

# Wealth distribution, endogenous fiscal policy and growth: status-seeking implications\*

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## Abstract

We investigate the wealth distribution and endogenous fiscal policy in a two-classes growth model in which individuals exhibit a desire for social status. The latter is increasing with individual wealth and decreasing with the average level of the society. First, we show that status seeking is crucial in determining the long-run wealth distribution: agents with stronger status motive end up holding a higher level of wealth. Second, a higher inequality can be associated with a higher growth if it is due to a stronger incentive to accumulate wealth of one class of agents. Third, the model implies that a higher growth rate may reduce welfare of one class of agents and raise welfare of the other one. Finally, when fiscal policy is determined through a voting mechanism, an increase in the strength of status motive of majoritarian class may lead to a reduced political equilibrium growth.

**Keywords:** Individual welfare; endogenous growth; endogenous fiscal policy; status-seeking; wealth distribution

**JEL Classification:** D31; H31; H50; O41

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# 1 Introduction

The relative utility hypothesis, which supposes that individuals care about the social aspect of wealth accumulation in addition to caring about consumption, is supported in numerous empirical investigations (see e.g. Clark and Oswald, 1996; Kapteyn, Van de Geer, Van de Stadt and Wansbeek, 1997, McBride, 2001). It is shown that an individual's welfare depends both positively on her wealth and negatively on a reference level of the society. This relativity assumption has been used to explain many economic phenomena. For instance, it is used by Easterlin (1974) to explain the paradox that individual welfare is increasing with individual income while the average welfare remains independent of the material standard of living. Long and Shimomura (2004) claim that the desire for wealth-enhanced social status can explain the process of catching up with the rich by the poor.

The conjecture that wealth accumulation yields social status and that status matters for individual welfare has been emphasized in *The Theory of Moral Sentiments* (Smith, 1759). In *The Theory of the Leisure Class*, Veblen (1899) has focused on the role of conspicuous consumption in signalling social status. The social aspect of consumption is also found in *The Social Limits to Growth* (Hirsch, 1976). Recently, the role of social rewards as motive of individual behavior has been incorporated into models of economic growth.<sup>1</sup> By considering preferences for social status, economists emphasize the role of the demand side, which is determined by individual preferences, as determinant of economic growth, apart from the role of the supply side. In particular, Corneo and Jeanne (2001a) showed that the competition to achieve social status can generate endogenous long-run growth.

This paper introduces status preferences into an endogenous growth model with public sector. It builds on the conventional framework of Glomm and Ravikumar (1994), where fiscal policy financing public capital is endogenously determined through a voting mechanism. The economy is populated by two types of agents who care about both consumption and social status. The latter is an increasing function of both absolute and relative wealth. Agents are heterogeneous in two aspects: wealth endowment and weight attached to status-seeking. The implications of status-seeking behavior on wealth distribution, endogenous fiscal policy as well as political equilibrium growth are investigated. We also discuss the relationship between individual welfare and growth in this economy where agents exhibit a desire for status.

In the framework without status consideration, Glomm and Ravikumar (1994) found the income convergence in the long run independent of the initial wealth distribution. In our model, we first show that the status-seeking behavior, and not the wealth endowment, is crucial in determining the long-run wealth distribution: agents with stronger status motive will hold a higher level of wealth. For the same incentive in wealth accumulation,

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<sup>1</sup>Social status of an individual can be defined by her relative wealth (Corneo and Jeanne, 1997, 2001a,b; Long and Shimomura, 2004), or relative consumption (Rauscher, 1997; Fischer and Hof, 2000). Furthermore, Fershtman, Murphy and Weiss define social status as the human capital accumulation.

agents end up holding the same quantity of wealth. In other words, the conclusion in the conventional model is a particular case of our model for which status motive of both types of agents is identical and equal to zero.

Standard economic growth models generally predict a negative relation between inequality and growth. For instance, Murphy, Shleifer and Vishny (1989) find a negative relation, considering the effects of wealth distribution on the composition of demand and the techniques of production. The introduction of status-seeking into growth model provides a relation between wealth distribution and growth which is different from the usual link found in the growth literature. In our model, since income divergence is due to difference in individual incentive to accumulate wealth, a higher inequality is associated with a higher growth if it is due to higher incentive to accumulate wealth of one group of agents. Otherwise, it is shown that a higher growth rate may reduce welfare of one group of agents and raise that of other one. Finally, when the fiscal policy is endogenously determined through a voting mechanism, an increase in the strength of status motive of majoritarian class may lead to a reduced political equilibrium growth.

The paper proceeds as follows. The next section lays out the modeling framework with status-seeking agents. Section 3 presents the steady state analysis under exogenous fiscal policy. Section 4 adds endogenous fiscal policy via a voting mechanism and studies the effect of status-seeking on political equilibrium growth. Section 5 concludes.

