First-Best Fiscal Policy with Social Status*

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Abstract

This paper examines the first-best fiscal policy in a stochastic, infinite-horizon representative agent model that exhibits consumption-enhanced as well as wealth-enhanced social status in the household utility. We show that the first-best labor tax rate is a positive constant that is used to correct negative consumption externalities. The first-best tax rate on capital income is also positive in order to overturn agents' status-seeking capital over-accumulation. Moreover, we find that in sharp contrast to a conventional automatic stabilizer, the first-best capital tax rate moves in the opposite direction with shocks to firms' production technology, thus exacerbating the business cycle.

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1 Introduction

There is now an extensive literature that examines the macroeconomic effects of agents' quest for social status (or concern for their relative position in the society) within neoclassical models of capital accumulation, economic growth, and asset pricing. Specifically, an individual household's status-motivated preferences are postulated to depend on its own consumption or wealth relative to a reference standard that is typically defined as the economy's aggregate level of consumption or capital stock. With the noted exception of Tournemanie and Tsoukis (2008), previous research in this literature has investigated the case with either consumption-enhanced or wealth-enhanced social comparisons separately.[1] By contrast, we examine the first-best (or socially-optimal) fiscal policy in a stochastic, infinite-horizon representative agent model that exhibits both consumption and wealth indicators of social status in the household utility. To our knowledge, this is the first work that explores such an important research topic not only for its theoretical insights, but also for its wide-ranging implications for the design and implementation of socially-optimal tax policies.

This paper incorporates agents' status-seeking motives in consumption as well as in wealth into an otherwise standard stochastic one-sector real business cycle model with shocks to perfectly-competitive firms' production technology. In particular, the representative household's constant-relative-risk-aversion (CRRA) utility function includes consumption-based and wealth-based social comparisons represented by its consumption and physical-capital ownership relative to the economy's respective aggregate levels. The presence of these external effects call for government intervention in that competitive equilibrium does not yield Pareto-optimal resource allocations. On the other hand, the non-separable CRRA preference formulation allows us to examine how the interaction between these two preference distortions affects equilibrium efficiency and the first-best fiscal policy in a rather transparent manner.

In our model economy, the equilibrium level of consumption is higher than that at the Pareto optimum because of agents' jealous desire to keep up with the Joneses. To correct this particular market failure, the first-best tax rate on labor income turns out to be a positive

[1] Existing work on consumption-based social comparisons includes Abel (1990), Galí (1994), Rauscher (1997), Fisher and Hof (2000), Ljungqvist and Ulhig (2000), Alonso-Carrera et al. (2004), Guo (2005), Liu and Turnovsky (2005), Tsoukis (2007), and Mino (2008), among many others. In terms of wealth-based social comparisons, see Zou (1994, 1995, 1998), Bakshi and Chen (1996), Corneo and Jeanne (1997, 2001*a*, 2001*b*), Futagami and Shibata (1998), Chang, Hsieh and Lai (2000), Chang and Tsai (2003), Clemens (2004), Chang, Tsai and Lai (2004), Fisher and Hof (2005), and Chen and Guo (2009), among many others.

constant that is equal to the strength of consumption externalities. Since it is the economy's contemporaneous aggregate consumption that enters the household utility, the representative agent's intratemporal trade-off between consumption and hours worked will be affected. It follows that the benevolent social planner can choose the socially-optimal labor tax that is independent of productivity disturbances period by period.

We find that the first-best tax rate on capital income is also positive such that the Pareto-optimal level of investment can be achieved by eliminating equilibrium over-accumulation of physical capital caused by agents' wealth-based status-seeking motive. In addition, the first-best capital tax rate does not depend on the parameter that captures the social comparisons in consumption. Intuitively, capital taxation affects the representative household's intertemporal choices of consumption goods at different time periods, whereas the current level of aggregate consumption enters its utility function as a negative externality. As a result, consumption spillovers can be corrected by taxing agents' labor income without any dynamic considerations. On the contrary, a state-contingent tax rate on capital income is needed to overturn the wealth-induced preference externality.

