Consumption Externalities, Market Imperfections, and Optimal Taxation

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ABSTRACT

This paper sets up a dynamic model with a keeping-up-with-the Joneses preference and market imperfections. Two important questions are investigated: (i) under what circumstances and for what reason should the optimal tax be state-varying? (ii) what are the roles played by distinctive types of taxes (including labor, capital and consumption taxes) in the social optimum? By introducing merit good arguments, we extend the Ljungqvist and Uhlig (2000) proposition to provide a more precise interpretation of the demand-management tax policy. Surprisingly, we find that a keeping-up-with-the Joneses preference *sufficiently* leads the social planner to commit to a state-contingent tax on labor income and a stabilization tax policy is *not* always desirable for the economy. Besides, we incorporate a consumption tax into an extended model and show that the role of income tax will be replaced by that of a consumption tax. In this case, a consumption tax not only corrects consumption externalities, but also varies with business cycle fluctuations.

Key Words: Consumption externalities; keeping up with the Joneses; demand-management tax policy.
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1. Introduction

Economists have long been aware of consumption externalities. Not only has their importance been repeatedly emphasized, but they have also been widely studied in many contexts.[1] In the literature, consumption externalities are introduced in order to provide a possible explanation for the equity premium puzzle (Abel, 1990, Gali, 1994, and Campbell and Cochrane, 1999), and to explore the patterns of growth (Carroll, et al. 1997, 2000, Liu and Turnovsky, 2005, and Turnovsky and Monteiro, 2007), the properties of the business cycle (Lettau and Uhlig, 2000), as well as their inefficient consequences (Fisher and Hof, 2000, Shieh, et al., 2000, Dupor and Liu (2003), and Alonso-Carrera, et al., 2004, 2005).

In an influential paper, Ljungqvist and Uhlig (2000, hereafter LU) addressed the role of consumption externalities in setting the optimal (first-best) labor taxation in an infinite-horizon representative agent model with "keeping up with the Joneses" (interpersonally dependent) and "catching up with the Joneses" (intertemporally dependent) preferences.[2] In the absence of capital accumulation, LU show that in the setting of keeping up with the Joneses (henceforth, KUJ) that exhibits an intertemporally *independent* preference, there is no cyclical consequence for the optimal labor tax, i.e., the first-best tax on labor is constant and independent of the productivity shock. However, if the consumption externality enters the utility function in an *intertemporal* fashion, the model with the catching-up-with-the-Joneses utility function calls for a Keynesian demand-management policy, i.e., the optimal tax policy affects the economy countercyclically via procyclical taxes. Guo (2005) incorporates capital accumulation and market imperfections into the LU framework with a KUJ preference and reexamines the optimal tax policy. Due to the KUJ utility function not being intertemporally dependent, he finds that only adding capital accumulation to the LU model does not change their main finding whereby the first-best policy only consists of a state-invariant labor tax, although it can be either positive or negative depending on the relative magnitudes of the consumption externality and monopoly power. However, the first-best tax policy involves a capital subsidy that is state-varying and operates as an automatic stabilizer, e.g., stimulating the economy with a higher subsidy on capital income in recessions caused by adverse productivity disturbances. They elegantly

[1] This issue can be traced as far back as Smith (1759) and Veblen (1899), although it was Duesenberry (1949) who first formalized consumption externalities as a determinant of aggregate consumption in his relative income hypothesis.

[2] By defining different forms of consumption externalities, Dupor and Liu (2003) uncover the relationship between these distinct externalities with equilibrium over-consumption.

indicate the potential advantage and the limit of the traditional Keynesian view of "automatic stabilizers."

This paper is an attempt to clarify these related issues. Under a KUJ setting, we extend LU's analysis to include (1) a generalized functional form of utility, (2) capital accumulation, and (3) three distinctive types of taxes, consisting of labor, capital, and consumption taxes. By identifying the (non-)homotheticity property of the utility function, we would like to investigate two important questions: (i) given an interpersonally dependent (rather than intertemporally dependent) KUJ preference, under what circumstances and why should the optimal tax be state-varying, and (ii) in the presence of two distortions – consumption externalities and market imperfections, what are the roles played by these distinctive types of taxes in the social optimum? In particular, by introducing the concept of the merit good argument, we will provide a straightforward but more precise interpretation of the demand management policy.

Our results sharply contradict those of LU and Guo. We first show that a KUJ preference *sufficiently* leads the social planner to commit to a state-contingent tax on labor income as long as the utility function is *non-homothetic*, even though it is *not* intertemporally dependent. This result follows because "unaccounted-for-consumption externalities" will drive a wedge between the household's intertemporal substitution elasticity of consumption and that of the social planner. This preference divergence will create an incentive for a "paternalistic" government to design a state-contingent labor tax so as to correct the household's "*faulty*" preference. This is the essence of the merit good argument that is raised by Musgrave (1959) and introduced by Besley (1988) in the optimal taxation literature.[3] Of interest, we prove that the optimal labor tax can be either procyclical or countercyclical with respect to an economic shock, hinging on the relative magnitude of the intertemporal elasticity of substitution between the household and the social planner. Unlike LU and Guo, we cannot always recommend a stabilization tax policy because consumption externalities may distort the household's intertemporal elasticity of substitution to an unduly low level, leading cyclical fluctuations to be of benefit to the economy.

