Alternative Forms of Government Expenditure Financing in Growth and Welfare Analysis with Production Externalities, Leisure and Relative Wealth

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Abstract

The motive of relative wealth-as-status seeking and elastic labor supply are introduced into a Romer (1986)-type model with cash-in-advance constraint on consumption. This paper analyzes the roles of these two factors in the growth and welfare effects of a wasteful government expenditure expansion financed by alternative distortionary tax schemes, including seigniorage, consumption tax and income tax. Some related parameter conditions that are rendering positive welfare effects are characterized.

Keywords: Wasteful Government Expenditure; Distortionary Tax; Relative Wealth

1. Introduction

Fiscal spending policies with different tax-financing means are generally believed to have different influence on economic development/performance and social welfare. In particular, within the endogenous growth paradigm, this influence is even more worthy of investigation.

In previous endogenous growth studies, it is well understood that expansionary fiscal spending policies can be used to stimulate economic growth if the expansion is financed by a specific taxation such as lump-sum tax or some tax that does not seriously discourage investment. Specifically, these channels of stimulating growth are either through increasing the quantity of production factors or indirectly through increasing marginal productivity of privately supplied production factors[1] (Barro 1990; Turnovsky 2000; Baier and Glomm 2001; Aísa and Pueyo 2006). On the other hand, it is also straightforward that government consumption spending can improve welfare whereby the crowding out effect on private consumption is not serious. It is curious that, when the government spending neither enters agents' production function nor enters their utility function, for a "wasteful"[2] and

[1] The former are, for example, investments in infrastructure, while the latter are investments in such as education, health or something affecting human capital accumulation.
[2] As documented by Turnovsky (1999, pp167-168), " … tax revenues, instead of being rebated, are wasted on

"non-lump-sum-tax-financed" government spending expansion, is it theoretically possible to promote economic growth rate?[3] How about social welfare improvement? Furthermore, if the so-called "non-lump-sum-tax finance" means seigniorage, consumption tax and income tax finance, for a wasteful fiscal spending expansion, which one financing policy is preferred in the growth-enhancing sense? This paper is devoted to find the answers for these problems.

In the representative-agent endogenous growth literature, a number of papers have investigated how the wasteful government spending affects economic growth and/or social welfare. In their two-sector model of endogenous growth, Devereux and Love (1995) show that government spending may raise growth rate, but only if the spending policy is financed without tax distortions. Instead, if the spending policy is financed with few distortions, the way of raising growth rate, for a wasteful fiscal spending expansion, is through a rise in the labor supply. Abandoning elastic labor supply in Devereux and Love (1995), Chang, Tsai and Lai (2004) introduce the role of the spirit of capitalism, or say motive of wealth-induced social status seeking, to analyze the relation between public spending/finance and economic growth in general two-sector model. They show that if the spirit of capitalism is present, lump-sum tax financed increases in government spending reduces the economic growth rate, and that while the spirit of capitalism is absent, neutrality on growth rate will be obtained. Similar conclusion is also found in Chang, Chen and Kao (2008).

In the one-sector endogenous growth model, to our knowledge, Palivos and Yip (1995) is the only study regarding examining the relation among wasteful fiscal spending, financing policy, economic growth rate and social welfare. In their generalized cash-in-advance (CIA) monetary growth model with a continuously balanced budget constraint, Palivos and Yip (1995) let seigniorage rate and income tax rate be endogenous variables to finance a given expenditure-income ratio. They find that seigniorage-financed government expenditure expansion has no (negative) growth effect when CIA constraint is imposed on consumption only (consumption and a fraction of investment). However, the income-tax-financed expansionary spending always leads to negative growth effect. Instead of endogenous finance tax rate proposed by Palivos and Yip (1995), Pelloni and Waldmann (2000) take the tax rate(s) as exogenous policy instrument to analyze that growth and welfare effects where the tax revenues are thrown away or wasted on useless government expenditure. Specifically, they modified Romer's (1986) model with variable labor supply and thereby show that a small amount of capital taxation increases both economic growth rate and social welfare whenever the balanced growth path (BGP) is locally indeterminate.

In this paper, using the methodology of Palivos and Yip (1995), we simultaneously introduce both roles — relative wealth-as-status seeking motive and elastic labor supply into Romer (1986)-type endogenous model with a CIA constraint on consumption purchases. By such a modeling framework, we attempt to examine how a wasteful government expenditure expansion, financed by alternative

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useless government expenditure that has no effect on the behavior of the private sector or the resources available to it." The related discussion is also found in Marrero and Novales (2005).

[3] In fact, empirical evidence linking public expenditures and economic growth rates is mixed (Landau 1983; Kormendi and Meguire 1985; Ram 1986; Miller and Russek 1997).

distortionary tax schemes, including seigniorage, consumption tax and income tax, affect economic growth rate and social welfare.

In order to obtain more comprehensive results, some related existing literature is worth to mention. First, some papers have demonstrated that an agent's concern for social status has important implications for tax policy. For example, Zou (1998) show that the Tobin portfolio-shift effect holds unambiguously: an increase in money growth rate stimulates economic growth rate when absolute wealth-as-status seeking motive is present in AK model with money-in-utility (MIU) approach. Similarly, Chang, Hsieh, and Lai (2000) also show that same result in AK model with CIA approach.[4] Second, as a seigniorage/inflation taxation financing method, Ho, Zeng, and Zhang (2007) use numerical analysis to investigate how inflation taxation affects resource allocation, growth rate and social welfare in a neoclassical or Romer (1986) growth model when consumption, leisure and money are non-separable in a utility function. One of their major propositions is that the switch from consumption taxation to inflation taxation reduces both leisure and the fraction of output for consumption and thereby accelerates economic growth rate. Furthermore, they found that the net welfare effect of inflation-consumption taxation switch depends on the strength of production externalities and the elasticity of intertemporal substitution. Third, Chang (2006) found that the validity of the neutrality of consumption taxation, in growth rate sense, is determined by the relative wealth-induced status motive. When agents care about their relative wealth, an increase in consumption taxation enhances the growth rate of the economy under an AK model.

In contrast to the existing literature, our findings are summarized as follows: First, under the environment with production externalities, when the relative status-seeking motive is present and/or labor-leisure choice is endogenous, an increase in seigniorage-financed wasteful public expenditure will result in positive growth effect. Compared with the aforementioned government spending policy, which is used to stimulate the growth rate of economy, we, therefore, show the likelihood of growth-enhancement via (distortionary) seigniorage financing channel. In addition, compared with Chang, Hsieh, and Lai (2000), although we both are able to obtain the positive growth effect from raised money growth rate (seigniorage rate), we obtain the zero growth effect if we set the environment be the same with their model— inelastic labor supply and AK form production technology. The main reason for different results is that their discussions focus on the revenue-rebated tax policy rather than wasteful spending policy. Second, in the consumption tax-financing mode, regardless of whether the relative status-seeking motive is present or not and whether the labor-leisure choice is endogenous or exogenous, neutrality of consumption taxation in growth rate sense always holds. This result sharply stands in contrast to Chang (2006). Third, in income tax-financing mode, we find that the growth effect of government expenditure expansion is always negative. Hence, we show that the income tax-financing result in Palivos and Yip (1995) is robust. As for welfare effect, we find

[4] Chang, Hsieh and Lai (2000) define wealth-status as physical capital only while Zou (1998) claims that his results are valid regardless of whether the definition of wealth is physical capital only or is sum of both physical capital and real money balances. In this paper, we adopt the latter definition— sum of both physical capital and real balances are wealth.

that wasteful spending expansion via seigniorage and income tax financing method may result in positive welfare effects under some specific environmental settings, while the consumption tax financed expansion tends to result in negative welfare effect.