Finally and perhaps most surprisingly, in sharp contrast to the traditional Keynesian view of automatic stabilizers that emphasizes their countercyclical role in mitigating business cycle fluctuations, the first-best capital tax rate in our model economy moves in the *opposite* direction with disturbances to firms' production technology. Specifically, it is adopted to make the government's net-of-depreciation tax revenue on capital income proportional to consumption. It follows that the socially-optimal fiscal policy includes procyclical capital taxation, which in turn exacerbates the business cycle.

The remainder of this paper is organized as follows. Section 2 presents our model economy, and the conditions that characterize competitive equilibrium as well as Pareto optimal allocations. Section 3 derives and discusses the first-best fiscal policy. Section 4 concludes.

2 The Model

Our model economy consists of households, firms and the government. Households' preferences are defined over their own consumption, capital stock and leisure, as well as the current levels of aggregate consumption and physical capital in the economy. Specifically, we consider a constant-relative-risk-aversion (CRRA) utility formulation that includes relative consumption together with relative wealth to capture agents' status-seeking motives. On the production side, a homogeneous final good (GDP) is produced in a perfectly competitive environment. The government balances its budget each period and chooses the first-best (or socially-optimal) fiscal policy under commitment.

2.1 Firms

There is a continuum of identical competitive firms in the economy, with the measure normalized to one. Each firm produces output y_t using a constant returns-to-scale Cobb-Douglas production function

$$y_t = z_t k_t^{\alpha} h_t^{1-\alpha}, \quad 0 < \alpha < 1, \tag{1}$$

where k_t and h_t are capital and labor inputs, respectively, and z_t represents a stochastic technology shock that is assumed to be stationary with bounded support and unitary mean.

Under the assumption that factor markets are perfectly competitive, the firm's profit maximization conditions are given by

$$r_t = \alpha \frac{y_t}{k_t}, \tag{2}$$

$$w_t = (1-\alpha) \frac{y_t}{h_t}, \tag{3}$$

where r_t is the capital rental rate and w_t is the real wage.

2.2 Households

The economy is populated by a unit measure of identical, infinitely-lived households. Each household is endowed with one unit of time together with $k_0 > 0$ units of physical capital, and maximizes a discounted stream of expected utilities over its lifetime

$$E_o \sum_{t=0}^{\infty} \beta^t \left\{ \frac{\left[\left(\frac{c_t}{C_t^{\phi}} \right) \left(\frac{k_t}{K_t} \right)^{\theta} \right]^{1-\sigma}}{1-\sigma} - A \frac{h_t^{1+\gamma}}{1+\gamma} \right\}, \tag{4}$$

$$0 < \beta < 1, \quad 0 \leq \phi < 1, \quad \theta \geqslant 0, \quad \sigma > 0, \quad A > 0, \quad \gamma \geq 0,$$

where β is the discount factor, c_t is the individual household's consumption, C_t is the contemporaneous level of aggregate consumption that is taken as given by the representative agent, and σ is the inverse of the intertemporal elasticity of substitution in private consumption. When $\phi > 0$, an individual's utility level decreases with the aggregate consumption, hence the household's preferences exhibit a negative consumption externality because each agent does not take into account the external effect that its consumption reduces the utility of everyone else's. In this case, per the taxonomy of Dupor and Liu (2003, p.424), the utility function (4) also possesses the feature of "keeping up with the Joneses" provided $\sigma > 1$, or "running away from the Joneses" under $\sigma < 1$. Moreover, the strength of consumption-based social comparisons is bounded above by the restriction $\phi < 1$ such that the household utility is monotonically increasing with consumption in a symmetric equilibrium. Finally, to ensure that (4) is jointly concave in c_t and k_t, $\theta(1-\sigma) < 1$ and $\sigma > \frac{\theta}{1+\theta}$ need to be imposed.

In addition to consumption and leisure ($= 1 - h_t$), the representative agent derives utilities from the wealth-based social status represented by its capital ownership k_t relative to the economy-wide level of capital stock K_t. Therefore, the relative wealth $\frac{k_t}{K_t}$ is postulated to enter the household utility (4) non-separably from the social comparisons in consumption $\frac{c_t}{C_t^{\phi}}$, and the parameter θ measures the degree for "the spirit of capitalism" (Zou, 1994, 1995, 1998). As for consumption, the status-seeking motive in wealth generates a negative capital externality in the household's preferences when $\theta > 0$. Finally, A is a preference parameter, and γ governs the intertemporal elasticity of substitution in labor supply. Notice that standard preferences correspond to the case of $\phi = \theta = 0$ whereby households derive utilities only from their own consumption and leisure.