## 2 A model with status-seeking agents

We develop the model of Glomm and Ravikumar (1994) including status-seeking behavior. Let assume that the economy has two groups of agents.<sup>2</sup> The population size is  $\delta$  for the first group, and  $1 - \delta$  for the second group. Agents into each group are identical, so that there is a representative agent for each group. Each agent is supposed to care about both consumption ( $c_{it}$ ) and social status, which increases with her wealth ( $k_{it}$ ) and decreases with the average level of the society ( $k_t$ ). The intertemporal utility function for agent  $i$  is

$$U(c_{it}, k_{it}, k_t) = \sum_{t=0}^{\infty} \beta^t \left[ (1 - s_i) \ln c_{it} + s_i \ln \left( \frac{k_{it}}{k_t^\theta} \right) \right], \quad i = 1, 2 \quad (1)$$

where  $0 < \beta < 1$ ,  $0 < \theta < 1$ , and  $k_t = \delta k_{1t} + (1 - \delta) k_{2t}$ .

We do not attach importance to the distribution of wealth endowment between two groups of agents, i.e.  $k_{10}$  may be higher, equal or lower than  $k_{20}$ , with  $k_{i0} > 0$ , for  $i = 1, 2$ . Instead, two group of agents are distinguished by their attitude towards social status. The parameter  $s_i$  measures the importance of agent  $i$ 's utility from social status (i.e. strength of status-seeking motive) as compared to the importance of her utility from consumption.  $s_i$  is in the interval  $[0; 1)$ .<sup>3</sup> The value of  $s_i$  is exogenous and the size of each group,  $\delta$  and

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<sup>2</sup>In Glomm and Ravikumar's model, the economy is populated by a continuum of heterogeneous household-producers.

<sup>3</sup>We exclude the case with  $s_i = 1$  to avoid the extreme situation where social status is all-important and consumption does not give any satisfaction.

$1 - \delta$ , are assumed to be constant over time (i.e. there is no exit and no entry for each group). This model is then consistent with no social mobility.

The utility from consumption is represented by  $\ln(c_{it})$ . The utility from social status is represented by  $\ln(k_{it}/k_t^\theta)$ . This specification of utility formalizes the assumption that wealth accumulation gives satisfaction to agent  $i$  through an improvement of her social status. Notice that the status utility can be written as:

$$\ln\left(\frac{k_{it}}{k_t^\theta}\right) = (1 - \theta) \ln k_{it} + \theta \ln\left(\frac{k_{it}}{k_t}\right)$$

In this formulation, the status utility involves two components: absolute and relative wealth. The parameter  $\theta$  represents the weight assigned to relative wealth, and  $1 - \theta$  the weight assigned to absolute wealth in the individual quest for status. Different from most existing studies, such a specification of status utility does not give generally the same weight to an increase in individual wealth and to a decrease in the average level of wealth.<sup>4</sup> In addition,  $\theta$  may be interpreted as the degree of the individual's social interaction (Jellal and Rajhi, 2003).

The output,  $y_{it}$ , for any  $t \geq 0$  is produced following a Cobb-Douglas production function:

$$y_{it} = AZ_t^\alpha k_{it}^{1-\alpha} l_{it}^\alpha, \quad (2)$$

where  $A > 0$  and  $\alpha \in (0, 1)$  are constant parameters. The aggregate variable  $Z_t$ , which is the stock of public capital at  $t$ , is assumed to be a pure public good. The variables  $k_{it}$  and  $l_{it}$  are private capital and labor force, respectively. Each agent is supposed to supply one unit of labor force inelastically.

The underlying assumption is that the economy is segmented in two sectors, and there are no transfers of production factors from a sector to another. This lack of transfer may be explained either by barriers, or by potential heterogeneity of two types of capital and two types of labor. For example, one may think that qualified and unqualified labor force are not freely transferable from a market to another, due to markets specificities. This modeling is used in the model of Glomm and Ravikumar (1994) and can be found in Glomm and Ravikumar (1992), Cardak (1999), Gradstein (2003).<sup>5</sup>

As in the model of Glomm and Ravikumar (1994), agent  $i$  is assumed to be both household and producer,  $i = 1, 2$ . Then, there are no markets for production factors (see also Glomm and Ravikumar, 1995; Lau, 1995; Mohtadi and Roe, 1998, etc.). This modeling captures the notion that the agents derive satisfaction from the consumption of a non-marketed or home good. It should be noticed that if we keep the assumption of no

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<sup>4</sup>For instance, the status function depending only on relative wealth is proposed in Corneo and Jeanne (1997), Futagami and Shibata (1998), Long and Shimomura (2004), while the status function depending only on absolute wealth is proposed in Zou (1994), Gong and Zou (2002) and Hosoya (2002).

<sup>5</sup>For instance, in Gradstein (2003), household  $i$ 's production function is  $y_{it+1} = A_{it+1} [f(x_{it+1})G_t]^\alpha$  where  $G_t = \tau_t \int_0^1 y_{it} di$  is public spending on education, financed by income tax.  $x_{it+1}$  is her investment made in an attempt to ensure a larger share of educational resources for her offspring, and  $A_{it+1}$  is her production capability. Her budget constraint is given by:  $c_{it} + x_{it+1} = (1 - \tau_t) A_{it} [f(x_{it})G_{t-1}]^\alpha$ .

factors transfers but relax the assumption of household-producer (i.e. incorporating segmented factor markets), the main results of the paper will remain unchanged. Appendix A presents the model with segmented factor markets.