The remainder of this paper is organized as follows. The analytical framework and the steady state of the economy are described in Section 2. In Section 3, we examine the effect of permanent government expenditure expansion, financed by alternative financing schemes, on a balanced growth rate. Section 4 examines the welfare effect of permanent government spending. Section 5 concludes.

2. The model and the steady state

We assume that the economy is a continuum of infinitely-lived representative agents with unit mass and a government. Their settings are described as follows:

Representative agents

All agents care not only about their consumption c_t, and leisure l_t but also about their relative wealth, which is the determinant of relative social status. Specifically, we define relative wealth as real money balances m_t and physical capital k_t, relative to the aggregate average $\overline{m}+\overline{k}$, i.e. $(m_t+k_t)/(\overline{m}+\overline{k})$. Identical households are endowed with one unit of productive time in each instant of time $t>0$ and with the same positive amount of physical capital $k_0>0$ at the initial date $t=0$. They all share the technology of production that is commonly available and seek to maximize the following lifetime utility:

$$Max \quad \int_0^\infty \left[\ln c + \alpha \frac{(l)^{1-\eta}-1}{1-\eta} + \beta v\left(\frac{m+k}{\overline{m}+\overline{k}}\right) \right] e^{-\rho t} dt\,, \quad \eta>0,\, \rho>0 \tag{1}$$

subject to:

$$\dot{m} = (1-\tau)y - (1+\delta)c - i - \pi m\,, \quad y \equiv Ak^{1-\varepsilon}(1-l)^{\xi}\overline{k}^{\varepsilon}\,, \quad A>0,\; 0\le \xi \le \varepsilon < 1\,, \tag{2}$$

$$\dot{k} = i\,, \tag{3}$$

$$m \ge (1+\delta)c\,, \tag{4}$$

where α = a non-negative parameter, representing the desire for leisure, β = a non-negative parameter reflecting the desire for social status, η = the elasticity of the marginal utility of leisure, ρ = subjective time preference rate, y = real income, ε = the non-negative parameter indicating externalities from aggregate capital, ξ = the output elasticity of labor, A = a scale parameter, τ = the income tax rate, δ = the consumption tax rate, i = investment and π = the inflation rate. Following Corneo and Jeanne (1997), the instantaneous status utility $v(\bullet)$ is increasing, differentiable and concave. Throughout the paper, the time subscript t is omitted to simplify the notation. A dot over a variable is used to denote its time derivative.

Following Wang and Yip (1992), we concentrate on the case where the CIA constraint is binding:

$$m = (1+\delta)c\,. \tag{4'}$$

Let λ, λ_k and ψ, measured in utility terms, be the co-state variables and the multiplier of the current-value Hamiltonian, associated with equations (2) budget constraint faced by the representative agent, (3) the law of motion governing physical capital and (4'), respectively. The optimum conditions necessary for the representative agent are thus:

$$\frac{1}{c} = (\lambda + \psi)(1+\delta) \,, \tag{5}$$

$$\alpha (l)^{-\eta} = \lambda \xi (1-\tau) A k^{1-\varepsilon} (1-l)^{\xi-1} \bar{k}^{\varepsilon} \,, \tag{6}$$

$$\lambda = \lambda_k \,, \tag{7}$$

$$(\dot{\lambda}/\lambda) + (\psi/\lambda) + \left[\beta v'\left((m+k)/(\bar{m}+\bar{k})\right)/\lambda(\bar{m}+\bar{k})\right] = \rho + \pi \,, \tag{8}$$

$$(\dot{\lambda}_k/\lambda_k) + (\lambda/\lambda_k)(1-\varepsilon)(1-\tau)Ak^{-\varepsilon}(1-l)^{\xi}\bar{k}^{\varepsilon} + \left[\beta v'\left((m+k)/(\bar{m}+\bar{k})\right)/\lambda_k(\bar{m}+\bar{k})\right] = \rho \,, \tag{9}$$

together with equations (2), (3), and (4'), and the transversality conditions of m and k:

$$\lim_{t\to\infty} \lambda\, m e^{-\rho t} = \lim_{t\to\infty} \lambda_k\, k e^{-\rho t} = 0 \,.$$

The government

We assume that the government maintains a continuously balanced budget as equation (10):

$$G = T + \dot{M}/P \,, \tag{10}$$

where G, T, M and P denote government spending, taxes, nominal money and the price, respectively.

From the side of government expenditure, we specify the government expenditure is a constant share of income (γ) to ensure that the economy will follow a BGP, as proposed by Barro (1990). From the side of government revenue, we assume that the government levies taxes and prints money to finance its expenditure. The former includes income tax (τy) and consumption tax (δc) while the latter implies seigniorage (μm) where μ denote the growth rate of money supply. Accordingly, equation (10) is rewritten as equation (11):

$$(\gamma - \tau) A k^{1-\varepsilon} (1-l)^{\xi} \bar{k}^{\varepsilon} = \delta c + \mu m \,, \tag{11}$$

where we impose $\gamma - \tau > 0$. Because we assume that pre-existing taxes exist (τy, δc and μm), the government does not finance its expenditure expansion with the introduction of a new tax.[5] This assumption is appropriate for examining the effects of real-world taxes.

Following Palivos and Yip (1995), the policy experiment we conduct is that the government adopt alternative taxation schemes to finance a permanent increase in government expenditure-income ratio. In each of the three financing policies, the corresponding tax rate (μ, δ, τ) is endogenously determined. Additionally, for the sake of highlighting the effects of tax-finance, we abstract from government spending aspect, i.e., the services of government are assumed not to enter the representative agent's utility or production function. In other words, tax revenues are assumed to be wasted on useless government expenditures, such as administrative costs, rather than to be rebated.

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[5] For facilitating a comparison between seigniorage and income tax financing schemes, Palivos and Yip (1995) assume that one tax rate is endogenously determined to finance the public spending expansion, while the other tax rate is set to zero. This assumption exactly means that a tax increase is simply the introduction of a new tax.

By definition, the law of motion governing real money balances is:

$$\dot{m} = (\mu - \pi)m \ . \tag{12}$$

By combining equations (2), (3), (11) with $\bar{k} = k$ and (12) together,[6] the goods market equilibrium condition is given as:

$$\dot{k} = (1-\gamma)Ak(1-l)^{\xi} - c \ . \tag{13}$$

As a consequence, with $\bar{k} = k$ and $\bar{m} = m$, the perfect-foresight equilibrium of the macroeconomic economy is described by equations (4'), (5), (6), (7), (8), (9), (11), (12) and (13).