The budget constraint faced by the representative household is given by

$$c_t + k_{t+1} - (1-\delta)k_t = (1-\tau_{ht})\, w_t h_t + (1-\tau_{kt})\, r_t k_t + \tau_{kt}\delta k_t + T_t, \tag{5}$$

where $\delta \in (0,1)$ denotes the depreciation rate of physical capital. Households derive their income from supplying labor and capital services to the firms at rates w_t and r_t, and pay taxes on labor and capital income at rates τ_{ht} and τ_{kt}, respectively. Two additional sources for the household's income are the capital depreciation allowance $\tau_{kt}\delta k_t$ that is built into the U.S. tax code, and a lump-sum transfer T_t.

2.3 Government

Under the assumption that the government is able to commit, it chooses a state-contingent plan of τ_{ht}, τ_{kt} and T_t, subject to the following balanced-budget constrain each period:

$$T_t = \tau_{ht} w_t h_t + \tau_{kt}(r_t - \delta)k_t. \tag{6}$$

Since we focus on the first-best fiscal policy in this paper, government spending on goods and services does not enter our analysis.[2] Combining (2), (3), (5) and (6) yields the aggregate resource constraint for the economy

$$c_t + k_{t+1} - (1-\delta)k_t = y_t. \tag{7}$$

2.4 Competitive Equilibrium

In the competitive equilibrium, each household maximizes (4) subject to its budget constraint (5), while taking factor prices, tax rates and the economy's aggregate consumption and capital as given. The first-order conditions for the household's optimization problem are

$$\frac{c_t^{-\sigma}}{C_t^{\phi(1-\sigma)}}\left(\frac{k_t}{K_t}\right)^{\theta(1-\sigma)} = \lambda_t, \tag{8}$$

$$\frac{Ah_t^{\gamma}}{\lambda_t} = (1-\tau_{ht})\, w_t, \tag{9}$$

$$\lambda_t = \beta E_t \left\{ \frac{\theta}{k_{t+1}}\left(\frac{c_{t+1}}{C_{t+1}^{\phi}}\right)^{(1-\sigma)}\left(\frac{k_{t+1}}{K_{t+1}}\right)^{\theta(1-\sigma)} + \lambda_{t+1}\left[1 + (1-\tau_{kt+1})\,(r_{t+1}-\delta)\right] \right\}, \tag{10}$$

$$\lim_{t\to\infty} \beta^t \lambda_t k_{t+1} = 0, \tag{11}$$

where λ_t denotes the Lagrange multiplier associated with the representative agent's budget constraint (5), and (9) equates the slope of the household's indifference curve to the after-tax real wage rate. Equation (10) shows that the standard intertemporal consumption Euler equation is modified to reflect the expected marginal utility benefit from agents' status-seeking capital accumulation, and (11) is the transversality condition.

[2] It would be a worthwhile topic for future research that follows the primal approach of Chari et al. (1994) to solve the dynamic version of the Ramsey or second-best taxation problem in our representative-agent model with social status.

2.5 Pareto Optimum

At the Pareto optimum, the social planner internalizes the external effects of aggregate consumption and aggregate capital by setting $c_t = C_t$ and $k_t = K_t$ in the utility function (4), subject to the production technology (1) and the economy's aggregate resource constraint (7). The first-order conditions for the social planner's optimization problem are

$$(1-\phi)\, c_t^{-\sigma(1-\phi)-\phi} = \mu_t, \tag{12}$$

$$\frac{Ah_t^{\gamma}}{\mu_t} = (1-\alpha)\,\frac{y_t}{h_t}, \tag{13}$$

$$\mu_t = \beta E_t \left[\mu_{t+1}\left(1-\delta+\alpha\frac{y_{t+1}}{k_{t+1}}\right)\right], \tag{14}$$

$$\lim_{t\to\infty} \beta^t \mu_t k_{t+1} = 0, \tag{15}$$

where μ_t denotes the Lagrange multiplier associated with the aggregate resource constraint (7), and (13) equates the slope of the planner's indifference curve to the marginal product of labor, (14) is the consumption Euler equation, and (15) is the transversality condition.[3]