Both public and private capital are assumed to depreciate fully in one period. Therefore, private capital obtained by agent  $i$  at period  $t + 1$  is equal to her investment at  $t$ ,  $i_{it}$

$$k_{it+1} = i_{it}.$$

Public capital at time  $t + 1$  is equal to public investment at  $t$ ,  $I_t$

$$Z_{t+1} = I_t, \quad (3)$$

where  $I_t$  is financed by taxing individual income at rate  $\tau$ , and the government's budget is therefore balanced at each period:

$$I_t = \tau AZ_t^\alpha [\delta k_{1t}^{1-\alpha} l_{1t}^\alpha + (1 - \delta) k_{2t}^{1-\alpha} l_{2t}^\alpha] \quad (4)$$

The initial state of public capital  $Z_0$  is exogenous.

Agent  $i$  chooses  $\{c_{it}, k_{it+1}\}_{t=0}^\infty$  by resolving the following program:

$$\begin{aligned} \max_{\{c_{it}, k_{it+1}\}_{t=0}^\infty} & \sum_{t=0}^{\infty} \beta^t \left[ (1 - s_i) \ln(c_{it}) + s_i \ln\left(\frac{k_{it}}{k_t^\theta}\right) \right] \\ \text{s.t.} & \begin{cases} c_{it} + k_{it+1} = (1 - \tau) AZ_t^\alpha k_{it}^{1-\alpha} l_{it}^\alpha, \\ c_{it}, k_{it+1} \geq 0, \\ l_{it} = 1, \\ \text{given } k_{i0}, Z_0 \text{ and } \{\tau_t, Z_{t+1}\}_{t=0}^\infty \end{cases} \end{aligned} \quad (\text{P1})$$

The first order conditions for an interior solution are the following

$$\frac{(1 - s_i) \beta^t}{c_{it}} = \lambda_t, \quad (5)$$

$$\lambda_{t+1} (1 - \tau) (1 - \alpha) AZ_{t+1}^\alpha k_{it+1}^{-\alpha} = \lambda_t - \frac{s_i \beta^{t+1}}{k_{it+1}}. \quad (6)$$

The equations (5) and (6) imply the following condition:

$$\frac{1 - s_i}{c_{it}} = \beta \left[ \frac{(1 - s_i)}{c_{it+1}} (1 - \tau) (1 - \alpha) AZ_{t+1}^\alpha k_{it+1}^{-\alpha} + \frac{s_i}{k_{it+1}} \right] \quad (7)$$

The left hand side is the marginal cost (in utility terms) of reducing consumption at time  $t$  ( $c_{it}$ ) by a unit. The right hand side is the discounted marginal benefit of increasing an additional unit of private capital into time  $t + 1$  ( $k_{it+1}$ ). Marginal benefit is equal to net marginal product of private capital times the marginal utility of consumption at  $t + 1$  added to marginal utility of private capital at  $t + 1$  (which does not exist in conventional model). For agent  $i$ 's optimal choice, the marginal cost must equal marginal benefit.

Combining condition (7) and budget constraint provides us the following solutions:

$$c_{it} = \frac{\beta (1 - \alpha) (1 - \tau) AZ_t^\alpha k_{it}^{1-\alpha} c_{it-1}}{k_{it} - \frac{s_i \beta}{1 - s_i} c_{it-1}}, \quad (8)$$

$$k_{it+1} = (1 - \tau) AZ_t^\alpha k_{it}^{1-\alpha} \left( 1 - \frac{\beta (1 - \alpha) c_{it-1}}{k_{it} - \frac{s_i \beta}{1 - s_i} c_{it-1}} \right), \quad (9)$$

The transversality condition is:  $\lim_{t \rightarrow \infty} \lambda_t k_{t+1} = \lim_{t \rightarrow \infty} (1 - s_i) \beta^t k_{t+1} / c_{it} = 0$ , where  $\lambda$  is the shadow price of wealth. The first order conditions are also sufficient for a maximum since the Lagrangian is concave.

Given the initial  $k_{i0}$ ,  $Z_0$  and an arbitrary fiscal policy implemented in each period, an intertemporal equilibrium is the sequence of consumption, private capital and labor force such that

- $l_{it} = 1$  and  $\{c_{it}, k_{it+1}\}_{t=0}^{\infty}$  is given by Eqs. (8), (9), for  $i = 1, 2$
- $c_{it} + k_{it+1} = (1 - \tau) AZ_t^\alpha k_{it}^{1-\alpha}$ , and  $Z_{t+1} = \tau AZ_t^\alpha [\delta k_{1t}^{1-\alpha} + (1 - \delta) k_{2t}^{1-\alpha}]$
- $k_t = \delta k_{1t} + (1 - \delta) k_{2t}$  for any  $t \geq 0$ .

