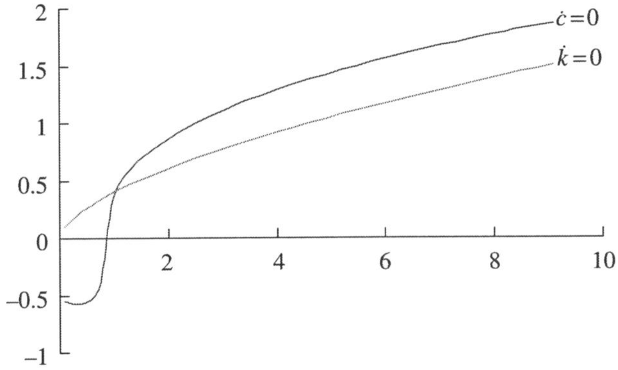

Fig. 4. $\sigma = 3$, $\tau_c = 0.05$, $\eta = 0.2$

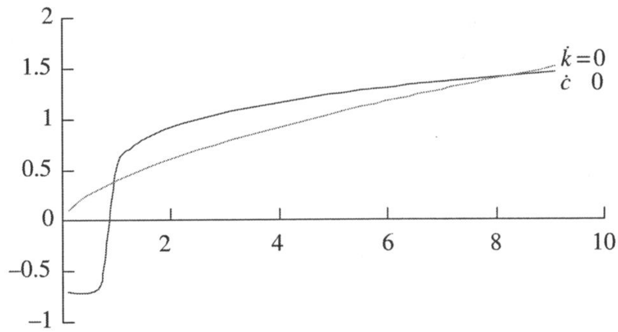

Fig. 5. $\sigma = 5$, $\tau_c = 0.05$, $\eta = 0.2$

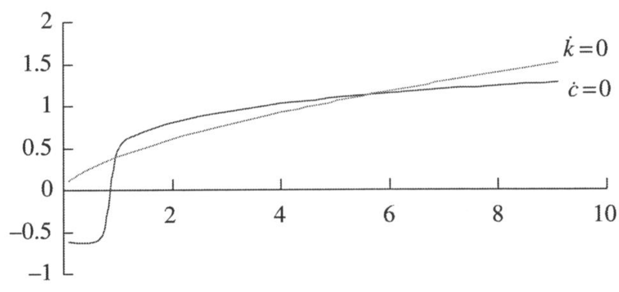

Fig. 6. $\sigma = 5$, $\tau_c = 1$, $\eta = 0.2$

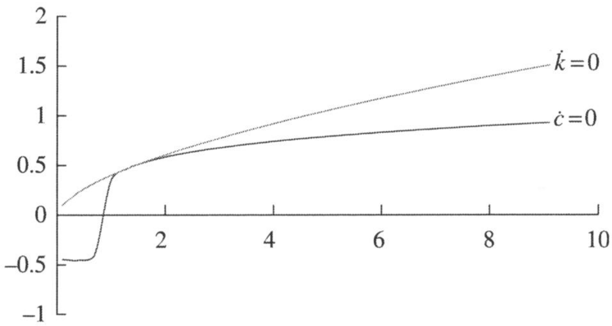

Fig. 7. $\sigma = 5$, $\tau_c = 0.05$, $\eta = 1.9099728$

Now we are in a position to undertake the steady-state analysis. The comparative statics on the steady state are straightforward. From Eqs. (7)–(9), we have:[7]

$$\frac{\partial k^*}{\partial \tau_c} = -\theta V'(1)/U''(\rho - f')\Delta k^* \geq 0, \text{ as } \theta \geq 0, \tag{15a}$$

$$\frac{\partial c^*}{\partial \tau_c} = f' \cdot \frac{\partial k^*}{\partial \tau_c} \geq 0, \text{ as } \theta \geq 0. \tag{15b}$$