Besides, we find that once the state-varying labor tax can remove the distortion caused by the

[3] In general, merit wants could arise because individuals have imperfect information regarding the future states of the world, such as in Sandom (1983). They also could arise because individuals are informed imperfectly concerning the consequences of actions taken by other individuals on their own welfare, such as in Pazner (1972) and this paper. Instead of imperfect information arguments, Besley (1988) introduced merit good arguments by assuming a pathology of individual choice and generating a defective preference.

consumption externality, the first-best tax policy will involve a capital subsidy that only aims at correcting market imperfections without any intertemporal considerations. This also stands in stark to that of Guo (2005) and others (for example, Guo and Lansing, 1999). This contradiction is due to different assumptions: they assume that capital depreciation is tax-deductible, while we do not. Given that the capital depreciation allowance is abstracted from the model the household's effective intertemporal elasticity of substitution will still *not* be affected by the consumption externality and, as a result, the optimal capital tax is state-invariant. We then provide a counterexample for the argument of Guo and Lansing (1999) and Guo (2005).[4]

Most studies, such as LU, have suggested that the income tax might largely internalize consumption externalities. Another purpose of this paper is to investigate whether the role played by income tax may change when consumption tax is an alternative instrument in terms of correcting the distortion caused by consumption externalities. Our analysis shows that when consumption taxes are available, it is optimal to use taxes on consumption rather than a comprehensive income tax in internalizing consumption externality. Thus, the optimal income tax can only aim at remedying the distortion caused by market imperfections and, consequently, it will correct the market imperfections without there being any intertemporal considerations. By contrast, provided that the utility is characterized by non-homotheticity, the government should commit to a state-contingent consumption tax in order to remove the wedge between the intertemporal elasticity of substitution of households and that of the social planner. These results potentially suggest that in the face of the distortion caused by consumption externalities, a consumption tax will play a more important role in sharing the burden of income tax. It is important when we consider a more effective tax reform.

2. The Analytical Framework

The model consists of three types of agents: households, firms, and the government. The typical household is not only concerned with its own consumption and leisure, but also cares about its consumption relative to the benchmark level of consumption (i.e., the average per capita consumption level). The

[4] In the context, we will show that the consequence of a state-varying capital tax in Guo (2005) reacts to the distortion caused by a capital depreciation allowance, rather than that caused by consumption externalities. When this distortionary tax arrangement is abstracted from the model, the first-best capital income tax should be constant and state-invariant.

appearance of the benchmark level of consumption in the household's utility function introduces an externality into the consumption. This externality, in line with Dupor and Liu (2003), could be either negative (reflecting jealousy) or positive (reflecting admiration). The production side of the economy comprises two sectors: the intermediate goods sector and the final good sector. As in Benhabib and Farmer (1994), the intermediate goods market is characterized by monopolistic competition, while the final good market is perfectly competitive. The intermediate good producers, who face a stochastic disturbance, operate with a Cobb-Douglas technology that uses capital and labor as factors of production. In the final good sector, goods are homogeneous and produced from the set of intermediate goods. Finally, the government levies taxes, including a capital tax and a labor income tax (as well as a consumption tax in an extended model), and balances its budget at any instant in time.

2.1. Firms

Time is continuous. To simplify our notation, we suppress the time index throughout the paper.

The final good market

There is a single final good in the economy, which can be consumed, accumulated as capital, and paid for as taxes. Following Dixit and Stiglitz (1977), the final good, y, is produced using a continuum of intermediate input y_i, $i \in [0,1]$, i.e., the quantity of input i used in the production of the final good. Thus, the final good production technology is given by:

$$y = [\int_0^1 y_i^{1-\eta} di]^{1/(1-\eta)} \; ; \;\; \eta \in [0,1) \, , \tag{1}$$

Given (1), the profit maximization problem for the final good firm is expressed as:

$$\max_{y_i} \quad y - \int_0^1 p_i y_i di \, , \tag{2}$$

where p_i is the relative price of the i-th intermediate good and the final good is viewed as the numeraire. Solving (2) is straightforward and leads to the demand function for the i-th intermediate good:

$$p_i = y^{\eta} y_i^{-\eta} \, . \tag{3}$$

It is easy to learn that the price elasticity of demand for y_i is $-1/\eta$. When $\eta = 0$, intermediate goods are perfect substitutes in the production of the final good, implying that the intermediate goods sector is perfectly competitive. If $\eta > 0$, intermediate goods firms face a downward sloping demand curve that can be exploited to manipulate prices; η thus measures the degree of monopoly of the intermediate goods firms.

The intermediate goods market

Intermediate good producers operate in a monopolistic market. By defining k_i and h_i as capital and labor inputs employed by each intermediate good producer *i*, respectively, each intermediate producer uses a symmetric technology as follows:[5]

$$y_i = A k_i^{\theta} h_i^{1-\theta}, \tag{4}$$

where A is a technology shock that reflects business cycle fluctuations. The parameters θ and $1-\theta$ measure the weights attached to production by the private capital and labor, respectively. In order to ensure a positive but diminishing marginal productivity of capital and labor, we assume that $0 < \theta < 1$.