3 First-Best Fiscal Policy

There are two kinds of market imperfections or distortions in our model economy. First, when $\phi > 0$, the negative consumption externality generates a higher level of consumption in equilibrium compared to that at the Pareto optimum. Second, when $\theta > 0$ that captures the presence of wealth-based social comparisons, the Pareto-optimal level of physical capital is lower than that in the competitive equilibrium. Therefore, these environments create an incentive for government intervention to address the sources of market failures in that competitive equilibrium does not yield socially-efficient allocation of resources.

Proposition 1. The first-best fiscal policy that implements the social planner's allocations as a decentralized equilibrium is

[3] Since the production function (1), and the utility function (4) with $c_t = C_t$ and $k_t = K_t$ both are strictly concave, equations (12)-(15) are the necessary and sufficient conditions for characterizing the unique Pareto optimal allocations.

$$\tau_{ht}^{*} = \phi, \tag{16}$$

$$\tau_{kt}^{*} = \frac{\theta c_t}{(r_t - \delta)\, k_t}, \tag{17}$$

$$T_t^{*} = \phi\,(1-\alpha)\, y_t + \theta c_t, \tag{18}$$

for all t, where r_t is given by (2) and y_t is given by (1) .

Proof. We note that equations (8)-(11), together with $c_t = C_t$ and $k_t = K_t$, are the necessary and sufficient conditions for the *symmetric* competitive equilibrium. On the other hand, as mentioned earlier, conditions (12)-(15) are necessary and sufficient for the Pareto optimum. To derive the first-best fiscal policy, we need to show that when policy rules (16) and (17) are implemented, the resulting equilibrium allocations, characterized by (8)-(11), satisfy the Pareto optimality conditions as in (12)-(15).

By comparing (8) and (12), we find that the marginal utility of consumption in the symmetric competitive equilibrium is proportional to its Pareto-efficient counterpart

$$\mu_t = (1-\phi)\,\lambda_t. \tag{19}$$

Substituting this condition, plus the equilibrium real wage rate (3) and the proposed $\tau_{ht}^{*} = \phi$ into (9) shows that the social planner's first-order condition for hours worked (13) is satisfied. Similarly, substituting (8) and (19), together with the period-$t+1$ equilibrium capital rental rate $r_{t+1} = \alpha \frac{y_{t+1}}{k_{t+1}}$ and the proposed $\tau_{kt+1}^{*} = \frac{\theta c_{t+1}}{(r_{t+1}-\delta)k_{t+1}}$ into (10) proves that the social planner's intertemporal consumption Euler equation (14) is satisfied. Finally, the optimal lump-sum transfer T_t^{*} is obtained by substituting (3), (16) and (17) into the government budget constraint (6). ■

Recall that agents' status measured by the social comparisons in consumption and wealth both generate negative externalities in the representative household's preferences. It follows that like a Pigouvian tax, taxing status-seeking activities will raise economic welfare in our model economy. Specifically, equation (16) shows that, as in Ljungqvist and Uhlig (2000), the first-best tax rate on labor income is a positive constant that is independent of the technology shock $\left(\frac{\partial \tau_{ht}^*}{\partial z_t} = 0\right)$.[4] The intuition for this finding is straightforward. The first-order condition for labor supply governs the intratemporal choices of consumption and leisure, along with the contemporaneous nature of consumption spillovers imply that the benevolent social planner can choose the socially-optimal labor tax period by period. As a result, eliminating negative consumption externalities calls for taxing labor income at the rate ϕ each period, which in turn induces agents to face the correct trade-off between their decisions in consumption versus leisure (or labor hours). Equation (16) also indicates that the first-best fiscal policy exhibits an increasing tax rate on labor income as the representative household's concern for its relative position in consumption rises $\left(\frac{\partial \tau_{ht}^*}{\partial \phi} > 0\right)$. This result turns out to be qualitatively identical to that of Boskin and Sheshinski (1978) on the design of an optimal redistributive income taxation scheme in a heterogeneous-agent model with consumption-based social comparisons.[5]