In addition, it should be noted that by combining equations (7), (8) and (9) with $\bar{k} = k$ and $\bar{m} = m$, we obtain the following relation from no-arbitrage condition between real money balances and real physical capital holdings as:

$$(\psi/\lambda) - \pi = (1-\varepsilon)(1-\tau)A(1-l)^{\xi} \ . \tag{14}$$

As shown by Barro and Sala-i-Martin (2004), we define the following transformed variables as:

$$S \equiv 1/(\lambda k) \quad \text{and} \quad X \equiv m/k \ .$$

In terms of the above stationary transformed variables, thus we can afford to derive an equilibrium and further analyze the state change of this dynamic growth system.

By combining equations (7), (8) and (9) with $\bar{k} = k$ and $\bar{m} = m$, we obtain the evolution of the shadow price of real balances in terms of transformed variables, S and X, as:

$$\dot{\lambda}/\lambda = \rho - \left(\beta S v'(1)/(1+X)\right) - (1-\varepsilon)(1-\tau)A(1-l)^{\xi} \ . \tag{15}$$

By substituting equations (4') and (14) into equation (5), we derive the instantaneous inflation rate, in terms of transformed variables, S and X, as:

$$\pi = (S/X) - 1 - (1-\varepsilon)(1-\tau)A(1-l)^{\xi} \ . \tag{16}$$

Next, by combining equations (12) and (16) together, we have:

$$\dot{m}/m = \mu - (S/X) + 1 + (1-\varepsilon)(1-\tau)A(1-l)^{\xi} \ . \tag{17}$$

Additionally, by substituting equation (4') into equation (13), the growth rate of physical capital in terms of the transformed variable, X, is given as:

$$\dot{k}/k = (1-\gamma)A(1-l)^{\xi} - X/(1+\delta) \ . \tag{18}$$

Likewise, with S and $\bar{k} = k$, equation (6) is rewritten as:

$$l^{\eta}/(1-l)^{1-\xi} = \alpha S/(1-\tau)A\xi \ , \tag{19}$$

where we know that $l = 0$, if $\alpha = 0$, which indicates that the supply of labor $1-l$ is inelastic. The agent has no endogenous labor-leisure discretion. We further discuss this case in Section 3 and 4.

Substituting equation (4') into equation (11) with $\bar{k} = k$, in terms of X, the continuously

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[6] In a symmetric equilibrium, all identical agents own the same amount of money and capital. As a result, $\bar{k} = k$ is true in equilibrium and $\bar{m} = m$ is also afterward.

government balanced-budget constraint implies:

$$(\gamma-\tau)A(1-l)^{\xi}=\left[\left(\delta/(1+\delta)\right)+\mu\right]X\ . \tag{20}$$

Accordingly, instantaneous relation of equations (19) and (20) give leisure l and the state-contingent endogenous tax financing rates (μ, δ, τ), in terms of S and X, as follows:[7]

$$l^{j}=\begin{cases} l(\underset{+,0}{S}) & as \quad j=\mu, \delta, \\ l(\underset{+,0}{S}, \underset{-,0}{X};\ \underset{+,0}{\gamma}) & as \quad j=\tau, \end{cases} \tag{21}$$

$$\mu^{j}=\begin{cases} \mu(\underset{-,0}{S},\ \underset{-}{X};\ \underset{+}{\gamma}) & as\ \ j=\mu, \\ \mu_0 & as\ j=\delta, \tau. \end{cases};\ \ \delta^{j}=\begin{cases} \delta(\underset{-,0}{S},\ \underset{-}{X};\ \underset{+}{\gamma}) & as\ \ j=\delta, \\ \delta_0 & as\ j=\mu, \tau. \end{cases};\ \ \tau^{j}=\begin{cases} \tau(\underset{-,0}{S},\ \underset{-}{X};\ \underset{+}{\gamma}) & as\ \ j=\tau, \\ \tau_0 & as\ j=\mu, \delta. \end{cases}, \tag{22}$$

where the superscript j of variables (hereafter) denotes the financing scheme corresponding to higher government spending. The signs below the variables indicate the qualitative relationship with the dependent variable. Wherever signs differ dependent on whether α is larger than or equal to zero, both effects are indicated; the first effect below the variables belongs to the case where $\alpha>0$.

Now, we are in a position to describe the steady state. Because the economy can be characterized by $\dot{S}=\dot{X}=0$ at steady-growth equilibrium, using equations (15), (17) and (18), we obtain the following two equations, along a BGP:

$$(\dot{S}/S)=-(\dot{\lambda}/\lambda)-(\dot{k}/k)=\left(\beta\bar{S}\,v^{'}(1)/(1+\bar{X})\right)-\rho+\bar{\Lambda}^{j}(\bar{S},\bar{X};\gamma)=0\ , \tag{23}$$

$$(\dot{X}/X)=(\dot{m}/m)-(\dot{k}/k)=\mu^{j}-(\bar{S}/\bar{X})+1+\bar{\Lambda}^{j}(\bar{S},\bar{X};\gamma)=0\ , \tag{24}$$

where $\mu^{j}=\bar{\mu}(\bar{S},\bar{X};\gamma)$ if $j=\mu$, and $\mu^{j}=\mu_0$, if $j=\delta, \tau$. $\bar{\Lambda}^{j}(\bullet)$ equals $\left(\gamma-\tau_0-(1-\tau_0)\varepsilon\right)A(1-\bar{l}^{j})^{\xi}$ $+\left(\bar{X}/(1+\delta_0)\right)$, $\left(\gamma-\tau_0-(1-\tau_0)\varepsilon\right)A(1-\bar{l}^{j})^{\xi}+\left(\bar{X}/(1+\bar{\delta})\right)$ and $\left(\gamma-\bar{\tau}-(1-\bar{\tau})\varepsilon\right)A(1-\bar{l}^{j})^{\xi}+\left(\bar{X}/(1+\delta_0)\right)$, if $j=\mu$, δ and τ, respectively. The upper bar, $^{-}$, denotes the BGP equilibrium value of the corresponding endogenous variables. Thus, from equations (21) ~ (24), we have a 4 $\times$ 4 system for $\left(\bar{l},(\bar{\mu}\text{ or }\bar{\delta}\text{ or }\bar{\tau}),\bar{S},\bar{X}\right)$. Because the growth rates of relevant economic variables are the same along a BGP, from equations (23), (24), (7) and (4'), we let $\bar{\theta}$ be steady-state growth rate and have:

$$\dot{y}/y=\dot{k}/k=\dot{m}/m=\dot{c}/c=\bar{\theta}, \quad \dot{\lambda}/\lambda=\dot{\lambda}_k/\lambda_k=-\bar{\theta}\ . \tag{25}$$

3. Growth effect

Combining equations (18), (20) and (25), the balanced growth rate is given as follows:

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[7] The calculation process is available from the author upon request.

$$\bar{\theta}=\left(1-\gamma-\frac{\gamma-\tau^j}{\delta^j+\mu^j(1+\delta^j)}\right)A(1-\bar{l}^j)^{\xi}, \tag{26}$$

where we assume $1-\gamma-\frac{\gamma-\tau^j}{\delta^j+\mu^j(1+\delta^j)}>0$ to let balanced growth rate positive in line with the Barro (1990)-Rebelo (1991) 'AK' model.