Equations (15a) and (15b) indicate that the desire for relative wealth-induced social status is a key factor in determining the neutrality of consumption taxation, even though the tax revenue collected is fully rebated to consumers as lump-sum transfers. Specifically, an increase in

7 The original expression of $\partial k^*/\partial \tau_c$ is

$$\partial k^*/\partial \tau_c = \lambda^*(\rho - f')/D,$$

where $D = -(1 + \tau_c)[\lambda^* f'' - \theta V'(1)/k^{*2}] + U'' f'(\rho - f') = -U''(\rho - f')\Delta$. In the latter expression of D, we have used Eq. (7). From Eq. (8), we have

$$\lambda^*(\rho - f') = \theta V'(1)/k^*.$$

By using $\lambda^*(\rho - f') = \theta V'(1)/k^*$ in the numerator of $\partial k^*/\partial \tau_c$, we obtain Eq. (15a) in the text.

the consumption tax rate has no effect on both the steady-state capital stock and the steady-state consumption if the effect of relative wealth-enhanced social status is absent ($\theta = 0$).

The above result without a concern for relative wealth is exactly the conclusion of the existing literature such as Schenone (1975), Summers (1981), Abel and Blanchard (1983), Auerbach and Kotlikoff (1987), and Itaya (1991). By contrast, if individuals care about their relative wealth ($\theta > 0$), then an increase in the consumption tax rate leads to an increase in both the steady-state capital stock and the steady-state consumption. Given the production technology $f(k)$, the steady-state output thus increases following a rise in τ_c. Evidently, the presence of status seeking leads to a *boom* in economic activities as a result of consumption taxation. This outcome runs in sharp contrast to the conclusion of the existing literature mentioned above.

The economic reasoning for the sharp difference between the existing literature mentioned above and this paper can be explained as follows. In a standard neoclassical growth model in which the motive of status seeking is absent ($\theta = 0$), Eq. (8) degenerates to the famous modified golden rule, $f'(k^*) = \rho$. As a result, the steady-state capital stock is directly tied to a constant rate of time preference and remains intact following a rise in τ_c. With an unchanged k^*, the steady-state consumption must remain constant to ensure equilibrium in the goods market. The neutrality of consumption taxation is thus valid. However, if the desire for relative wealth-induced social status is present ($\theta > 0$), then from Eq. (8) the stationary capital stock is no longer tied in with the constant time preference. Therefore, it creates an additional channel that leads a consumption tax policy to affect the steady-state capital stock and hence the steady-state consumption. The neutrality of consumption taxation is not tenable even if the tax revenue collected is fully rebated to taxpayers as a lump-sum transfer. As a consequence, we come to the following proposition:

Proposition 2: The desire for relative wealth-induced social status is a key factor in determining the validity of the neutrality of consumption taxation in the steady state, even though the tax revenue collected is fully rebated to consumers as lump-sum transfers. Specifically, the neutrality of consumption taxation is not tenable in the long run if individuals care about their relative wealth-induced social status.

It is interesting to examine the transitional adjustment of k and c in response to an unanticipated permanent increase in τ_c when individuals care about their relative wealth ($\theta > 0$).[8] Assume that initially, at time $t = 0$, the economy is in a steady state with $\tau_c = \tau_c^0$. At the same time, we suppose that the authorities increase the consumption tax rate from τ_c^0 to τ_c^1 permanently at $t = 0$.

In Fig. 8, the initial equilibrium, where the $\dot{c} = 0(\tau_c^0)$ locus intersects the $\dot{k} = 0$ locus, is established at E_0; the initial capital stock and consumption are k_0 and c_0, respectively. Upon the shock of an unanticipated permanent increase in consumption tax, the $\dot{c} = 0(\tau_c^0)$ locus shifts downward to the $\dot{c} = 0(\tau_c^1)$ locus while the $\dot{k} = 0$ curve stays put.[9] At point E_*, $\dot{c} = 0(\tau_c^1)$ intersects $\dot{k} = 0$, with k and c being k_* and c_*, respectively. The new long-run values of capital stock and consumption are at higher levels. As is evident in Fig. 8, at the instant of an unexpected rise in consumption tax, the capital stock remains intact since it is predetermined, but consumption must immediately decrease from c_0 to c_{0^+} so as to place the economy exactly at point E_{0^+} on the stable branch *SS*. Since at point E_{0^+} the economy has positive savings as a result of a sudden fall in consumption, from 0^+ onwards, the capital stock increases and is accompanied by an increasing consumption as the economy moves along the *SS* curve towards its new steady-state equilibrium E_*.