On the other hand, since the net rate of return from investment $r_t - \delta$ is positive so that households have an incentive to invest, the socially-optimal tax rate on capital income under the first-best fiscal policy, given by (17), is positive ($\tau_{kt}^* > 0$). That is, τ_{kt}^* is set to achieve the Pareto-optimal level of investment by removing agents' status-seeking motive which generates equilibrium over-accumulation of physical capital. Notice that in the absence of wealth-induced externalities ($\theta = 0$), the first-best capital tax rate becomes zero ($\tau_{kt}^* = 0$) as there are no intertemporal distortions among macroeconomic aggregates that the social planner needs to address. It is also straightforward to show that the steady-state version of the socially-optimal tax rate on capital income is

$$\tau_k^* = \frac{\theta}{\alpha}\left[1 + \frac{(1-\alpha)\,\beta\delta}{1-\beta}\right], \tag{20}$$

which is increasing with respect to the degree of capital-based preference externalities $\left(\frac{\partial \tau_k^*}{\partial \theta} > 0\right)$. Since an increase in θ *ceteris paribus* raises the equilibrium amount of status-driven capital over-accumulation, a higher level of τ_k^* is called for. Moreover, the first-best capital tax rate does not depend on the consumption externality that is governed by the parameter ϕ. In-

[4] Ljungqvist and Uhlig (2000) obtain the same result of a constant τ_{ht}^* under a slightly different utility function in a stochastic representative-agent model without capital accumulation. In particular, the household utility depends on a linear configuration of the consumption externality: the difference between an individual's own consumption and a fraction of the economy's current level of aggregate consumption. In this paper, we complement and re-affirm Ljungqvist and Uhlig's (2000) finding with a multiplicative preference formulation as in (4). Therefore, the policy rule (16) is robust to the exact specification of negative consumption externalities.

[5] We thank an anonymous referee for pointing this out to us.

tuitively, capital taxation affects the intertemporal trade-off between consumption goods at different dates, whereas the current level of aggregate consumption enters the household utility. Therefore, consumption spillovers can be corrected by the socially-optimal labor tax (16) without any dynamic considerations. By contrast, a positive and state-contingent tax rate on capital income, as in (17), is needed to overturn wealth-enhanced social comparisons.

Proposition 2. The first-best (positive) tax rate on capital income moves in the opposite direction with disturbances to firms' production technology, $\frac{\partial \tau_{kt}^*}{\partial z_t} < 0$.

Proof. We first rewrite the socially-optimal capital tax rate by substituting (2) into (17) to obtain

$$\tau_{kt}^* = \frac{\theta}{\alpha\left(\frac{y_t}{c_t}\right) - \delta\left(\frac{k_t}{c_t}\right)}, \tag{21}$$

and note that $\frac{\partial k_t}{\partial z_t} = 0$ because the value of k_t is pre-determined in period $t-1$. It follows that the relationship between the first-best tax rate on capital income and technology shocks is given by

$$\frac{\partial \tau_{kt}^*}{\partial z_t} = \frac{-\theta\left[\alpha \underbrace{\frac{\partial\left(\frac{y_t}{c_t}\right)}{\partial z_t}}_{\text{positive}} + \frac{\delta k_t}{c_t^2}\underbrace{\left(\frac{\partial c_t}{\partial z_t}\right)}_{\text{positive}}\right]}{\left[\alpha\left(\frac{y_t}{c_t}\right) - \delta\left(\frac{k_t}{c_t}\right)\right]^2} < 0. \tag{22}$$

A positive productivity disturbance shifts out the labor demand curve, which causes the real wage and hours worked $\left(\frac{\partial h_t}{\partial z_t} > 0\right)$ both to rise. This in turn raises total output, whose increase is then divided between higher levels of consumption and investment through the aggregate resource constraint for the economy (7). As a result, the economy's output-to-consumption ratio will rise, $\frac{\partial\left(\frac{y_t}{c_t}\right)}{\partial z_t} > 0$. ■