### 3 Steady state analysis

Let us define new variables

$$X_{i,t+1} \equiv \frac{k_{i,t+1}}{c_{it}}, \quad W_{t+1} \equiv \frac{Z_{t+1}}{c_{it}}, \quad R_{ji,t+1} \equiv \frac{k_{j,t+1}}{k_{i,t+1}} \quad \text{for } i, j = 1, 2 \text{ and } t \geq 0.$$

Then combining equations (8), (9), and equation  $Z_{t+1} = \tau AZ_t^\alpha [\delta k_{1t}^{1-\alpha} + (1 - \delta) k_{2t}^{1-\alpha}]$  gives the system

$$X_{i,t+1} = \frac{1}{\beta(1-\alpha)} X_{it} - \frac{1 + s_i \alpha - \alpha}{(1 - s_i)(1 - \alpha)}, \quad (10)$$

$$R_{ji,t+1} = R_{ji,t}^{1-\alpha} \left( 1 - \frac{\beta(1-\alpha)}{X_{jt} - \frac{s_j \beta}{1-s_j}} \right) / \left( 1 - \frac{\beta(1-\alpha)}{X_{it} - \frac{s_i \beta}{1-s_i}} \right), \quad (11)$$

$$W_{1,t+1} = \frac{\tau}{(1-\tau)\beta(1-\alpha)} \left( X_{1t} - \frac{s_1 \beta}{1-s_1} \right) (\delta + (1-\delta) R_{21t}^{1-\alpha}) \quad (12)$$

$$W_{2,t+1} = \frac{\tau}{(1-\tau)\beta(1-\alpha)} \left( X_{2t} - \frac{s_2 \beta}{1-s_2} \right) (\delta R_{12t}^{1-\alpha} + 1 - \delta). \quad (13)$$

In the following, we restrict our attention to steady-state analysis in which all variables (consumption, private capital, public capital) grow at the same rate  $g$ . The steady state of the economy is given by

$$X_i = \frac{\beta}{1-s_i} \frac{1 + \alpha s_i - \alpha}{1 + \alpha \beta - \beta}, \quad (14)$$

$$R_{ji} = \frac{h(s_j)^{1/\alpha}}{h(s_i)^{1/\alpha}}, \quad \text{with } h(s_i) = \frac{1 + \alpha s_i - \alpha}{1 + \beta s_i - s_i} \text{ for } i, j = 1, 2. \quad (15)$$

$$W_1 = \frac{\tau}{(1-\tau)(1-s_1)} \left( \frac{1 + \beta s_1 - s_1}{1 + \alpha \beta - \beta} \right) (\delta + (1-\delta) R_{21}^{1-\alpha}) \quad (16)$$

$$W_2 = \frac{\tau}{(1-\tau)(1-s_2)} \left( \frac{1 + \beta s_2 - s_2}{1 + \alpha \beta - \beta} \right) (\delta R_{12}^{1-\alpha} + 1 - \delta)$$

#### 3.1 Wealth distribution and status-seeking

Let  $q_1$  be the fraction of agent 1's wealth relative to total wealth,  $k_{1t+1} = q_1 k_{t+1}$ . We can write  $k_{2t+1} = q_2 k_{t+1}$ , for any  $t \geq 0$ , with  $q_2 = (1 - \delta q_1) / (1 - \delta)$ .

Proposition 1 (Steady state wealth distribution)

- i). Agent  $i$  will hold more wealth than agent  $j$  if her status-seeking motive is stronger than agent  $j$ 's status-seeking motive

$$q_i \geq q_j \text{ if } s_i \geq s_j. \quad (17)$$

- ii). An increase in agent  $i$ 's status-seeking motive yields larger the fraction of her wealth relative to total wealth and lower that of agent  $j$

$$\frac{\partial q_i}{\partial s_i} > 0 \text{ and } \frac{\partial q_j}{\partial s_i} < 0 \text{ for } i, j = 1, 2. \quad (18)$$

Proof. See Appendix B. ■

The conclusion in Glomm and Ravikumar's model concerning income convergence is overturned when status behavior is taken into account. Actually, Glomm and Ravikumar (1994) show that wealth inequality declines over time, and then all agents have the same wealth in the long run whatever the initial distribution. In addition, a similar result to that of Glomm and Ravikumar (1994) can be found in Glomm and Ravikumar (1992)'s model with education expenditures. They show that in public education regime, the growth rate of any agent's income is inversely related to the level of her income. Thus agents with income below the average grow faster than agents with income above the average, and then incomes end up by converging over time.

Proposition 1 shows that the status behavior is crucial in explaining the long-run wealth divergence. Our finding underlines the cause of wealth divergence through the status behavior: agents end up by holding the same quantity of wealth if they have the same incentive to accumulate wealth (i.e.  $s_1 = s_2$ ); and Glomm and Ravikumar's result corresponds to the case where  $s_1 = s_2 = 0$  in our model. Such a result is explained by the following intuition. On the one hand, the marginal status utility of wealth being equal to the term  $1/k_{it}$ , is decreasing with  $k_{it}$ . This means that poor people get more satisfaction from a marginal increase in wealth than rich people. On the other hand, a higher value of  $s_i$  corresponds to a higher importance of the utility from social status as compared to the utility from consumption. This implies a stronger incentive to accumulate wealth. Therefore, given wealth endowment with  $k_{1,0} < k_{2,0}$  for example, if  $s_1 = s_2$ , agent 1 will catch up with agent 2 as she gets more satisfaction from a marginal increase in wealth. If  $s_1 > s_2$ , she catch-ups with agent 2 before to hold a larger share of total wealth since she assigns more importance to accumulate wealth than agent 2.<sup>6</sup>