Through the information of equations (21) and (22), differentiating equation (26) with respect to γ, we can derive the growth effect of the higher government expenditure-income ratio, financed by alternative financing schemes, as follows:

$$\left(\frac{d\bar{\theta}}{d\gamma}\right)^j=\left(\left(\frac{d\bar{\theta}}{d\gamma}\right)^j\Bigg|_{\text{given } \bar{j}}+\left(\frac{d\bar{\theta}}{d\bar{j}}\right)\left(\frac{d\bar{j}}{d\gamma}\right)\right)\Bigg|_{\text{given } \bar{l}}-\left(1-\gamma-\frac{\gamma-\tau^j}{\delta^j+\mu^j(1+\delta^j)}\right)A\xi(1-\bar{l})^{\xi-1}\left(\frac{d\bar{l}}{d\gamma}\right)^j, \tag{27}$$

where the first term $(d\bar{\theta}/d\gamma)^j\Big|_{\substack{\text{given } \bar{j}\\ \text{given } \bar{l}}}=\left[-1-\left(1/(\delta^j+\mu^j(1+\delta^j))\right)\right]A(1-\bar{l}^j)^{\xi}$ implies that an increase in government spending reduces the amount of resources available and then affect the economic growth rate. We call this channel the resources withdrawal channel, which generates a negative growth effect. The remainders $(d\bar{\theta}/d\bar{j})(d\bar{j}/d\gamma)\Big|_{\text{given } \bar{l}}$ and $\left[1-\gamma-\left((\gamma-\tau^j)/(\delta^j+\mu^j(1+\delta^j))\right)\right]A\xi(1-\bar{l})^{\xi-1}(d\bar{l}/d\gamma)^j$, respectively, implies the induced effect via alternative tax financing channel and the labor-leisure choice effect resulted from a wasteful government spending expansion. Through the responses of these effects, we can then examine systematically total growth effect. These analyses proceed as follows:

Scheme 1: Seigniorage Financing

From equations (21) ~ (24), on steady state, we derive: $(d\bar{S}/d\gamma)^{\mu}<0$ and $(d\bar{X}/d\gamma)^{\mu}<0$. By substituting some related results into equation (27), we can derive the total growth effect as follows:

$$\left(\frac{d\bar{\theta}}{d\gamma}\right)^{\mu}=\underbrace{\left(\frac{d\bar{\theta}}{d\gamma}\right)^{\mu}\Bigg|_{\substack{\text{given } \bar{j}\\ \text{given } \bar{l}}}}_{-}+\frac{(\gamma-\tau_0)(1+\delta_0)}{\left(\delta_0+\bar{\mu}(1+\delta_0)\right)^2}A(1-\bar{l})^{\xi}\underbrace{\left(\frac{d\bar{\mu}}{d\gamma}\right)}_{+}-\left(1-\gamma-\frac{\gamma-\tau_0}{\delta_0+\bar{\mu}(1+\delta_0)}\right)A\xi(1-\bar{l})^{\xi-1}\underbrace{\left(\frac{d\bar{l}}{d\gamma}\right)^{\mu}}_{-,0}$$

$$=\frac{A(1-\bar{l})^{\xi}}{J^{\mu}\bar{X}}\left[\frac{\alpha(\bar{l})^{1-\eta}(1-\bar{l})}{\eta(1-\bar{l})+(1-\xi)\bar{l}}\left(\left(1-\varepsilon\right)\rho+\frac{\beta v'(1)\varepsilon\bar{S}}{(1+\bar{X})^2}\right)+\frac{\beta v'(1)\varepsilon(1-\tau_0)A(1-\bar{l})^{\xi}}{(1+\bar{X})^2}\right]\geq 0, \tag{28-1}$$

where $\left(\frac{d\bar{\mu}}{d\gamma}\right)=\underbrace{\bar{\mu}_S}_{-,0}\underbrace{\left(\frac{d\bar{S}}{d\gamma}\right)^{\mu}}_{-}+\underbrace{\bar{\mu}_X}_{-}\underbrace{\left(\frac{d\bar{X}}{d\gamma}\right)^{\mu}}_{-}+\underbrace{\bar{\mu}_{\gamma}}_{+}>0$, $\left(\frac{d\bar{l}}{d\gamma}\right)^{\mu}=\underbrace{\bar{l}_S}_{+,0}\underbrace{\left(\frac{d\bar{S}}{d\gamma}\right)^{\mu}}_{-}\leq 0$. $J^{\mu}\equiv\frac{1}{(1+\delta_0)\bar{\bar{X}}}+\frac{\beta v'(1)}{(1+\bar{X})\bar{\bar{X}}}$ $\left(\frac{1+\bar{X}}{1+\delta_0}-\frac{(1-\tau_0)\varepsilon A(1-\bar{l})^{\xi}}{1+\bar{X}}\right)-\bar{\Delta}_1\left(\bar{\Delta}_2\rho+(1-\tau_0)\varepsilon\left(\frac{\beta v'(1)\bar{S}}{(1+\bar{X})^2}-\frac{1}{1+\delta_0}\right)\right)$, $\bar{\Delta}_1\equiv\frac{A(1-\bar{l})^{\xi}\xi\bar{l}}{\left(\eta(1-\bar{l})+(1-\xi)\bar{l}\right)\bar{\bar{S}}\bar{\bar{X}}}\geq 0$ as $\alpha\geq 0$, $\bar{\Delta}_2\equiv\gamma-\tau_0-(1-\tau_0)\varepsilon$. Because we restrict our analysis to the case where the system with two jump variables (S and X) has a unique perfect-foresight equilibrium, we must impose: $J^{\mu}>0$.

From the inspection of equations (28-1), we find the following results. First, we obtain two "positive" effects on steady-growth rate, exhibited by the first equation in equation (28-1), one of which is labor-leisure choice effect and the other is induced effect of wasteful government expenditure expansion via seigniorage financing channel. Second, the key factors in determining the final total growth effect, as shown in second equation in equation (28-1), are elastic labor supply (α) and the motive of relative-wealth-seeking (β). Third, the second equation in equation (28-1) indicates that if a model allows for the introductions of "elastic labor supply ($\alpha \neq 0$)" and/or considers "motive of relative-wealth-seeking" under the environment with "production externalities" ($\beta \neq 0$ and $\varepsilon \neq 0$), we have *positive* growth effects resulting from higher *wasteful* government expenditure.