In sharp contrast to traditional Keynesian demand-management policies that are designed to mitigate aggregate cyclical fluctuations, the first-best capital tax τ_{kt}^* in our model economy does not operate like an automatic stabilizer. Instead, it exacerbates the business cycle driven by shocks to firms' production technology, a result that has not been found in the existing literature on wealth-based social status. To understand this (perhaps quite) surprising finding, we rearrange the analytical expression of τ_{kt}^*, as in (17), to find that for a given period t,

$$\tau_{kt}^{*}\left(r_t-\delta\right)k_t=\theta c_t, \tag{23}$$

which states that the government's tax revenue on net-of-depreciation capital income $\left(r_t-\delta\right)k_t$ should be proportional to consumption. A positive innovation to the productivity disturbance raises the economy's tax base because of higher output. Moreover, higher labor hours and real wage increase the household's projected income stream, thereby raising its ability to consume. Given the economy's aggregate resource constraint (7), expansion of output will be stronger than the associated increase in consumption, *i.e.* $\frac{\partial y_t}{\partial z_t}>\frac{\partial c_t}{\partial z_t}>0$. This, together with k_t being a pre-determined variable and $r_t=\alpha\frac{y_t}{k_t}$ from equation (2), implies that $\left(r_t-\delta\right)$ rises faster than c_t in response to a technological improvement, thus τ_{kt}^{*} has to fall in order to maintain the equality of (23). As a result, the first-best fiscal policy consists of a *procyclical* capital tax rate that moves inversely with the macroeconomic conditions $\left(\frac{\partial\tau_{kt}^{*}}{\partial z_t}<0\right)$, which in turn destabilizes the economy with a larger magnitude of business cycle fluctuations.

Finally, we offer further insights as to what explains the striking difference between a conventional automatic stabilizer and our procyclical first-best capital income taxation. Ljungqvist and Uhlig (2000) also obtain a state-contingent socially-optimal fiscal policy in a no-capital representative agent model characterized by "catching-up" rather than "keeping-up" preferences, whereby the benchmark standard that an individual cares about is a state variable accumulating past quantities of aggregate consumption. A positive technology shock, which raises the current level of aggregate consumption, will lead to increases in the future consumption reference values. In this case, these authors show that first-best income taxation should be countercyclical, rising in good times (with a high productivity) in order to offset the resulting heightened consumption externality. Therefore, such a tax policy works as an automatic stabilizer that reduces current consumption with a higher tax rate such that future consumption-based preference distortions are alleviated. On the contrary, equation (17) in our model economy aims to make net-of-depreciation capital income in the face of productivity disturbances proportional to consumption at the current period. The preceding analysis shows that in this case, the first-best tax rate on capital income operates like an automatic destabilizer that falls (rises) when the economy is impacted by a technological improvement (regress). This will stimulate today's investment and raises the next-period's aggregate capital stock, thereby magnifying the business cycle.

4 Conclusion

We have shown that when consumption-enhanced as well as wealth-enhanced social status enter non-separably into the representative household's utility function, there is a clear division of the first-best fiscal policy with regard to correcting the economy's two market failures. Specifically, a time-invariant and positive tax rate on labor income is needed to eliminate negative externalities that arise from the contemporaneous level of aggregate consumption. In addition, to overturn agents' status-seeking capital over-accumulation in equilibrium, a state-contingent and positive tax rate on capital income is called for. Finally and perhaps quite surprisingly, in sharp contrast to a conventional automatic stabilizer, the first-best capital tax rate moves in the opposite direction to technology shocks such that the net-of-depreciation tax revenue on capital income is proportional to consumption. As a result, the socially-optimal fiscal policy in our model economy includes procyclical capital taxation, which in turn exacerbates the business cycle. It would be worthwhile to examine the robustness of our results by considering other kinds of market imperfections that have been studied in the optimal taxation literature, *e.g.* incomplete markets (Aiyagari, 1995), untaxed factors of production (Correia, 1996), lack of commitment (Benhabib and Rustichini, 1997), and imperfectly competitive firms (Guo, 2005), among many others. We plan to pursue these research projects in the near future.

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