The finding indicated in Proposition 1 is in line with the sociological theory explaining the poverty by individual negative attitudes (for instance lack of effort). However, it

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<sup>6</sup>This conclusion is close to the well known work by Ramsey (1928) using a model without status seeking. Ramsey shows that if the subjective discount rate differs across agents, the most patient will hold all the wealth. Indeed, if agent  $i$  has a discount rate lower than agent  $j$ , it means that agent  $i$  cares about his future life more seriously, and thus her saving incentive becomes higher. She ends up holding the total of wealth. Cardak (1999) find that households with the strongest preference for education will have the greatest income, independent of initial conditions.

contrasts with the theory explaining the poverty by social pattern (such as lack of equal opportunity, that we can interpret as unequal wealth endowment in our model).<sup>7</sup> Our finding suggests that redistributive policy taxing agents with higher status motive and subsidizing agents with lower status motive is not a good solution for economic growth as the poverty does not stem from the lack of equal opportunity. Such policy may discourage wealth accumulation of agents with high effort.<sup>8</sup> A government intervention regarding individual preferences may be preferable, however this type of intervention is rather complex because it should act to “modify” individual motivation, or preferences.

We should note that growth models with status-seeking generate diverse conclusions concerning wealth distribution, and it is partially due to the difference in hypothesis. For instance, Futagami and Shibata (1998) examine a growth model where the subjective discount rate differs across agents and relative wealth determines social status. These authors conclude that even less patient agents could hold a positive share of the total wealth, because utility from their relative wealth position decreases until they catch up with more patient agents. In an exogenous growth model, Long and Shimomura (2004) claim that if the elasticity of marginal utility of relative wealth is greater than the elasticity of marginal utility of consumption, thus eventually poor people will be able to catch up with rich people. This catching-up is found in our model only when  $s_1 = s_2$ .<sup>9</sup> On the contrary, Corneo and Jeanne (1999) found the persistence inequality in a two-classes growth model in which agents care about the social perception of their wealth rank as determinant of their social status. Their result is explained as follows. On the one hand, the total marginal return on savings, in terms of consumption and esteem, is identical for a poor and a rich agent. On the other hand, the marginal status utility of wealth is assumed to be identical for two types of agents (while it is concave in our model). Their specification implies that poor and rich people have the same wealth accumulation incentive, and wealth inequality remains constant overtime.

### 3.2 Long-run growth and status-seeking

The constant value of  $W_i \equiv Z/c_i$  and  $X_i \equiv k_i/c_i$  at the steady state implies that all variables grow at the same rate  $g$  which is approximately equal to  $\ln(Z_{t+1}/Z_t)$

$$g = \ln(\tau A) + \ln \left[ \delta \left( \frac{k_1}{Z} \right)^{1-\alpha} + (1 - \delta) \left( \frac{k_2}{Z} \right)^{1-\alpha} \right]$$

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<sup>7</sup>See for example Kluegel, Csepele, Kolosi, Örkény and Neményi (1995) and Kreidl (1998) for other explanatory factors about income divergence.

<sup>8</sup>For instance, Fields (1989) showed in an empirical study that redistributive policy is not necessarily wealth-improving. The author found that in an economy with different propensities to save, the transfers from rich to poor people, which reduces the inequality, reduce capital accumulation and economic growth.

<sup>9</sup>It should be noticed that the model in Long and Shimomura (2004) represents the integrated economy with only one representative firm, and an aggregate production function. It is implicitly assumed that agent 1 and 2 provide the same type of capital, and then receive the same rental rate.



$$\text{where } \frac{k_1}{Z} = \frac{\beta(1-\tau)}{\tau} \frac{h(s_1)}{\delta + (1-\delta)R_{21}^{1-\alpha}}$$

$$\frac{k_2}{Z} = \frac{\beta(1-\tau)}{\tau} \frac{h(s_2)}{\delta R_{12}^{1-\alpha} + 1 - \delta}.$$

**Proposition 2** The steady state growth rate of the economy is given by

$$g = \ln(A\beta^{1-\alpha}) + (1-\alpha)\ln(1-\tau) + \alpha\ln\tau + \ln[\delta B_1^{1-\alpha} + (1-\delta)B_2^{1-\alpha}] \quad (19)$$

where

$$B_1 = \frac{h(s_1)}{\delta + (1-\delta)R_{21}^{1-\alpha}} \text{ and } B_2 = \frac{h(s_2)}{\delta R_{12}^{1-\alpha} + 1 - \delta}$$

$$R_{ij} = \left(\frac{h(s_i)}{h(s_j)}\right)^{1/\alpha} \text{ and } h(s_i) = \frac{1 + \alpha s_i - \alpha}{1 + \beta s_i - s_i}, \text{ for } i, j = 1, 2.$$

Notice that the impact of fiscal policy on growth rate is exerted through two terms  $\alpha\ln\tau$  and  $(1-\alpha)\ln(1-\tau)$ . The first one represents the positive effect of public capital on the private capital marginal product and the second one represents the negative effect of taxation on net benefice rate of saving. The endogenization of individual preferences allows us to take into account individuals' action. It is exerted through the last term.