The intuitive explanation for the short-run dynamics of consumption and capital stock is as follows. An unanticipated permanent increase in the consumption tax rate raises the opportunity cost of purchasing consumption goods relative to capital goods. Moreover, a higher level of capital goods enhances social status and boosts consumer's utility. Accordingly, a rise in the consumption tax leads to a decrease in consumption on impact. A decrease in consumption results in positive savings, thereby encouraging capital accumulation. Thereafter, the capital stock increases over time. More capital input means more output (income), inducing agents to gradually increase consumption. Thus, we have the following proposition:

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8 A brief mathematical derivation for the transitional adjustment of the economy is provided in Appendix A.

9 From Eq. (A.1) of Appendix A, we have:

$$\partial c/\partial \tau_c\big|_{\dot{k}=0} = 0 \quad \text{and} \quad \partial c/\partial \tau_c\big|_{\dot{c}=0} = -b_1/a_{22} < 0.$$

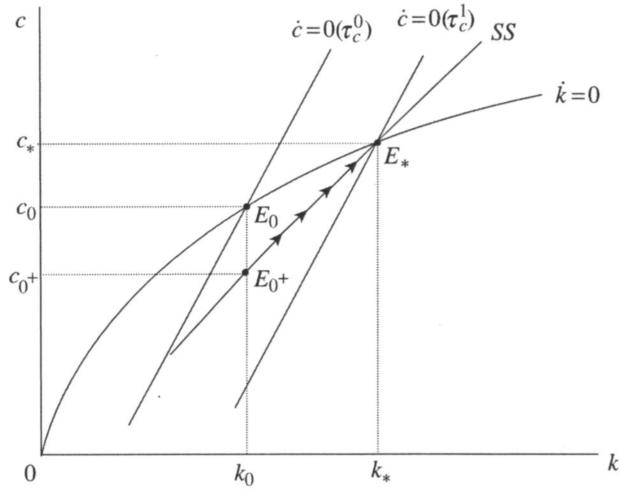

Fig. 8.

Proposition 3: In response to an unanticipated permanent increase in the consumption tax rate, the impact response and the steady-state response of consumption are in opposite direction. In the transition process, both the capital stock and consumption increase. The neutrality of consumption taxation is not tenable in the short run if the motive of status seeking is present.

We finally discuss both the impact of an unanticipated permanent increase in the consumption tax rate on the social welfare in the economy and how a welfare-maximizing government chooses the optimal consumption tax policy. Since the agents are assumed to be identical, in a symmetric equilibrium the social welfare W is:

$$W = \int_0^{\infty} [U(c) + \theta V(1)] \exp(-\rho t) dt. \tag{16}$$

The social welfare obviously depends on the time path of consumption as follows:[10]

$$c = c^*(\tau_c) + (s_1 - f')(\partial k^* / \partial \tau_c) \mathrm{d}\tau_c \exp(s_1 t), \tag{17}$$

10 From Eqs. (A.4b) and (A.6) of Appendix A, we obtain Eq. (17) in the text.

where $c^*(\tau_c) = c^*(\tau_c^1) - c^*(\tau_c^0)$, $\mathrm{d}\tau_c = (\tau_c^1 - \tau_c^0)$, and s_1 is a negative eigenvalue. Accordingly, from Eqs. (16) and (17), the effect of an increase in consumption taxation on the social welfare is given by:[11]

$$\partial W/\partial\tau_c = -s_1(1+\tau_c)\theta V'(1)(\partial k^*/\partial\tau_c)/\rho(s_1-\rho)kU'. \qquad (18)$$