Given the demand function of final good firms (3) and the production function (4), the optimization problem of the intermediate producer *i* is to choose k_i, and h_i so as to maximize profits, π_i, i.e.:

$$\max_{k_i, h_i} \quad \pi_i = p_i y_i - r k_i - w h_i, \quad \text{s.t.} \quad p_i = y^{\eta} y_i^{-\eta} \ \text{ and } \ y_i = A k_i^{\theta} h_i^{1-\theta},$$

where r is the interest rate and w is the wage rate. The first-order conditions for this optimization problem yield:

$$r = (1-\eta)\theta \frac{p_i y_i}{k_i} \quad \text{and} \quad w = (1-\eta)(1-\theta)\frac{p_i y_i}{h_i}. \tag{5}$$

Symmetric equilibrium

Our analysis is confined to a symmetric equilibrium under which $p_i = p$, $k_i = k$, $h_i = h$, $y_i = y$, and $\pi_i = \pi$, for all *i*. Accordingly, under symmetric equilibrium the production function can be restated as:

$$y = A k^{\theta} h^{1-\theta}. \tag{4a}$$

Because the final good market is perfectly competitive, the free-entry equilibrium is pinned down by the zero-profit condition: $y - \int_0^1 p_i y_i di = 0$, implying that $p_i = p = 1$ in equilibrium. Given the symmetric equilibrium and $p = 1$, (5) can be rewritten as:

$$r = (1-\eta)\theta \frac{y}{k} \quad \text{and} \quad w = (1-\eta)(1-\theta)\frac{y}{h}, \tag{6}$$

and, as a consequence, the profit of intermediate producers is given by:

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[5] Our main results hold if the production function is specified as a more generalized form: $y_i = A \cdot f(k_i, h_i)$.

$$\pi = y - rk - wh = \eta y . \tag{7}$$

It follows from (7) that η not only measures the degree of monopoly, but also represents the equilibrium profit share of national income; if $\eta > 0$, intermediate firms earn an economic profit.

2.2. Households

The representative household derives utility from the comparison of its own consumption level, c, relative to the benchmark consumption level, C, and suffers disutility from working, h. To shed light on our point, we specify a generalized functional form for the household's utility as follows:

Assumption U. ***The instantaneous utility function is given by:***

$$U = u(c, C) - g(h) , \tag{8}$$

which is characterized by:

(i) $u_c > 0$, $u_{cc} < 0$, $g_h > 0$, ***and*** $g_{hh} > 0$***: The conditions*** $u_c > 0$ ***and*** $u_{cc} < 0$ ***ensure a positive but diminishing marginal utility of the typical household's own consumption and the conditions*** $g_h > 0$ ***and*** $g_{hh} > 0$ ***imply that the household suffers an increasing disutility from working.***

(ii) $u_C \gtrless 0$***:*** $u_C < 0$ ***implies a negative consumption externality (jealousy) and*** $u_C > 0$ ***implies a positive consumption externality (admiration);***

(iii) $\dfrac{\partial (u_c / g_h)}{\partial C} > 0$ ***refers to "keeping up with the Joneses."***

(iv) $u_c + u_C > 0$ ***guarantees that the utility of each individual rises if the economy moves from one symmetric situation to another in which each individual has a higher level of consumption.***[6]

For ease of comparison with LU, the utility function is specified as being separable between consumption and leisure. Nevertheless, relaxing this assumption will not alter our main results.

Given a positive capital endowment $k_0 > 0$, the budget constraint faced by the household is given by:

$$\dot{k} = (1 - \tau_w) wh + (1 - \tau_k)(rk + \pi) - (1 + \tau_c) c + tr - \delta k , \tag{9}$$

where τ_w is the rate of wage income tax, τ_k is the rate of capital income tax, τ_c is the rate of consumption, $tr > 0$ (< 0) is a lump-sum transfer (lump-sum tax) and δ is the depreciation rate of capital.

[6] Gali (1994), Fisher and Hof (2000), and Liu and Turnovsky (2005) impose the same assumption.

It is important to remind the reader that, unlike Guo, in (9) capital depreciation is *not* subject to any allowance. Due to this distinction, our results will dramatically differ from those of Guo.

Subject to (9) and taking consumption externalities C as given, the household's optimization problem is to choose consumption c and working hours h (or leisure l) so as to maximize the discounted sum of future utilities, $\int_0^\infty Ue^{-\rho t}dt$, where ρ is a constant rate of time preference. The optimal conditions necessary for this optimization problem are therefore as follows:

$$u_c(c,C) = (1+\tau_c)\lambda \,, \tag{10a}$$

$$g_h(h) = (1-\tau_w)w\lambda \,, \tag{10b}$$

$$-\dot{\lambda} + \rho\lambda = [(1-\tau_k)r - \delta]\lambda \,, \tag{10c}$$

together with (9) and the transversality condition $\lim_{t\to\infty} \lambda k e^{-\rho t} = 0$. In (10a)-(10c), the term λ is the co-state variable, which can be interpreted as the shadow value of private capital stock measured in utility terms. Equations (10a) and (10b) are the marginal conditions for consumption and labor, respectively. Given (10a), (10c) is essentially the Euler equation for capital accumulation.

2.3. The Government

It is assumed that the government balances its budget at any instant in time. It collects taxes, including a labor income tax, capital income tax, and consumption tax, and redistributes these tax revenues to households as a transfer payment in a lump-sum manner. Accordingly, the government's budget constraint:

$$tr = \tau_w wh + \tau_k(rk+\pi) + \tau_c c \,, \tag{11}$$

is met by adjusting the lump-sum transfers, tr.

In addition, by substituting (4a), (6), (7) and (11) into the household's budget constraint (9), the economy-wide resource constraint is given by:

$$\dot{k} = Ak^\theta h^{1-\theta} - c - \delta k \,. \tag{12}$$

3. First-Best Tax Policy

Owing to the imperfectly competitive behavior of intermediate goods firms and the presence of consumption externalities, the market equilibrium will be inefficient. In the Pareto optimum, the social planner will internalize these market failures.

To make our point clearer, two scenarios are considered and in turn analyzed in this section. As a benchmark case, we first undertake our analysis under the situation where the consumption tax is not available. In this case, the socially optimal labor and capital income taxes will be derived, thus allowing us to make a comparison between the present study and LU as well as Guo (2005). In the second scenario, we introduce a consumption tax in the analytical framework, and accordingly, show that the optimal income tax will be characterized by very different functions in terms of achieving a Pareto optimum if the consumption tax is an alternative instrument in terms of removing the distortion caused by consumption externalities.