Figure 1 illustrates the growth rate at asymmetric and symmetric steady state. Each agent has an individual specific growth rate, determined by Eqs. (20) and (21):

$$g_1 = \ln A\beta^{1-\alpha} + \ln(1-\tau)^{1-\alpha}\tau^\alpha + (1-\alpha)\ln h_1 + \alpha\ln[\delta + (1-\delta)(q_2/q_1)^{1-\alpha}] \quad (20)$$

$$g_2 = \ln A\beta^{1-\alpha} + \ln(1-\tau)^{1-\alpha}\tau^\alpha + (1-\alpha)\ln h_2 + \alpha\ln[\delta(q_1/q_2)^{1-\alpha} + 1 - \delta] \quad (21)$$

The decreasing curve represents the wealth growth rate of agent 1, which is decreasing with  $q_1$ . The increasing curve represents the wealth growth rate of agent 2, which is decreasing with  $q_2$ . The intersection point between both curves gives the value of growth rate in the long run, written in Eq. (19). The graph on the left hand side of figure 1 represents the growth rate at an asymmetric steady state (non-egalitarian wealth distribution) with  $q_1 > q_2$  corresponding to  $s_1 > s_2$ . The graph on the right hand side represents a symmetric case (egalitarian wealth distribution) when  $s_1 = s_2$ .

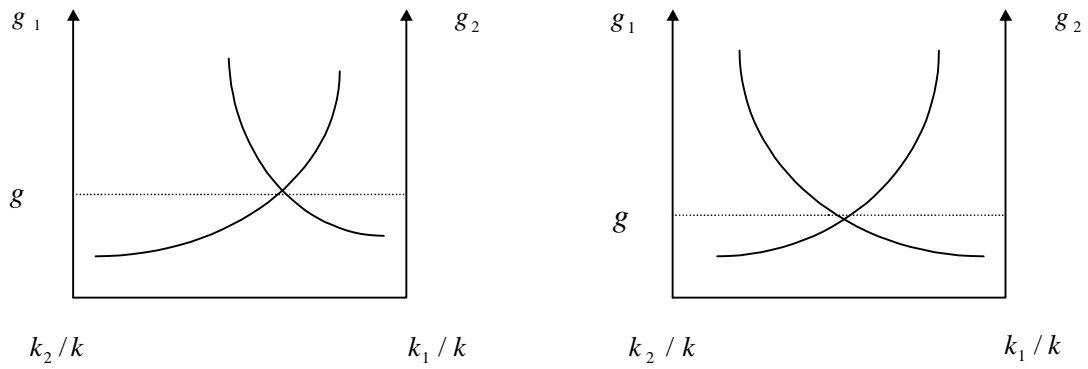


Figure 1. The growth rate at the asymmetric and symmetric steady state.

Figures 2 and 3 give a representation of the wealth-public capital ratio  $k/Z$  and a representation of the growth rate in function of  $s_1$  and  $s_2$ .

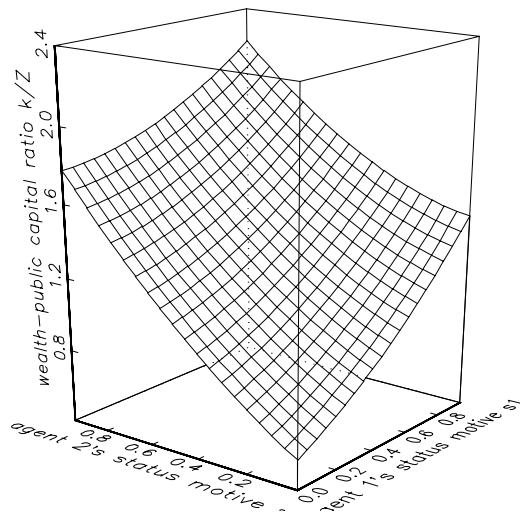


Figure 2: Wealth-public capital ratio as a function of  $s_1$  and  $s_2$   
 $(\alpha = 0.7, \beta = 0.8, \delta = 0.4, \tau = 0.3)$

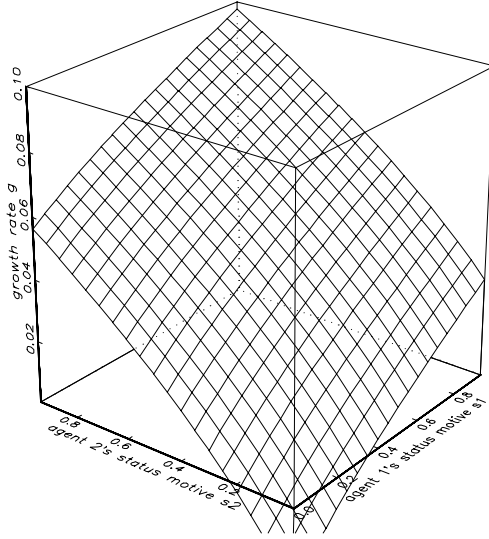


Figure 3: Growth rate as a function of  $s_1$  and  $s_2$   
 $(\alpha = 0.7, \beta = 0.8, \delta = 0.4, \tau = 0.3, A = 3.)$

It happens that status-seeking has a positive impact on total wealth and growth rate. Intuitively, the higher is the parameter  $s_i$ , for  $i = 1, 2$ , the stronger is the importance that agent  $i$  assigns to social status as compared to consumption in her quest for satisfaction. Therefore, she is more incited to accumulate wealth. This implies an increase in the quantity of total wealth, which has a positive impact on growth.