If the motive of status seeking is absent ($\theta = 0$), then the steady-state capital stock remains intact ($\partial k^*/\partial\tau_c = 0$) and hence consumption taxation does not affect social welfare. If the desire for relative wealth-induced social status is present ($\theta > 0$), then the steady-state capital stock increases with consumption taxation and hence the effect of consumption taxation on social welfare decreases. These results can be explained as follows. As is well known in the literature, the effect of government policy changes on the social welfare comprises two types of effects: the steady-state effects and the dynamic effects along the transitional path. When the motive of status seeking is absent, the effect of consumption taxation is neutral in the steady state and along the transition path since initially the economy is in the steady state. As a result, social welfare remains intact. When individuals care about their relative wealth, the steady-state effects of the level of welfare increase with consumption taxation since the effect of consumption taxation enhances the capital stock and hence consumption in the steady state. However, as is shown in Figure 8, an increase in the consumption tax rate leads to a short-run decrease in consumption below the new steady state, both on impact and along the entire adjustment path. Thus, the level of welfare deteriorates during the transitional path. As the dynamic effects dominate the steady-state effects, the impact of consumption taxation on social welfare is decreasing. Therefore, we establish the following proposition:

Proposition 4: If the motive of status seeking is absent, then consumption taxation does not affect social welfare. If the desire for relative wealth-induced social status is present, then the effect of consumption taxation on social welfare is negative.

11 The original expression of $\partial W/\partial\tau_c$ is

$$\partial W/\partial\tau_c = s_1(f'-\rho)(\partial k^*/\partial\tau_c)/\rho(s_1-\rho).$$

In deriving the above result, we have used Eq. (15b). Furthermore, from Eq. (12) we have $(f'-\rho) = -(1+\tau_c)\theta V'(1)/kU'$. As a result, we yield Eq. (18) in the text.

The objective of a welfare-maximizing government is to choose an optimal consumption tax rate so as to maximize Eq. (16) by considering Eq. (17). The necessary condition for this maximization is to let $\partial W/\partial \tau_c = 0$ in Eq. (18). Obviously, if individuals do not care about their relative wealth-induced social status, then $\partial W/\partial \tau_c = 0$ in Eq. (18) is automatically fulfilled and hence there is no choice problem of an optimal rate of consumption tax since there is no status-seeking externality and any consumption tax rate is as good as any other. If individuals do care about their relative wealth, the $\tau_c = -1$ satisfies $\partial W/\partial \tau_c = 0$ in Eq. (18). Thus, consumption should be fully subsidized. The following proposition summarizes the results mentioned above.

Proposition 5: A welfare-maximizing government has no choice problem for an optimal rate of consumption tax if individuals do not care about their relative wealth-induced social status, but provides full subsidies to consumption if individuals care about relative wealth-induced social status.

4 Consumption Taxation and Endogenous Growth

This section first amends the previous exogenous growth model to an endogenous growth model and then examines whether a consumption tax policy will affect the economy's steady-state growth rate when the effects of relative wealth-induced social status enter the picture. To obtain an explicit closed-form solution of the endogenous-growth rate, following Barro (1990) and Rebelo (1991), the production function exhibits constant returns to scale with respect to capital as the engine of sustained growth. That is

$$f(k) = Ak, \quad A > 0. \tag{19}$$

Furthermore, in line with Corneo and Jeanne (1997), the model is specialized with the following utility function:

$$U(c) = \log(c). \tag{20}$$

Given $f(k) = Ak$, $f'(k) = A$, and $U'(c) = 1/c$, Eqs. (3), (4a), and (6) can be rewritten as:

$$1/c = \lambda(1 + \tau_c), \tag{3a}$$

$$\theta V'(1)/k + \lambda A = -\dot{\lambda} + \lambda\rho, \tag{4a$'$}$$

$$\dot{k} = Ak - c. \tag{6a}$$

From Eqs. (3a) and (4a)′, the growth rate of consumption is as follows:

$$\dot{c}/c = \theta V'(1)(1 + \tau_c)c/k + A - \rho. \tag{21}$$

In addition, the goods market equilibrium condition provides the growth rate of capital stock:

$$\dot{k}/k = A - c/k. \tag{22}$$

Equations (21) and (22) constitute a set of dynamic equations with respect to c and k in an endogenous-growth economy.

Following Futagami, Morita, and Shibata (1993), and Barro and Sala-i-Martin (1995), we define the following variable:

$$x \equiv c/k,$$

since the growth rate of relevant variables will be the same along the balanced growth path. Accordingly, we can utilize Eqs. (21) and (22) to derive a dynamic equation in terms of the transformed variable, x, as follows:

$$\dot{x}/x \equiv \dot{c}/c - \dot{k}/k = \theta V'(1)(1 + \tau_c)x - \rho + x. \tag{23}$$

At the steady-state growth equilibrium, the economy is characterized by $\dot{x} = 0$, and x is at its stationary value, namely x^*.[12] From Eq. (23) with $\dot{x} = 0$, we have:

$$x^* = \rho/[1 + \theta V'(1)(1 + \tau_c)] > 0. \tag{24}$$

Letting γ^* denote the steady-state growth rate and substituting equation (24) into Eqs. (21) and (22), we yield:

12 The transversality condition ensures that $\dot{x} = 0$ and $x = x^*$ hold.

$$\gamma^* = (\dot{c}/c)^* = (\dot{k}/k)^* = A - \rho/[1 + \theta V'(1)(1 + \tau_c)]. \tag{25}$$

First, if individuals do not care about their relative wealth ($\theta = 0$), then Eq. (25) reduces to

$$\gamma^* = A - \rho, \tag{26}$$

which is a standard result in the Barro-Rebelo "AK" model. In line with the Barro (1990) and Rebelo (1991) assumption that $A > \rho$, one sees from Eq. (26) that γ^* is positive. Furthermore, Eq. (26) tells us that changes in the consumption tax rate do not affect the economy's steady-state growth rate. This result is consistent with Milesi-Ferretti and Roubini's (1998, p. 733) finding under the situation where there is no leisure-labor decision, although we specify the engine of sustained growth through the "AK" production technology while the engine of sustained growth is driven by the joint accumulation of physical and human capital in the Milesi-Ferretti and Roubini's (1998) model.

Second, if the effect of relative wealth-induced social status enters the picture ($\theta > 0$), then the economy exhibits sustained growth as long as $A[1 + \theta V'(1)(1 + \tau_c)] > \rho$, even when we relax the Barro-Rebelo assumption in such a manner, $A < \rho$.[13] It further implies that a rise in the consumption tax rate positively affects the economy's long-run growth rate.[14]

This conclusion runs in sharp contrast to Milesi-Ferretti and Roubini (1998). The key difference between this paper and Milesi-Ferretti and Roubini (1998) is revealed in Eq. (24). If the effect of relative wealth-enhanced social status is absent, then a consumption tax does not affect the economy's overall consumption/capital ratio and hence has no effect on the economy's long-run growth rate. However, if individuals care about their relative wealth, then the consumption tax has a negative impact on the economy's overall consumption/capital ratio and hence positively affects the economy's steady-state growth rate. Therefore, the neutrality of consumption taxation in the *growth rate* sense does not hold

13 If we follow the Barro-Rebelo assumption, $A > \rho$, then from Eq. (25) $\gamma^* > 0$ is definitely true.

14 Differentiating Eq. (25) with respect to τ_c, we yield $\partial\gamma^*/\partial\tau_c = \theta V'(1)\rho/[1 + \theta V'(1)(1 + \tau_c)]^2 \geq 0$ as $\theta \geq 0$.

when individuals care about their social status. We thus come to the following proposition:

Proposition 6: A key factor determining the validity of the neutrality of consumption taxation in the growth rate sense is the desire for relative wealth-induced social status. If individuals care about their relative wealth-induced social status, increases in consumption taxation raise the economy's balanced growth rate.