The social planner, subject to the aggregate resource constraint (12), maximizes the discounted sum of future utilities, $\int_0^{\infty} U e^{-\rho t} dt$, with the aggregate consistency condition $c = C$, by choosing c, h, and k. By letting v be the co-state variable associated with the aggregate resource constraint (12), the optimal conditions for the social planner's optimization problem are given by:

$$u_c(c,c) + u_C(c,c) = v, \tag{13a}$$

$$g_h(h) = (1-\theta)Ak^{\theta}h^{-\theta}v, \tag{13b}$$

$$-\dot{v} + \rho v = (\theta A k^{\theta-1}h^{1-\theta} - \delta)v, \tag{13c}$$

By comparing the social planner's solution with the competitive equilibrium, we will determine the first-best tax policy.

3.1. Consumption Tax Is Not Available

We start our analysis with the benchmark case, setting $\tau_c = 0$. Since, as mentioned in the Introduction, our results hinge crucially on the characteristics of the utility function, we first introduce the concept of homotheticity:

Lemma 1. ***If the utility is homothetic in*** *c* ***and*** *C****, the marginal rate of substitution between consumption and contemporaneous aggregate consumption, defined as*** MRS***, is constant along the (symmetric) equilibrium path, i.e., when*** $c = C$***. That is***

$$MRS = -\frac{u_c(c,c)}{u_C(c,c)} = z\,,$$

where z ***is some constant value.***

Proof: By following the well-documented feature of a homothetic utility function, in the $(c\,,C)$ plane any ray through the origin will cut all the indifference curves at points where the slopes are the same (see, for example, Deaton and Muellbauer, 1980, pp. 142-147, and Varian, 1992, pp. 17-19). Given that the *MRS* depends only on the ratio *C/c*, the *MRS* under the symmetric equilibrium ($c = C$) must be a constant, as shown in Figures 1 and 2. □

Let superscript "o" be the first-best tax rate associated with the relevant variables. By calling for Lemma 1, we have the following proposition:

Proposition 1. ***Given Assumption U, in the presence of consumption externalities and market imperfections,***

(i) the first-best tax policy is given by:

$$\tau_k^o = \frac{-\eta}{1-\eta} < 0 \quad \text{and} \quad \tau_w^o = \frac{1}{1-\eta}\left(\frac{1}{MRS} - \eta\right) \gtrless 0\,. \tag{14}$$

(ii) The optimal capital income tax is independent of the economic shock A***, but to achieve a social optimum, the government should commit to a state-contingent tax on labor income, provided that the utility is non-homothetic.***

Proof: Let $\tau_c = 0$. Under symmetric equilibrium $c = C$, we can easily derive the following from (10a) and (13a):

$$\frac{u_c(c,c)}{u_c(c,c) + u_C(c,c)} = \frac{\lambda}{v}\,. \tag{15}$$

Equipped with this relationship and by equating (10b) with (4a) and (6) with (13b), we further obtain:

$$\frac{v}{\lambda} = (1-\tau_w^o)(1-\eta) = \frac{u_c(c,c) + u_C(c,c)}{u_c(c,c)}\,,$$

implying that the first-best tax on labor income is:

$$\tau_w^o = 1 - \frac{1}{1-\eta}\left(\frac{[u_c(c,c)/u_C(c,c)]+1}{u_c(c,c)/u_C(c,c)}\right) = \frac{1}{1-\eta}\left(\frac{1}{MRS} - \eta\right).$$

In line with Liu and Turnovsky (2005), replication involves setting labor and capital taxes such that capital and consumption are the same in both the centralized and decentralized economies which then require that $\dot{v}/v = \dot{\lambda}/\lambda$.[7] Given that, using (10c) and (13c), together with the expression for the equilibrium interest rate (6) and imposing certainty equivalence, immediately yields the optimal capital income tax rate:

$$\tau_k^o = \frac{-\eta}{1-\eta} < 0\,,$$

accordingly, we also have $\partial\tau_k^o / \partial A = 0$.

Moreover, by applying Lemma 1, if the utility is homothetic, in (14) the term *MRS* under the symmetric equilibrium must be a constant and, as a result, τ_w^o is state-invariant. By contrast, if the utility function is non-homothetic, *MRS* is the function of the steady-state consumption c^*. From (12) and (13a)-(13c), it is easy to derive:

$$\frac{\partial c^*}{\partial A} = \frac{\Gamma[(\rho+(1-\theta)\delta)/\theta]\{(1-\theta)\Gamma^{\theta}A(u_c+u_C)+h^* g_{hh}\}}{(1-\theta)A\Delta} > 0\,, \tag{16}$$

where $\Gamma = [\theta A/(\rho+\delta)/]^{1/(1-\theta)}$ and $\Delta = -(1-\theta)\Gamma^{1+\theta}A[(\rho+(1-\theta)\delta)/\theta](u_{cc}+2u_{cC}+u_{CC}) - g_{hh} > 0$. This implies that the optimal labor tax τ_w^o will be state-varying. □

Proposition 1 provides novel results that contribute new insights for the relevant literature. We in turn summarize these as follows. By focusing on Proposition 1(i), we find that while τ_k^o is unambiguously negative, τ_w^o can be either positive or negative, depending on the relative magnitude of the strength of the consumption externality and the degree of monopoly power if there is a negative consumption externality (jealousy), $u_C < 0$. As stressed by Layard (2006), in the presence of keeping up with the Joneses the unhappiness that one person’s extra consumption (or income) can cause to others, is a form of pollution. To correct this externality, taxes are thereby desirable. We also find that the optimal capital tax corresponds to the distortion caused by market imperfections, but the optimal labor tax internalizes both distortions caused by consumption externalities and market imperfections. These results are qualitatively in conformity with those in LU and Guo (2005).