In order to provide the intuitional explanations for these results, we first discuss the special case where the agents neither care about their leisure nor their relative wealth. In this case, we can obtain a certain closed-form solution for steady-growth rate, $\bar{\theta} = (1-\varepsilon)(1-\tau_0)A - \rho$, from equations (15) and (25). Obviously, the balanced growth rate is constant and determined by the differential between the after-income-tax marginal productivity of physical capital and the rate of time preference. In other words, from the viewpoint of equation (27), it implies the negative resources withdrawal effect, $(d\bar{\theta}/d\gamma)^{\mu}\Big|_{\substack{\text{given } \bar{\mu} \\ l=0}}$, must be neutralized by the positive induced-effect, $(d\bar{\theta}/d\bar{\mu})(d\bar{\mu}/d\gamma)\Big|_{\bar{l}=0}$. Steady-state growth rate of the economy is therefore immune to changes in the wasteful public expenditure. Take this case as a benchmark, and thereby the cases when we allow for the introductions of "motive of relative-wealth-seeking ($\beta \neq 0$)" and "elastic labor supply ($\alpha \neq 0$)" could be clearly compared.

Owing to the requirement of continual balance of the government budget, a rise in the share of government spending in output results in an increasing seigniorage rate and thereby generates a positive induced effect, in addition to negative resources withdrawal effect, on steady-growth rate. When we consider the "motive of relative-wealth-seeking" under the environment with "production externalities", this positive induced effect is reinforced,[8] compared with benchmark case, while the negative wealth effect from the same shock remains same as benchmark case. Therefore, the positive induced effect dominates the negative resources withdrawal effect, and then the growth rate of economy is promoted. More intuitively, under the environment with production externalities, since the private rate of return on capital fails to reflect the social rate of capital, representative agent holds too little capital compared to the social optimum. Furthermore, when agent is concerned with the relative-wealth-induced social status, seigniorage-financed government expenditure expansion just acts as applying a higher inflation tax to induce individuals to switch out of real money balances into capital, and thereby corrects the distortion (under-investment in capital) created by production externalities. Economic growth rate is therefore promoted.

On the other hand, when the "elastic labor supply" exists, a higher wasteful government expenditure expansion, financed by seigniorage, generates an additional positive labor-leisure choice effect, compared with benchmark case; therefore, the growth rate of economy is promoted. More

[8] The related proof is available from the author upon request.

intuitively, public expenditure crowd out resource available to the private sector and reduce not only consumption but also leisure time and, as a result, representative agent will work more. Since labor and capital are technical complements under a Romer (1986)-type (Cobb-Douglas) production technology, this will in turn encourage capital accumulation and speed up economic growth.

To sum up, in addition to "elastic labor supply" factor, when our Romer (1986)-type endogenous growth model ($\varepsilon \neq 0$) allows for the introductions of "motive of relative-wealth-seeking" ($\beta \neq 0$), Tobin-type effect[9] in growth rate sense will emerge.

In the existing literature, the concept, where a change in fiscal policy may correct the technological spillovers distortion via seigniorage (inflation tax) financing channel; thereby produces a positive growth effect, can be found in Ho, Zeng and Zhang (2007). However, they introduce money into their model with MIU approach and they treat seigniorage as finance revenue for a consumption taxation cut. Furthermore, in their model, an increase in inflation tax for tax-switch has no real effect on production in the long run, if labor supply were fully inelastic; however, in our model with production externalities, as long as the status-seeking motive exists, positive growth effect emerges even if the labor supply is *inelastic*. This clearly stands in contrast to Ho, Zeng and Zhang (2007).

On the other hand, it is worth noting that, compared with Chang, Hsieh and Lai (2000), although we both are able to obtain the positive growth effect from raised money growth rate (seigniorage rate), the wealth-as-status concept we adopted is relative to average rather than absolute level. Moreover, we assume that seigniorage revenue is wasted on useless public spending rather than rebated and that the wealth is defined as sum of real balances and physical capital rather than physical capital only. Hence, the spirit of our model is inconsistent with theirs. This point can be clearly shown as following case. When we set $\alpha = 0$ and $\varepsilon = 0$ simultaneously in our model, where the environment with inelastic labor supply and AK form production technology is same with that in Chang, Hsieh and Lai (2000), the growth effect of seigniorage-financd public expanding policy is absent even if the motive of relative-wealth-seeking is present.

Scheme 2: Consumption Tax Financing

From equations (21) ~ (24), on steady state, we derive: $(d\bar{S}/d\gamma)^{\delta} = 0$ and $(d\bar{X}/d\gamma)^{\delta} = 0$. By substituting some related results into equation (27), we derive the total growth effect as follows:

$$\left(\frac{d\bar{\theta}}{d\gamma}\right)^{\delta} = \underbrace{\left(\frac{d\bar{\theta}}{d\gamma}\right)^{\delta}}_{-}\Bigg|_{\substack{\text{given } \bar{j} \\ \text{given } \bar{l}}} + \frac{(\gamma-\tau_0)(1+\mu_0)}{\left(\bar{\delta}+\mu_0(1+\bar{\delta})\right)^2} A(1-\bar{l})^{\xi} \underbrace{\left(\frac{d\bar{\delta}}{d\gamma}\right)}_{+} - \left(1-\gamma-\frac{\gamma-\tau_0}{\bar{\delta}+\mu_0(1+\bar{\delta})}\right) A\xi(1-\bar{l})^{\xi-1} \underbrace{\left(\frac{d\bar{l}}{d\gamma}\right)^{\delta}}_{0} = 0, \quad (28\text{-}2)$$

[9] In endogenous growth literature, so-call Tobin effect in the growth rate sense means that an exogenous increase in the rate of money growth brings about a less than proportional rise in the inflation rate, and thereby obtain a positive correlation between the inflation rate and the endogenous growth rate (Itaya and Mino 2003). However, our model here lets the money growth rate be endogenously determined. Therefore, we use the term "Tobin-type effect" to describe this difference.

where $\left(\frac{d\bar{\delta}}{d\gamma}\right) = \underset{-,0}{\bar{\delta}_S}\underset{0}{\left(\frac{d\bar{S}}{d\gamma}\right)^{\delta}} + \underset{-}{\bar{\delta}_X}\underset{0}{\left(\frac{d\bar{X}}{d\gamma}\right)^{\delta}} + \underset{+}{\bar{\delta}_\gamma} > 0$, $\left(\frac{d\bar{l}}{d\gamma}\right)^{\delta} = \underset{+,0}{\bar{l}_S}\underset{0}{\left(\frac{d\bar{S}}{d\gamma}\right)^{\delta}} = 0$.

Similar with the analysis in seigniorage financing mode, we can obtain a certain closed-form solution for steady-growth rate as $\bar{\theta} = (1-\varepsilon)(1-\tau_0)A-\rho$, from equations (15) and (25), if $\alpha = \beta = 0$. From the viewpoint of equation (27), it implies the negative resources withdrawal effect must be neutralized by the positive induced-effect. Steady-state growth rate of the economy is therefore immune to changes in the wasteful government expenditure in this benchmark case.