We briefly discuss the economy's transition dynamics and the optimal consumption tax policy for the optimal growth rate. If the motive of status seeking is absent, then the economy always stays at its steady state in response to an unanticipated permanent increase in the consumption tax rate, since any change in the consumption tax rate has no effect on the economy's growth equilibrium. In this case, whereby there is no externality of status seeking, growth maximizing equals welfare maximizing and the steady-state growth rate in Eq. (26) is the optimal growth rate of the economy. However, if the motive of status seeking is present, then an increase in consumption taxation reduces the consumption/capital ratio and hence raises the economic growth rate. Since the equilibrium is locally unstable as exhibited in Eq. (23),[15] in order to satisfy the transversality condition, the consumption/capital ratio must at once decrease from the initial steady-state value to the new one following an unanticipated permanent increase in the consumption tax rate. The economic growth rate thus exhibits an instantaneous increase from the initial steady-state value to the new one. Clearly, there are no transitional dynamics. This result is consistent with the conclusion of Barro (1990) and Rebelo (1991), i.e., that an unanticipated shock leads to no evolutional adjustment in the AK model. Furthermore, when there is an externality of status seeking, the economic growth rate exhibited in Eq. (25) is different from the optimal growth rate in Eq. (26). There is room for the government to enact an optimal tax policy for achieving the optimal growth rate. Comparing Eqs. (25) and (26) gives an optimal consumption tax rate, $\tau_c = -1$. Therefore, we have the following propositions:

15 For the stability property of Eq. (23), see Appendix B.

Proposition 7: In the AK model of endogenous growth, regardless of the motive of status seeking, there are no transitional dynamics in response to an unanticipated consumption tax shock.

Proposition 8: If the motive of status seeking is present, then the government provides full subsidies to consumption so as to induce the economy to grow at the optimal rate.

Before ending the discussion, one point should be mentioned. In line with Zou (1994), Corneo and Jeanne (1997), and Futagami and Shibata (1998), we examine the relationship between the desire for relative wealth-induced social status and the economy's steady-state growth rate. Differentiating Eq. (25) with respect to θ, we have:

$$\partial\gamma^*/\partial\theta = \rho V'(1)(1+\tau_c)/[1+\theta V'(1)(1+\tau_c)]^2 > 0. \qquad (27)$$

Equation (27) indicates that the stronger the desire for relative wealth-induced social status is, the higher the economy's steady-state growth rate will be. This comes from the fact that an increase in the desire for relative wealth-induced social status leads to a decrease in the overall consumption/capital ratio (see Eq. (24)), hence raising the economy's long-run growth rate. This outcome further implies that the spirit of capitalism is a driving force behind economic growth. Such a conclusion conforms with the proposal of Weber (1958) and the observations of Zou (1994), Corneo and Jeanne (1997), and Futagami and Shibata (1998). Accordingly, we obtain the following proposition:

Proposition 9: The stronger the desire for relative wealth-induced social status is, the higher the economy's steady-state growth rate will be.

5 Conclusions

This paper first sets up an intertemporal optimizing model of economic growth and then examines the validity of neutrality of consumption taxation. The novel feature is that the agent's preferences depend on his wealth relative to the economy's average wealth so as to capture the viewpoint of the capitalistic spirit. If status motives are present, it is found that an increase in the consumption tax rate leads to an increase in the stationary level of capital stock and consumption. Furthermore, we extend our study to a model with endogenous growth through the "AK" production technology. It is shown that a rise in the consumption tax rate stimulates an economy's steady-state growth rate. These results indicate that the neutrality of consumption taxation in both the *level* sense and the *growth rate* sense does not hold. Furthermore, the government should provide full subsidies to consumption so as to induce the economy to achieve the social optimum and the optimal growth rate. In addition, the spirit of capitalism obviously is a driving force behind economic growth.