However, the result of Proposition 1(ii) differs dramatically from theirs. In a model without capital accumulation, LU argue that there is no cyclical consequence for the optimal labor tax in the KUJ model.

[7] It follows from (15) that in the steady state $\dot{c} = \dot{h} = 0$ holds true, implying that $\dot{v}/v = \dot{\lambda}/\lambda$. Accordingly, this assumption implies that our analysis only focuses on the steady-state effect.

By contrast, the model with a catching-up-with-the-Joneses preference calls for a Keynesian demand-management policy, i.e., the optimal tax policy affects the economy countercyclically via procyclical taxes, since the consumption externality enters the utility function in an *intertemporal* fashion. However, by departing from their finding, Proposition 1(ii) indicates that, given a KUJ preference while the optimal capital tax is state-invariant, the government should in order to achieve a social optimum commit to a state-contingent tax on labor income. In other words, a KUJ preference *sufficiently* leads the optimal labor tax to be state-varying even though the utility is *not* intertemporally dependent, provided that it is non-homothetic.

Our result also stands in sharp contrast to the findings of Guo and Lansing (1999) and Guo (2005). By incorporating capital accumulation into a model with a KUJ preference, Guo (2005) claims that, "adding capital accumulation alone to the Ljungqvist-Uhlig model does not change their main finding where the first-best policy only consists of a time-invariant labor tax that corrects the consumption externality." However, Guo and Lansing (1999) and Guo (2005) show that, given an existing tax allowance for capital depreciation, the social planner needs to address the interrelations between the macroeconomic aggregates of different time periods by setting an optimal capital subsidy that operates like an automatic stabilizer, e.g., by stimulating the economy with a higher subsidy on capital income in recessions caused by adverse productivity disturbances. Our result obviously provides a counterexample to their argument. By removing the distortion caused by tax arrangements (i.e., the capital depreciation allowance), our model ends up with a very different result whereby the first-best capital tax is state-invariant and the first-best labor tax may be state-contingent. In the analysis that follows, we will further show that once the capital depreciation allowance is abstracted from the economy the household's effective intertemporal elasticity of substitution will still *not* be affected by the consumption externality in a dynamic model with capital and, as a result, the optimal capital tax should be state-invariant.

We now turn to the following questions: Should the socially optimal labor income tax be procyclical or countercyclical with respect to an economic shock? In addition, under what condition is the labor tax characterized by a Keynesian-like stabilizer that is designed to mitigate business cycle fluctuations? To perform such an analysis, we must further derive the steady-state consumption. To this end, we consider some specific functional forms with regard to the household's utility function that are common specifications in the related literature.

Example 1. ***The household's instantaneous utility*** U ***satisfies the homotheticity property and, for example, takes the following two functional forms:***

$$U = \frac{(c-\phi C)^{1-\sigma}}{1-\sigma} - \Lambda\frac{h^{1+\varepsilon}}{1+\varepsilon}, \tag{17a}$$

$$U = \frac{c^{1-\sigma}C^{\gamma\sigma}}{1-\sigma} - \Lambda\frac{h^{1+\varepsilon}}{1+\varepsilon}, \text{ with } \gamma < 0. \tag{17b}$$

Equation (17a) is similar to that of LU (2000), Dupor and Liu (2003), and Guo (2005), while (17b) is the same as that of Gali (1994), Carroll, et al. (2000) and Alvarez-Cuadrado, et al. (2004).

Example 2. ***The utility function is non-homothetic and is specified as:***

$$U = \frac{c^{1-\sigma}}{1-\sigma} + \Phi\frac{(c/C)^{1-\alpha}}{1-\alpha} - \Lambda\frac{h^{1+\varepsilon}}{1+\varepsilon}. \tag{17c}$$

This is Fisher and Hof's (2000) specification that is in conformity with the argument of Duesenberry (1949) and more recently Falk and Knell (2004) where, to capture the socio-economic characteristics, utility should depend on the absolute outcome as well as on the relative outcome, i.e., on the outcome relative to some reference level.

Prior to the succeeding analysis, we should emphasize that, while these functional forms of utility in Examples 1 and 2 may be either homothetic or non-homothetic, they have two common features: (i) the preference exhibits jealousy, i.e., $u_C < 0$ and (ii) is characterized by KUJ, i.e., $\partial(u_c / g_h)/\partial C > 0$. Therefore, in what follows, we will restrict our focus to the case where jealousy and KUJ are present. It is important to note that since the homotheticity property of utility will affect the household's effective intertemporal substitution elasticity of consumption, denoted by ξ, we then establish:

Lemma 2. ***According to Examples 1 and 2, in the decentralized economy***

(i) ***If the utility is homothetic, from (17a) ((17b)) we have:*** $\xi = 1/\sigma$ ***(*** $\xi = 1/\sigma(1-\gamma)$ ***) along the symmetric equilibrium path, which is constant and independent of consumption externalities.***

(ii) ***If the utility is non-homothetic,*** $\xi = (\Phi + c^{1-\sigma})/(\Phi + \sigma c^{1-\sigma})$ ***along the symmetric equilibrium path, which is affected by consumption externalities and is state-varying.***

In addition, in the optimal allocation of the economy, for a social planner who takes consumption externalities into account, i.e., $c = C$, according to (17a) and (17c) ($(17b)$) the intertemporal substitution elasticity of consumption is $\xi^c = 1/\sigma$ ($\xi^c = 1/\sigma(1-\gamma)$) in the centrally planned economy.