It should be noticed that an increase in wealth inequality might be associated with either a higher or a lower growth rate. For instance, from a symmetric situation where  $s_1 = s_2$  corresponding to  $q_1 = q_2$ , the first possibility will be held when there is an increase in agent  $i$ 's status motive while agent  $j$ 's status motive remains unchanged. Actually, this increase of  $s_i$  leads to a higher growth rate corresponding to a non-egalitarian wealth distribution in favor of agent  $i$ . This new situation is preferred in terms of growth than the symmetric situation. The possibility that wealth inequality is associated with a lower growth rate will be held when there is a decrease in agent  $i$ 's status motive. Actually, a decrease of  $s_i$  corresponds to a decrease in her incentive to accumulate wealth. This reduces the total wealth of the society, which has a negative effect on growth.

In other words, higher inequality due to stronger incentive to accumulate wealth of one group of agents may be consistent with a higher growth. With this result, status-seeking behavior can be considered as an explaining argument, among others, for recent empirical studies on emerging Asian economies, which indicate that strong growth is associated with

a fall in poverty and a rise in inequality (see e.g. Justino and Litchfield, 2003 for an study on Vietnamese case; Benjamin et al., 2004 for an analysis on Chinese case).

### 3.3 Welfare and long-run growth

We investigate now the growth effect on lifetime utility of each agent. Notice that

$$\ln v_{it} = \ln v_{i0} + gt, \text{ where } v = c, k_i, k, \text{ for } t > 0 \quad (22)$$

$$c_{i0} = (1 - \tau) y_{i0} - k_{i1} = (1 - \tau) y_{i0} - k_{i0} \exp g \quad (23)$$

$$\text{where } y_{i0} = AZ_0^\alpha k_{i0}^{1-\alpha}, \text{ for } i = 1, 2. \quad (24)$$

Substituting Eqs. (22), and (23) into Eq. (1), agent  $i$ 's lifetime utility is given by

$$\begin{aligned} U_i &= (1 - s_i) \ln[(1 - \tau) y_{i0} - k_{i0} \exp g] \sum_{t=0}^{\infty} \beta^t + (1 - s_i \theta) g \sum_{t=0}^{\infty} \beta^t t + s_i \ln \left( \frac{k_{i0}}{k_0^\theta} \right) \sum_{t=0}^{\infty} \beta^t \\ &= \frac{1 - s_i}{1 - \beta} \ln[(1 - \tau) y_{i0} - k_{i0} \exp g] + \frac{(1 - s_i \theta) \beta g}{(1 - \beta)^2} + \frac{s_i}{1 - \beta} \ln \left( \frac{k_{i0}}{k_0^\theta} \right). \end{aligned} \quad (25)$$

We realize that the relationship between individual welfare and growth has an inverted-U:

$$\frac{\partial U_i}{\partial g} \geq 0 \Leftrightarrow g \leq \hat{g}_i \quad (26)$$

$$\text{where } \hat{g}_i = \ln \left\{ \frac{(1 - s_i \theta) (1 - \tau) \beta A Z_0^\alpha}{(1 - s_i \theta) \beta + (1 - \beta) (1 - s_i) k_{i0}^\alpha} \right\}$$

This implies that economic growth is not necessarily welfare-improving. In addition, the positive or negative correlation between welfare and growth depends in part on the strength of status-seeking motive. Actually, as welfare-maximizing growth rate  $\hat{g}_i$  is increasing with  $s_i$ , the probability that  $g$  is on the increasing part of the curve  $U_i(g)$  is higher when  $s_i$  is higher.

Moreover, as  $\hat{g}_i$  is different between agent 1 and agent 2, this means that when the growth rate is higher, it is possible that a part of the population is happier while another one is less happy.<sup>10</sup> In other words, our finding shows that in an economy with non-egalitarian either initial distribution ( $k_{1,0} \neq k_{2,0}$ ) or long-run distribution ( $k_1 \neq k_2$  due to  $s_1 \neq s_2$ ), it is possible that economic growth is welfare-improving for only one group of the population.

## 4 Endogenous fiscal policy

In this section we investigate the implications of status-seeking behavior on the vote of tax rate and political equilibrium growth. We endogenize the fiscal policy by assuming that the tax rate  $\tau_t$  is chosen through a majority voting. As the income tax is financing the

<sup>10</sup> A numerical example:  $\alpha = 0.6$ ,  $\beta = 0.8$ ,  $\tau = 0.3$ ,  $\theta = 0.8$ ,  $A = 3$ ,  $Z_0 = 1$ ,  $k_{1,0} = 2.5$ ,  $k_{2,0} = 2$ ,  $s_1 = 0.5$  and  $s_2 = 0.4$ . These values of parameters give  $\hat{g}_1 = 0.4\%$  and  $\hat{g}_2 = 12\%$ . Therefore, if the growth rate of the economy is in the interval  $(0.004, 0.12)$ , a higher growth rate will imply a lower welfare for agent 1, and a higher welfare for agent 2.

public factor of production, agents face a trade-off. On the one hand, a higher tax rate at period  $t$  lowers current consumption and private investment which becomes future private capital, and then reduces current utility and future output. On the other hand, a higher tax rate at period  $t$  implies more public investment, which becomes future public capital, and then leads to higher future output. The chosen tax rate will balance the losses against the gains.