The existing literature has long recognized the importance of leisure-labor discretion in impacting the effectiveness of fiscal policy and monetary growth. For example, Brock (1974) introduces an elastic labor supply into an optimizing monetary growth model and shows how endogenous labor affects the superneutrality of money. Fisher and Turnovsky (1992) consider the interaction between variable employment and the effect of government spending in the intertemporal optimizing model. They find that the transitional dynamics and the term structure of interest rates are influenced in an important way. Turnovsky (2000) incorporates leisure-labor discretion into a simple AK model of endogenous growth and demonstrates that endogenous labor employment has significant consequences for fiscal policy. Obviously, further investigation into our analysis on the basis of endogenous leisure-labor discretion is the next step. This matter is an interesting subject for future research.

Acknowledgements

I would like to thank the managing editor of this journal, Giacomo Corneo, and an anonymous referee for their stimulating suggestions and valuable comments, which have led to significant improvements in the paper's quality. I also thank Hsueh-fang Tsai for her helpful discussions on this paper. Any remaining errors and omissions are my responsibility.

Appendix A

This appendix provides a brief derivation of short-run dynamics reported in Fig. 8 of the text. By expanding Eqs. (6) and (10) around the steady-state values of the capital stock, k^*, and consumption, c^*, we have:

$$\begin{bmatrix} \dot{k} \\ \dot{c} \end{bmatrix} = \begin{bmatrix} f' & -1 \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} k - k^* \\ c - c^* \end{bmatrix} + \begin{bmatrix} 0 \\ b_1 \end{bmatrix} (\tau_c - \tau_c^0), \qquad \text{(A.1)}$$

where $a_{21} = [-U'f'' + (1+\tau_c)\,\theta V'(1)/\,k^{*2}]/\,U'' < 0$, $a_{22} = \rho - f' > 0$, and $b_1 = -\theta V'(1)/k^* U'' > 0$. Let s_1 and s_2 be two characteristic roots of the dynamic system. From Eq. (A.1), we have:

$$s_1 + s_2 = \rho > 0, \tag{A.2a}$$

$$s_1 s_2 = f'(\rho - f') + [-U'f'' + (1+\tau_c)\theta V'(1)/k^{*2}]/U'' = -(\rho - f')\Delta \gtrless 0. \tag{A.2b}$$

As stated in the text, the regular saddlepoint stability requires $\Delta > 0$, and hence $s_1 s_2 < 0$ is true. For expository convenience, we assume that $s_1 < 0 < s_2$. The general solution for k and c thus can be described by

$$k = k^*(\tau_c) + B_1 \exp(s_1 t) + B_2 \exp(s_2 t), \tag{A.3a}$$

$$c = c^*(\tau_c) - (s_1 - f')B_1 \exp(s_1 t) - (s_2 - f')B_2 \exp(s_2 t), \tag{A.3b}$$

where B_1 and B_2 are as yet undetermined coefficients.

Now we are ready to examine the dynamic adjustment of k and c in response to an unanticipated permanent increase in the consumption tax rate when the motive of status seeking is present. Assume that initially, at time $t = 0$, the economy is in a steady state with $\tau_c = \tau_c^0$. At the same time, we suppose that the authorities increase the consumption tax rate from τ_c^0 to τ_c^1 permanently at $t = 0$. With the general solution reported in equations (A.3a) and (A.3b) as a base, we can use the following equations to express the feature of such a tax policy switch:

$$k_t = \begin{cases} k^*(\tau_c^0); & t = 0^- \\ k^*(\tau_c^1) + B_1 \exp(s_1 t); & t \geq 0^+ \end{cases}, \tag{A.4a}$$