Proof: Following Fisher and Hof (2000) and Liu and Turnovsky (2005), we first define the household's effective coefficient of relative risk aversion as $\xi = -c \cdot \frac{\partial u_c(c,C)}{\partial c} / \frac{\partial u(c,C)}{\partial c}$ along the symmetric equilibrium, and the social planner's effective relative risk aversion as $\xi^c = -c \cdot \frac{\partial u_c(c,c)}{\partial c} / \frac{\partial u(c,c)}{\partial c}$. In the decentralized economy the households behave atomistically, taking the aggregate consumption C as given. Thus, in Example 1 the property of homotheticity of (17a) yields $\xi = 1/\sigma$ and, by analogy, from (17b) we have $\xi = 1/\sigma(1-\gamma)$ under the symmetric equilibrium, i.e., $c = C$. In addition, in Example 2 utility is non-homothetic, and so along the symmetric equilibrium:

$$\xi = \frac{\Phi + c^{1-\sigma}}{\Phi + \sigma c^{1-\sigma}}, \tag{18}$$

implying that the household's intertemporal substitution elasticity of consumption is not only affected by consumption externalities, but is also state-varying (because of the state-varying consumption). □

Lemma 2 clearly indicates that an "unaccounted for consumption externality" drives a wedge between the household's preference and that of the social planner. To be precise, there is a divergence between the household's intertemporal substitution elasticity of consumption (ξ) and that of the social planner (ξ^c). The preference distortion (divergence) will create an incentive for interventions of a government in the sphere of intertemporal resource allocation. This, in effect, is the essence of the merit good concept that is raised by Musgrave (1959) and introduced by Besley (1988) in the optimal taxation literature.[8] The merit good argument states that when society is in conflict with the preferences of individuals, in the social calculus individual preferences are neglected or supplemented by other considerations. This, as we will see later, also provides a convincing explanation as to why the labor tax should be designed to react to business cycle fluctuations.

According to Example 1, the optimal labor tax in (14) will be reduced to

[8] Such a case where "unaccounted for externalities" drive merit wants for a "paternalistic" social planner has also been raised by Pazner (1972).

$$\tau_w^o = \frac{\sigma(\eta-\gamma)-\eta}{(1-\eta)(1-\sigma)}, \tag{14a}$$

if we adopt Gali's (1994) specification, which turns out to be

$$\tau_w^o = \frac{\phi-\eta}{1-\eta}, \tag{14b}$$

if we follow the specification of LU and Guo. Equation (14b) is essentially the Guo result. When setting $\eta = 0$ (perfect competition), (14b) will recover LU's result, $\tau_w^o = \phi$. It follows from (14a) and (14b) that, as proved in Proposition 1, the optimal labor is constant and is independent of *A*.

However, if we follow Fisher and Hof's (2000) specification which is expressed in Example 2, (14) will become:

$$\tau_w^o = \frac{(1-\eta)\Phi - \eta c^{1-\sigma}}{(1-\eta)(\Phi + c^{1-\sigma})}. \tag{14c}$$

Accordingly, the relationship between the optimal labor tax and the productivity shock is given by:

$$\frac{\partial \tau_w^o}{\partial A} = \frac{\sigma\, c^{-\sigma}}{(1-\eta)(\Phi + c^{1-\sigma})\xi}(\xi - \xi^c)\cdot\frac{\partial c^*}{\partial A} \gtrless 0, \qquad \text{if} \quad \xi \gtrless \xi^c. \tag{19}$$

Based on Proposition 1, the above results can be summarized in the following corollary:

Corollary 1. ***Given Example 2, if the utility function is non-homothetic, the government will commit to a state-contingent labor tax when in the presence of the wedge*** $(\xi - \xi^c)$ ***of the intertemporal substitution elasticity of consumption between the decentralized (*** $\xi = (\Phi + c^{1-\sigma})/(\Phi + \sigma c^{1-\sigma})$ ***) and centralized economy (*** $\xi^c = 1/\sigma$ ***). Specifically, the optimal labor tax varies procyclically (countercyclically) with an economic shock if the intertemporal substitution elasticity of the household is larger (smaller) than that of the social planner, i.e.,*** $\xi > \xi^c$ ***(*** $\xi < \xi^c$ ***).***

Corollary 1 clearly shows that there is no obvious connection between the state-varying tax and the intertemporally dependent preference. The wedge between the household's intertemporal substitution elasticity of consumption and that of the social planner is a key motivation for a "paternalistic" government to commit to a state-contingent labor tax policy. If the utility function is homothetic, as specified by LU, the consumption externality will not drive any wedge between ξ and ξ^c, and there is no need for the government to impose a labor tax with intertemporal considerations.

However, if the utility is non-homothetic, the consumption externality will drive a wedge between ξ

and ξ^c and, consequently, a state-contingent labor tax will be designed to react to the business cycle fluctuations. A lower intertemporal elasticity of substitution implies that the agent has a lower willingness to substitute intertemporally and, hence, will be less willing to accept deviations from a uniform pattern of consumption over time if $r-\delta=\rho$ applies.[9] Thus, the agent will *ceteris paribus* prefer a higher degree of consumption smoothing. However, if the intertemporal elasticity of substitution of the household is larger than that of the social planner ($\xi>\xi^c$), relative to households, the social planner will prefer a higher degree of consumption smoothing. Thus, by calling for merit wants, the government will attempt to remove the divergence between ξ and ξ^c by setting the optimal labor tax that should be procyclical with respect to economic shock *A* so as to smooth out household consumption and, as a result, mitigate business cycle fluctuations. By contrast, if the household's intertemporal elasticity of substitution is smaller than that of the social planner, the story is reversed and the optimal labor tax will vary countercyclically with the shock. In other words, we cannot always recommend a stabilization tax policy because the consumption externality could distort the household's intertemporal elasticity of substitution to an unduly low level, thereby causing cyclical fluctuations to be of benefit to the economy.[10]

3.2. Consumption Tax is an Alternative

An interesting scenario, in addition to τ_k^o and τ_w^o, is one in which a consumption tax is also available for a social planner. We now turn to uncover such a case in this subsection.