Further, when we consider the "motive of relative-wealth-seeking" under the environment with "production externalities", compared with benchmark case, is the positive induced effect reinforced? Obviously, $(d\bar{S}/d\gamma)^{\delta} = 0$ and $(d\bar{X}/d\gamma)^{\delta} = 0$ show the answer is no. Accordingly, the positive induced effect is still equal with the negative resources withdrawal effect, and thereby we obtain the result that the growth rate of economy remains intact when the wasteful government expenditure increases. Intuitively, since the consumption tax rate after impacting by public spending expansion immediately jumps to the new rate and then becomes the same rate over time, it is indifferent when you consume. As a result, agent has no incentive to change assets' allocation. In other words, consumption tax-financed government spending expansion would not distort intertemporal consumption-savings behavior. Even if $\alpha \neq 0$ and $\beta \neq 0$, this feature remains unchanged.[10]

From the perspective of "the role of the relative wealth-induced status motive in affecting the neutrality of consumption taxation", this result sharply stands in contrast to Chang (2006). The key reason is that our model assumes that consumption tax revenue is wasted on useless government spending, rather than rebated, there exists an additional, compared with Chang (2006), negative growth effect from resources withdrawal channel. Specifically, this negative resources-withdrawal effect is exactly offset by the effect of changes in the consumption-capital ratio resulted by an increase in consumption taxation. Therefore, the neutrality of consumption taxation holds in our model.

Scheme 3: Income Tax Financing

From equations (21) ~ (24), on steady state, we derive: $(d\bar{S}/d\gamma)^{\tau} < 0$ and $(d\bar{X}/d\gamma)^{\tau} < 0$. By substituting some related results into the equation (27), we derive the total growth effect as follows:

$$\left(\frac{d\bar{\theta}}{d\gamma}\right)^{\tau} = \left(-1-\frac{1}{\delta_0+\mu_0(1+\delta_0)}\right)A(1-\bar{l})^{\xi} + \frac{A(1-\bar{l})^{\xi}}{\delta_0+\mu_0(1+\delta_0)}\underset{+}{\left(\frac{d\bar{\tau}}{d\gamma}\right)} - \left(1-\gamma-\frac{\gamma-\bar{\tau}}{\delta_0+\mu_0(1+\delta_0)}\right)A\xi(1-\bar{l})^{\xi-1}\underset{?}{\left(\frac{d\bar{l}}{d\gamma}\right)^{\tau}}$$

$$= \frac{-(1-\varepsilon)\bar{\Omega}}{J^{\tau}}\left[\frac{1+\mu_0}{\bar{X}} + \frac{\beta v'(1)}{1+\bar{X}}\left(1+\mu_0+\frac{\bar{S}}{(1-\varepsilon)\bar{X}^2(1+\bar{X})}\right)\right] < 0, \tag{28-3}$$

[10] Similarly, Rebelo (1991) shows that consumption tax has no growth effect when the labor supply is elastic.

where $\left(\frac{d\bar{\tau}}{d\gamma}\right) = \underset{-,0}{\bar{\tau}_S}\underset{-}{\left(\frac{d\bar{S}}{d\gamma}\right)^{\tau}} + \underset{-}{\bar{\tau}_X}\underset{-}{\left(\frac{d\bar{X}}{d\gamma}\right)^{\tau}} + \underset{+}{\bar{\tau}_\gamma} > 0$, $\left(\frac{d\bar{l}}{d\gamma}\right)^{\tau} = \underset{+,0}{\bar{l}_S}\underset{-}{\left(\frac{d\bar{S}}{d\gamma}\right)^{\tau}} + \underset{-,0}{\bar{l}_X}\underset{-}{\left(\frac{d\bar{X}}{d\gamma}\right)^{\tau}} + \underset{+,0}{\bar{l}_\gamma} \gtrless 0$.

$\bar{\Omega} = \frac{A(1-\bar{l})^{\xi}(1-\bar{\tau})\left(\eta(1-\bar{l})+\bar{l}\right)}{(1-\bar{\tau})\left(\eta(1-\bar{l})+(1-\xi)\bar{l}\right)+(\gamma-\bar{\tau})\xi\bar{l}} > 0$, $J^{\tau} \equiv \frac{\beta v'(1)}{1+\bar{X}}\left(\bar{\Delta}_3 + \frac{\bar{S}}{\bar{X}^2(1+\bar{X})} + \frac{\bar{S}\bar{\Delta}_4}{1+\bar{X}}\right) + \frac{\bar{\Delta}_3}{\bar{X}} + \frac{\bar{S}\bar{\Delta}_4}{\bar{X}^2} > 0$,

$\bar{\Delta}_3 \equiv 1+\mu_0 - \frac{\varepsilon\left(\frac{\delta_0}{1+\delta_0}+\mu_0\right)(1-\bar{\tau})\left(\eta(1-\bar{l})+\bar{l}\right)}{(1-\bar{\tau})\left(\eta(1-\bar{l})+(1-\xi)\bar{l}\right)+(\gamma-\bar{\tau})\xi\bar{l}} \gtrless 0$ [note that: (i) $\bar{\Delta}_3 = 1+\mu_0-\varepsilon\left(\frac{\delta_0}{1+\delta_0}+\mu_0\right) \equiv \bar{\Delta}_3' > 0$ if $\bar{l}=0$ (i.e. $\alpha=0$); (ii) $\bar{\Delta}_3 = 1+\mu_0 > 0$ if $\varepsilon = 0$], $\bar{\Delta}_4 \equiv \frac{\varepsilon(1-\gamma)A(1-\bar{l})^{\xi}(1-\bar{\tau})\xi\bar{l}}{\left[(1-\bar{\tau})\left(\eta(1-\bar{l})+(1-\xi)\bar{l}\right)+(\gamma-\bar{\tau})\xi\bar{l}\right]\bar{S}} \geq 0$ as $\varepsilon\bar{l} \geq 0$ (i.e. $\varepsilon\alpha \geq 0$).

From the inspections of equation (28-3), we find the following results. First, the first equation in equations (28-3) indicates that the growth effect from labor-leisure choice channel is ambiguous while the induced effect of wasteful government expenditure expansion via income tax financing channel is positive. Second, the second equation in equation (28-3) reveals that regardless of the presence or absence of β and/or α, balanced growth rate is always decreasing with government spending γ.

In this benchmark case, $\alpha=\beta=0$, we obtain a relation $\bar{\theta}=(1-\varepsilon)(1-\bar{\tau})A-\rho$ from equations (15) and (25) to describe the steady-growth rate of the economy where the government expenditure policy adopts income taxation finance scheme. Obviously, the balanced growth rate is decreasing in government expenditure expansion by the fact that after-income-tax marginal productivity of physical capital is decreasing in the shock. In other words, from the viewpoint of equation (27), it implies the negative resources withdrawal effect must be larger than the positive induced-effect.

When we consider the "motive of relative-wealth-seeking" under the environment with "production externalities", this positive induced effect is weakened,[11] compared with benchmark case, while the negative resources withdrawal effect remains same as benchmark case. Therefore, the negative resources withdrawal effect still dominates the positive induced effect, and then the growth rate of economy declines. Intuitively, under the environment with production externalities, the representative agents hold little capital on the one hand and the income-tax-financed public spending expansion, on the other hand, directly decrease the marginal productivity of physical capital. Therefore, economic growth rate declines. Furthermore, when the subject that government levies income tax on is the relative-wealth-concerned agent, he tends to decrease accumulation of physical capital. The growth rate of economy is thereby retarded. When the "elastic labor supply" exists, although a higher wasteful government expenditure expansion generates an additional ambiguous labor-leisure choice effect, the growth rate of economy finally deteriorates by relatively larger negative resources withdrawal effect.