$$c_t = \begin{cases} c^*(\tau_c^0); & t = 0^- \\ c^*(\tau_c^1) - (s_1 - f')B_1 \exp(s_1 t); & t \geq 0^+ \end{cases}, \tag{A.4b}$$

where 0^- and 0^+ denote the instant before and after the policy change, respectively; and B_1 is an undetermined coefficient. There are some supplementary explanations for the specifications of Eqs. (A.4a) and (A.4b). First, at time 0^-, the economy is in its steady-state equilibrium with $\tau_c = \tau_c^0$; the steady-state values of k and c thus are associated with τ_c^0. Second, from 0^+ onwards, as the consumption tax rate has increased to τ_c^1 permanently, the steady-state values of k and c correspond to τ_c^1. Third, the consumption tax rate is increased from τ_c^0 to τ_c^1 at the moment of 0^+, as the stability of the system requires the economy to move to a point on the convergent stable branch associated with τ_c^1 at that instant of time. This means that the undetermined coefficient associated with the unstable eigenvalue, namely B_2, must be set to zero from 0^+ onwards.

To understand the exact paths of k and c, we must solve the appropriate value for B_1. The value for B_1 is determined by the following condition:

$$k_{0^-} = k_{0^+}. \tag{A.5}$$

Equation (A.5) indicates that the capital stock remains intact when the consumption tax rate is increased, since the capital stock is a predetermined variable. Putting Eq. (A.4a) into Eq. (A.5) gives the value of B_1 as follows:

$$B_1 = -(\partial k^*/\partial \tau_c)\ \mathrm{d}\tau_c < 0, \tag{A.6}$$

where $\mathrm{d}\tau_c = (\tau_c^1 - \tau_c^0) > 0$. Substituting Eq. (A.6) back into Eqs. (A.4a) and (A.4b), we have the exact paths of k and c. To save space, we do not explicitly write them out.

We are now ready to analyze the dynamic responses of the capital stock and consumption. In response to an unanticipated permanent increase in the consumption tax rate, the impact response of the capital stock is exhibited in Eq. (A.5), and from Eqs. (A.4b) and (A.6) the impact response of consumption is:

$$c_{0^+} - c_{0^-} = c^*(\tau_c^1) - c^*(\tau_c^0) - (s_1 - f')B_1 = s_1(\partial k^*/\partial \tau_c)\mathrm{d}\tau_c < 0, \tag{A.7}$$

by using the information of Eq. (15b) in the text. This implies that, in the presence of the motive of status seeking, consumption shows an instant decline on impact following an unanticipated permanent increase in the consumption tax rate. Thereafter, from Eqs (A.4a), (A.4b), and (A.6), the evolution of the capital stock and consumption from 0^+ onwards will be:

$$\dot{k} = s_1 B_1 \exp(s_1 t) > 0, \tag{A.8a}$$

$$\dot{c} = -s_1(s_1 - f')B_1 \exp(s_1 t) > 0. \tag{A.8b}$$

Appendix B

To examine the stability of the steady-state growth equilibrium, we first rewrite Eq. (23) as

$$\dot{x} = x[\theta V'(1)(1+\tau_c)x - \rho + x]. \tag{B.1}$$

Linearizing the dynamic equation around x^*, we then obtain

$$\dot{x} = x^*[\theta V'(1)(1+\tau_c) + 1](x - x^*). \tag{B.2}$$

It is clear from the above equation that the dynamic system has a *positive* eigenvalue, $x^*[\theta V'(1)(1+\tau_c)+1]$. Since the dynamic system has one *jump* variable ($x \equiv c/k$) to match one unstable root, there exists a *unique* perfect-foresight equilibrium solution (see Buiter, 1984, and Turnovsky, 1995). As a result, the system will always be on the balanced growth path, $\dot{x} = 0$.

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