In order to add more emphasis to our point without significant loss of generality, in this subsection we assume that the government levies income tax at the same rate, i.e., $\tau_w=\tau_k=\tau_y$. This simplification allows us to shed light on the role of a consumption tax in terms of correcting the distortions and, with added emphasis, it also enables us to distinguish the functional differences between income tax and consumption tax when households have benchmark levels of consumption. As a matter of fact, according to the *Economic Report of the President* (1987, 1989) and the analysis conducted by Guo and Lansing (1994), average marginal tax rates on labor and capital income have been brought closer together in the U.S. following the

[9] It follows easily from the Keynes-Ramsey rule that a lower ξ implies a smaller responsiveness of $\dot{c}/c$ to the gap between the *net* interest rate $r-\delta$ and the time preference rate ρ.

[10] This result is in contrast to the conventional normative theories of optimal fiscal policy, but there is substantial evidence that supports the possibility of procyclical fiscal policy, i.e., increases in tax rates during recessions and reductions in tax rates during expansions. Latin America (see Gavin and Perotti, 1997) and many developing countries (see Kaminsky et al., 2004) indeed exhibit the phenomenon of procyclical fiscal policy.

implementation of the Tax Reform Act in 1986.

By comparing the conditions (10a)-(10c) in the decentralized economy with the equilibrium interest rate and the wage rate (6) with the corresponding conditions for the centrally planned economy (13a)-(13c), we can establish:

Proposition 2. ***Under Examples 1 and 2, given that a consumption tax is available and capital and labor income are taxed at the same rate,***

(i) ***the first-best taxes on income and consumption are, respectively:***

$$\tau_y^o = \frac{-\eta}{1-\eta} < 0 \quad \text{and} \qquad \tau_c^o = -\frac{u_C(c,c)}{u_c(c,c)+u_C(c,c)} = \frac{1}{MRS-1} \gtrless 0, \tag{20}$$

indicating that the optimal income tax aims at remedying the distortion caused by market imperfections and the optimal consumption tax corrects the distortion caused by consumption externalities.

(ii) Each first-best income tax is independent of the economic shock A. ***If the utility function is homothetic, the first-best consumption tax is also independent of the productivity shock. However, if the utility function is non-homothetic, the optimal consumption tax varies procyclically (countercyclically) with economic shock A, when the intertemporal substitution elasticity of the household*** ξ ***is larger (smaller) than that of the social planner*** ξ^c***.***

Proof: Let $\tau_w = \tau_k = \tau_y$. Under symmetric equilibrium $c = C$, from (10a) and (13a) we have the following relationship:

$$\frac{u_c(c,c)}{u_c(c,c)+u_C(c,c)} = (1+\tau_c)\frac{\lambda}{v}. \tag{21}$$

Based on this relationship and using (4a), (6), (10b), and (13b), we obtain:

$$\frac{v}{\lambda} = (1-\tau_y^o)(1-\eta) = (1+\tau_c)\frac{u_c(c,c)+u_C(c,c)}{u_c(c,c)}. \tag{22}$$

This implies that in the steady state the condition $\dot{v}/v = \dot{\lambda}/\lambda$ must be true, as raised by Liu and Turnovsky (2005). With this condition, by equating (10c) with (4a) and (6) with (13c), we have: $(1-\tau_y)(1-\eta) = 1$, meaning that the optimal income tax rate is:

$$\tau_y^o = \frac{-\eta}{1-\eta} < 0. \tag{23}$$

Putting (21)-(23) together, the optimal consumption tax rate is also immediately obtained:

$$\tau_c^o = -\frac{u_C(c,c)}{u_c(c,c)+u_C(c,c)} = \frac{1}{MRS-1} \gtrless 0 .$$

Given Assumption U (iv) $u_c + u_C > 0$ (hence $MRS = |u_c / u_C| > 1$**),** this indicates that the government should levy a tax on consumption in the presence of a *jealous* preference ($u_C < 0$, and hence $MRS > 0$).

According to Example 1, if the utility takes Gali's (1994) form, the optimal consumption tax in (20) is reduced to: $\tau_c^o = -\gamma\sigma/[1+\sigma(\gamma-1)]$, and if utility takes LU's (2000) form, it turns out to be: $\tau_c^o = \phi/(1-\phi)$. Clearly, both of them are constant. However, in line with Fisher and Hof's (2000) specification, as shown in Example 2, the optimal consumption tax becomes:

$$\tau_c^o = \frac{\Phi}{c^{1-\sigma}} > 0 , \tag{24}$$

and, accordingly, is characterized by:

$$\frac{\partial \tau_c^o}{\partial A} = \frac{\sigma(\Phi + \sigma c^{*1-\sigma})}{(c^*)^{2-\sigma}} (\xi - \xi^c) \frac{\partial c^*}{\partial A} \gtrless 0 \quad \text{if} \quad \xi \gtrless \xi^c . \ \square$$

Proposition 2 (i) provides an interesting result. When the consumption tax is an alternative, the government will use a consumption tax, rather than an income tax, to correct for the consumption externality, since a consumption tax can more effectively remove the distortion caused by the consumption externality.[11] Therefore, the role of the income tax is replaced by that of a consumption tax. Once the optimal consumption tax aims at correcting the distortion caused by consumption externalities, the role of the income tax becomes simpler and the first-best income tax only remedies the distortion caused by market imperfections.