Summarizing, since $(d\bar{\theta}/d\gamma)^{\mu} \geq (d\bar{\theta}/d\gamma)^{\delta} > (d\bar{\theta}/d\gamma)^{\tau}$ always holds, the seigniorage-financing

[11] The related proof is available from the author upon request.

scheme is preferred in the growth-enhancing sense, especially under the technology spillovers' environment with the motive of status-seeking and/or with the elastic labor supply. Seigniorage (*distortionary tax*)-financed wasteful government expenditure expansion can *improve* the long-run growth rate rather than retard growth as an expectation of conventional wisdom. Accordingly, we show the different result with one case of Palivos and Yip (1995) in which liquidity constraint applies only to consumption. Furthermore, this result is analogous to the proposition of Pelloni and Waldmann (2000) while we show the likelihood of positive growth effect in the monetary growth model.

4. Welfare effect

Along the steady-state growth equilibrium, private consumption, real balances and physical capital grow at the same rate, $\bar{\theta}$. Hence, the time paths of these economic variables are given as: $c_t = c_0\, e^{\bar{\theta}\, t}$; $m_t = m_0\, e^{\bar{\theta}\, t}$; $k_t = k_0\, e^{\bar{\theta}\, t}$, where c_0 and m_0 are endogenously determined.[12] As a result, from equation (1), we have the steady-state equilibrium lifetime utility function as follows:

$$\bar{V} = \frac{1}{\rho}\left[\ln \bar{X} + \frac{\bar{\theta}}{\rho} + \alpha \frac{(\bar{l}^{j})^{1-\eta} - 1}{1-\eta} - \ln(1+\delta^{j}) + \ln k_0 + \beta v(1)\right]. \tag{29}$$

Next, we examine the welfare effects of a permanent government expenditure expansion under alternative financing schemes. These analyses proceed as follows:

Scheme 1: Seigniorage Financing

Differentiating equation (29) with respect to γ and substituting the related outcomes into this resulting equation yield:

$$\left(\frac{d\bar{V}}{d\gamma}\right)^{\mu} = \frac{1}{\rho}\left[\frac{1}{\bar{X}}\underbrace{\left(\frac{d\bar{X}}{d\gamma}\right)^{\mu}}_{-} + \frac{1}{\rho}\underbrace{\left(\frac{d\bar{\theta}}{d\gamma}\right)^{\mu}}_{+,0} + \alpha(\bar{l})^{-\eta}\, \underset{+,0}{\bar{l}_S}\underbrace{\left(\frac{d\bar{S}}{d\gamma}\right)^{\mu}}_{-}\right] \gtreqless 0\,. \tag{30-1}$$

Equation (30-1) indicates that the effect of a permanent government expenditure expansion on welfare is ambiguous if a positive growth effect arose from the same shock exists. Because we are interested in what kind of parameter conditions that are rendering positive welfare effects, our discussions proceed as follows:

First, let $\alpha = 0$, the labor supply is inelastic (i.e. $1-\bar{l} = 1$), while the relative status-seeking motive and technological spillovers are present ($\beta > 0$ and $\varepsilon > 0$). From equation (30-1) we have:

$$\left.\left(\frac{d\bar{V}}{d\gamma}\right)^{\mu}\right|_{\alpha=0} > 0 \qquad \text{as} \quad \begin{array}{l} (1)\ \ \beta > \beta_{\mu}^{a} > 0, 1 > \varepsilon > \varepsilon_{\mu}^{a} > 0 \text{ and } (1-\tau_0)A\bar{X} > \rho(1+\bar{X})^2; \\ (2)\ \ 1 > \varepsilon > \varepsilon_{\mu}^{b} > \varepsilon_{\mu}^{a} > 0,\ \beta > \beta_{\mu}^{b} > 0 \text{ and } (1-\tau_0)A\bar{X} > \rho(1+\bar{X})^2, \end{array} \tag{30-1a}$$

where $\beta_{\mu}^{a} \equiv \dfrac{\rho(1+\bar{X})^2}{\left((1-\tau_0)\varepsilon A\bar{X} - \rho(1+\bar{X})^2\right)v'(1)} > 0$, $1 > \varepsilon_{\mu}^{b} \equiv \dfrac{\left(1+\beta v'(1)\right)\rho(1+\bar{X})^2}{\beta v'(1)(1-\tau_0)A\bar{X}} > \varepsilon_{\mu}^{a} > 0$, $1 > \varepsilon_{\mu}^{a} \equiv \dfrac{\rho(1+\bar{X})^2}{(1-\tau_0)A\bar{X}} > 0$,

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[12] Note that, $m_0 = k_0 \bar{X}$ and $c_0 = k_0 \bar{X}/(1+\delta^{j})$, $\delta^{j} = \bar{\delta}$ if $j = \delta$ and $\delta^{j} = \delta_0$ if $j = \mu, \tau$.

$\beta_{\mu}^{a} > \beta_{\mu}^{b} \equiv \dfrac{\rho(1+\overline{X})^{2}}{\left((1-\tau_0)A\overline{X}-\rho(1+\overline{X})^{2}\right)v'(1)} > 0$. From the case (1), the relation $(1-\tau_0)A\overline{X} > \rho(1+\overline{X})^{2}$ is imposed, such that the inequality $1 > \varepsilon_{\mu}^{a}$ holds. The inequality $1 > \varepsilon > \varepsilon_{\mu}^{a}$ guarantees that the condition $\beta > \beta_{\mu}^{a} > 0$ makes sense. From case (2), the relation $(1-\tau_0)A\overline{X} > \rho(1+\overline{X})^{2}$ is imposed, such that the condition $\beta > \beta_{\mu}^{b} > 0$ makes sense, and the condition $\beta > \beta_{\mu}^{b} > 0$ guarantees ε_{μ}^{b} to satisfy $\varepsilon \in (0,1)$.

This outcome indicates that when the endogenous labor-leisure choice is absent ($\alpha = 0$), two plausible conditions exist for the model to generate positive and large enough growth effects, so that social welfare is raised. These two sufficient conditions require β and ε to be relatively large.