Proposition 2 (ii) indicates that since the socially optimal income tax does not correspond to the consumption externalities, it can correct market imperfections without any intertemporal considerations. Thus, the first-best tax on income is state-invariant. By contrast, since "unaccounted-for-consumption externalities" drive a wedge between the household's intertemporal substitution elasticity of consumption (ξ) and that of the social planner (ξ^c), the "authoritarian" interventions driven by the merit good argument will

[11] If taxes on labor, capital, and consumption are all available, the optimal taxation will be in accordance with: $\tau_k^o = -\eta/(1-\eta) < 0$ and $(1+\tau_c^o)/(1-\tau_w^o) = -(1-\eta)MRS/(1-MRS)$. This implies that we are only able to obtain a welfare-maximizing combination of the labor tax and consumption tax. Such a characteristic of the optimal taxation is similar to those of Liu and Turnovsky (2005) and Turnovsky and Monteiro (2007). By comparing this result with that in Proposition 2, we can see that imposing a uniform tax rate on labor and capital income constitutes a significant step toward the goal of achieving a simpler and more efficient tax arrangement.

attempt to give rise to intertemporal resource allocation in order to remove the preference divergence. By applying a logic similar to that in Corollary 1, we can see that the optimal consumption will vary procyclically (countercyclically) with the economic shock, when the intertemporal substitution elasticity of the household is larger (smaller) than that of the social planner.

4. Concluding Remarks

In this paper we have clarified the issue raised by LU and have surprisingly found that there is no obvious connection between the state-varying tax and the intertemporally dependent preference. The wedge between the household's intertemporal substitution elasticity of consumption and that of the social planner is a key motivation for a "paternalistic" government to commit to a state-contingent tax policy. As long as the utility function is non-homothetic, "unaccounted-for-consumption externalities" will drive a wedge between the household's intertemporal substitution elasticity of consumption and that of the social planner. As a result, by calling for merit wants, the government will attempt to remove such a wedge by designing a state-contingent tax. Interestingly, it has been found that the optimal tax can be either procyclical or countercyclical with respect to an economic shock, this crucially depending on the relative magnitude of the intertemporal substitution elasticity of consumption between the household and the social planner.

In an extended analysis, we have shown that if a consumption tax is available, the optimal consumption tax aims at remedying the distortion caused by consumption externalities and, as a result, the optimal income tax only aims at remedying the distortion caused by market imperfections. Since the socially optimal income tax does not correspond to the consumption externalities, it will correct market imperfections without any intertemporal considerations. By contrast, the government should commit to a state-contingent consumption tax in order to remove the preference distortion caused by consumption externalities, provided that the utility is non-homothetic.

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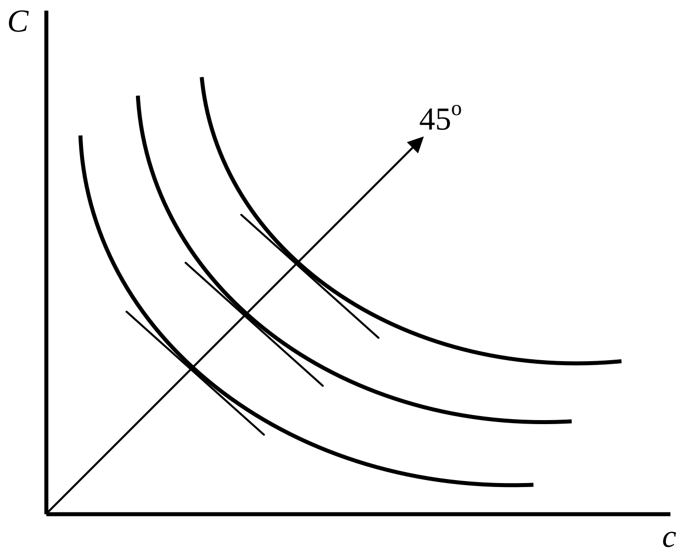

Figure 1. Homothetic Preferences: The $U_C > 0$ case

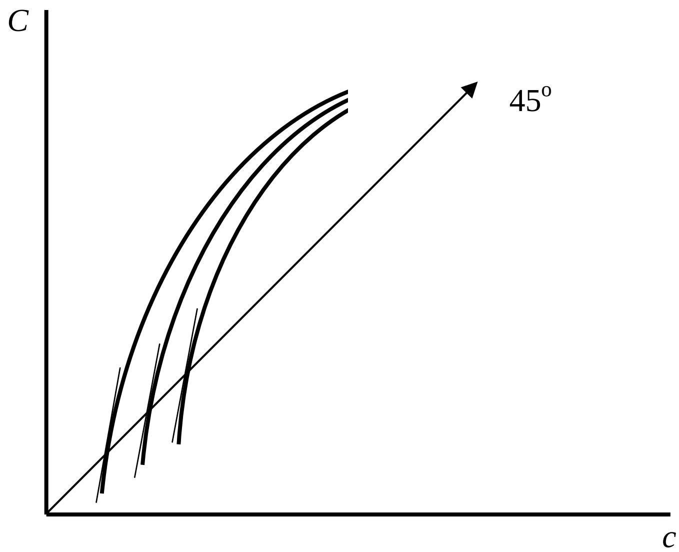

Figure 2. Homothetic Preferences: The $U_C < 0$ case