Second, when a relative status-seeking motive is not present ($\beta = 0$), but the labor-leisure choice and production externalities are present ($\alpha > 0$ and $\varepsilon > 0$), from equation (30-1) we have:

$$\left(\frac{d\overline{V}}{d\gamma}\right)^{\mu}\Bigg|_{\beta=0} > 0 \quad \text{as} \quad \begin{array}{l} (1)\ \alpha > \alpha_{\mu}^{a} > 0, 1 > \varepsilon_{\mu}^{c} > \varepsilon > 0 \text{ and } \overline{S} > \rho\,; \\ (2)\ 1 > \varepsilon_{\mu}^{c} > \varepsilon_{\mu}^{d} > \varepsilon > 0,\ \alpha > \alpha_{\mu}^{b} > 0 \text{ and } \overline{S} > \rho, \end{array} \tag{30-1b}$$

where $\alpha_{\mu}^{a} \equiv \dfrac{\eta(1-\bar{l})+(1-\xi)\bar{l}}{\left[\left(1-(\rho/\overline{S})\right)\overline{X}-\varepsilon(1+\overline{X})\right](\bar{l})^{1-\eta}(1-\bar{l})} > 0$, $1 > \varepsilon_{\mu}^{c} \equiv \dfrac{\overline{X}\left(1-(\rho/\overline{S})\right)}{1+\overline{X}} > 0$,

$\varepsilon_{\mu}^{d} \equiv \dfrac{\overline{X}\left(1-(\rho/\overline{S})\right)}{1+\overline{X}} - \dfrac{\eta(1-\bar{l})+(1-\xi)\bar{l}}{\alpha(\bar{l})^{1-\eta}(1-\bar{l})(1+\overline{X})} > 0$, $\alpha_{\mu}^{a} > \alpha_{\mu}^{b} \equiv \dfrac{\eta(1-\bar{l})+(1-\xi)\bar{l}}{\left(1-(\rho/\overline{S})\right)\overline{X}(\bar{l})^{1-\eta}(1-\bar{l})} > 0$. From case (1), inequalities $\overline{S} > \rho$ are imposed, such that the condition $1 > \varepsilon_{\mu}^{c} > \varepsilon > 0$ makes sense, and the condition $\varepsilon_{\mu}^{c} > \varepsilon > 0$ guarantees $\alpha_{\mu}^{a} > 0$ to hold. Furthermore, if the condition $\alpha > \alpha_{\mu}^{a} > 0$ occurs, then we obtain the positive welfare effect. From case (2), the relation $\overline{S} > \rho$ is imposed, such that the condition $\alpha_{\mu}^{b} > 0$ makes sense, and the condition $\alpha > \alpha_{\mu}^{b} > 0$ guarantees $\varepsilon_{\mu}^{d} > 0$. Thus, if the condition $1 > \varepsilon_{\mu}^{d} > \varepsilon > 0$ occurs, we obtain the positive welfare effect.

This result indicates that there exist two sufficient conditions for generating positive welfare effect. They require a relatively large α and appropriated value of ε. From the second equation in equation (28-1), we know that $(d\overline{\theta}/d\gamma)^{\mu}$ is negatively correlated with ε if $\beta = 0$, but it is positively correlated with α. Therefore, the value of α, accompanied by an appropriated value of ε, must be relatively large, so that we obtain a larger positive growth effect. The positive welfare effect then can be generated.

Scheme 2: Consumption Tax Financing

By differentiating equation (29), with respect to γ, and by substituting the related outcomes into this resulting equation yields:

$$\left(\frac{d\overline{V}}{d\gamma}\right)^{\delta} = \frac{1}{\rho}\left[\frac{1}{\overline{X}}\underset{0}{\left(\frac{d\overline{X}}{d\gamma}\right)^{\delta}} + \frac{1}{\rho}\underset{0}{\left(\frac{d\overline{\theta}}{d\gamma}\right)^{\delta}} + \alpha(\bar{l})^{-\eta}\underset{+,0}{\bar{l}_S}\underset{0}{\left(\frac{d\overline{S}}{d\gamma}\right)^{\delta}} - \frac{1}{1+\overline{\delta}}\underset{+}{\overline{\delta}_{\gamma}}\right] = \frac{-A(1-\bar{l})^{\xi}(1+\overline{\delta})}{\rho\overline{X}} < 0. \tag{30-2}$$

Equation (30-2) reveals that the welfare effect of a permanent government expenditure expansion is always negative, irrespective of the presence of β, ε and/or α.

Scheme 3: Income Tax Financing

Differentiating equation (29) with respect to γ and substituting the related outcomes into this resulting equation yield:

$$\left(\frac{d\overline{V}}{d\gamma}\right)^{\tau} = \frac{1}{\rho}\left[\frac{1}{\overline{\overline{X}}}\underset{-,0}{\left(\frac{d\overline{X}}{d\gamma}\right)^{\tau}} + \frac{1}{\rho}\underset{-}{\left(\frac{d\overline{\theta}}{d\gamma}\right)^{\tau}} + \alpha(\overline{l})^{-\eta}\left(\underset{+,0}{\overline{l}_S}\underset{-,0}{\left(\frac{d\overline{S}}{d\gamma}\right)^{\tau}} + \underset{-,0}{\overline{l}_X}\underset{-,0}{\left(\frac{d\overline{X}}{d\gamma}\right)^{\tau}} + \underset{+}{\overline{l}_\gamma}\right)\right] \gtreqless 0 . \qquad (30\text{-}3)$$

Equation (30-3) indicates that the welfare effect of a permanent government spending expansion is ambiguous if the positive leisure effect arose from the same shock exists. If the leisure-welfare effect is large enough, the steady-welfare level may increase with the government spending expansion.

Given $\beta = 0$, $\varepsilon > 0$ and $\alpha > 0$, then from equation (30-3) we have:

$$\left.\left(\frac{d\overline{V}}{d\gamma}\right)^{\tau}\right|_{\beta=0} > 0 \quad \text{as} \quad \alpha > \alpha_\tau^a > 0 , \qquad (30\text{-}3a)$$

where $\alpha_\tau^a \equiv \dfrac{A(1-\overline{l})^{\xi}(1-\overline{\tau})\left(\eta(1-\overline{l})+\overline{l}\right)\left(\varepsilon\rho+(1-\varepsilon)(1+\mu_0)\overline{X}\right)}{\rho\overline{X}^2(\overline{l})^{1-\eta}(1-\overline{l})\ J^{\tau}} > 0$. Obviously, all we need is a relatively large α to generate a positive leisure-induced welfare effect.

To sum up, it is found that in the seigniorage and income tax financing modes, there exists likelihood to obtain positive welfare effects in some environmental settings. Unfortunately, consumption tax financing policy always brings the economy negative welfare effects. From this viewpoint, consumption taxation is not always better than income taxation, despite the fact that consumption taxation does not result in negative growth effect.

5. Concluding remarks

This paper introduces the motive of the relative wealth-as-status seeking and endogenous labor-leisure choice into a Romer (1986)-type endogenous growth model with a cash-in-advance constraint on consumption purchases. We examine the growth and welfare effects of permanent wasteful-government-expenditure expansion, financed by alternative distortionary tax schemes, including seigniorage, consumption tax and income tax. We find that if the relative status-seeking motive is present under the environment with production externalities and/or the labor supply is elastic, a Tobin-type effect in the growth rate sense will emerge. Further, if the growth effect is large enough, higher wasteful government expenditure can even improve social welfare. Nevertheless, in consumption tax-financing mode, regardless of whether the relative status-seeking motive is present or not and whether the labor-leisure choices is endogenous or exogenous, neutrality of consumption taxation in growth rate sense always holds; meanwhile, the welfare effect is always negative. Additionally, in income tax-financing mode, we find that although the growth effect of government expenditure expansion is always negative, the positive welfare effect may exist if the welfare increment following from increases in leisure time is large enough.

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