The optimal tax rate for agent  $i$ , for  $i = 1, 2$ , at period  $t$  for any  $t \geq 0$ , is determined by choosing  $\tau_t$  to

$$\begin{aligned} & \max_{\tau_t} \left[ (1 - s_i) \ln(c_{it}) + s_i \ln\left(\frac{k_{it}}{k_t^\theta}\right) \right] + \beta \left[ (1 - s_i) \ln(c_{it+1}) + s_i \ln\left(\frac{k_{it+1}}{k_{t+1}^\theta}\right) \right] \\ \text{s.t. } & \begin{cases} \tau_t \in [0, 1], \\ k_t = \delta k_{1t} + (1 - \delta) k_{2t}, \\ c_{it} = \frac{\beta(1 - \alpha)(1 - \tau_t) AZ_t^\alpha k_{it}^{1-\alpha} c_{it-1}}{k_{it} - \frac{s_i \beta}{1 - s_i} c_{it-1}} \\ k_{it+1} = (1 - \tau_t) AZ_t^\alpha k_{it}^{1-\alpha} \left( 1 - \frac{\beta(1 - \alpha) c_{it-1}}{k_{it} - \frac{s_i \beta}{1 - s_i} c_{it-1}} \right) \\ Z_{t+1} = \tau_t AZ_t^\alpha [\delta k_{1t}^{1-\alpha} + (1 - \delta) k_{2t}^{1-\alpha}] \\ \text{given } k_0, Z_0. \end{cases} \end{aligned}$$

Substituting constraints into the value function gives the following program (see Appendix C)

$$\max_{0 \leq \tau_t \leq 1} \alpha \beta (1 - s_i) \ln \tau_t + [(1 - s_i)(1 + \beta - \alpha \beta) + s_i \beta (1 - \theta)] \ln(1 - \tau_t) + D_i.$$

where  $D_i$  corresponds to other variables and parameters which are independent of  $\tau_t$ . The optimal tax rate for agent  $i$  is given by

$$\tau_{it} \equiv \tau(s_i, \theta) = \frac{\alpha \beta (1 - s_i)}{1 - s_i + \beta(1 - s_i \theta)}, \quad (i = 1, 2) \quad (27)$$

Notice that in the case without status consideration, the chosen tax rate is identical for all agents, while it is different between two types of agents when status matters for individual welfare. We have  $\partial \tau(s_i, \theta) / \partial s_i < 0$ . The intuition of this negative effect is as follows. A higher value of  $s_i$  corresponds to a higher importance of the utility from status as compared to the utility from consumption. This implies a stronger incentive to accumulate wealth. Therefore it is to the detriment of consumption and of chosen tax.

However, we have  $\partial \tau(s, \theta) / \partial \theta > 0$ . This implies that the case where status utility is determined only by absolute wealth (i.e.  $\theta = 0$ ) is the worst situation for public expenditure determined by majority voting. Intuitively, when  $\theta = 0$ , status preferences lead each individual to accumulate wealth as high as possible without comparison with others. Therefore, she will vote on the lowest tax rate by keeping the maximum of wealth for herself. On the contrary, when  $\theta > 0$ , status utility depends on both absolute and relative wealth, i.e. individual compares her wealth level to the average level of the society. She can anticipate that the choice of a higher lowers her wealth as well as the wealth of

other people. She feels then less loss of relative standing when choosing a high tax rate. This may explain the positive effect of  $\theta$  on  $\tau(s_i, \theta)$ .

As the economy involves two groups of agents, it is reasonable that the median agent is in majoritarian group. Let us assume the group 2's size  $1 - \delta$  is higher than  $1/2$ . This implies that the voted tax rate of group 2 will overcome that chosen by the group 1. Therefore the equilibrium tax rate is equal to  $\tau(s_2, \theta)$ . Notice that the tax rate which maximizes the growth is equal to  $\alpha$ . Then both  $\tau(s_1, \theta)$  and  $\tau(s_2, \theta)$  are lower than the growth-maximizing tax rate. Therefore, whether the median agent belongs to group 1 or group 2, her welfare-maximizing tax rate is in the increasing part of the curve  $g(\tau)$ . This is consistent with empirical finding on positive correlation between public investment and growth (see, e.g. Barro, 1991, and Perotti, 1996).<sup>11</sup>

Substituting  $\tau(s_2, \theta)$  into Eq. (19), we can write the political equilibrium growth rate as

$$g = \ln(A\beta^{1-\alpha}) + (1 - \alpha) \ln(1 - \tau(s_2, \theta)) + \alpha \ln \tau(s_2, \theta) + \ln[\delta B_1^{1-\alpha} + (1 - \delta) B_2^{1-\alpha}]. \quad (28)$$

Figure 4 gives a representation of the political equilibrium growth rate as a function of  $s_1$  and  $s_2$ .

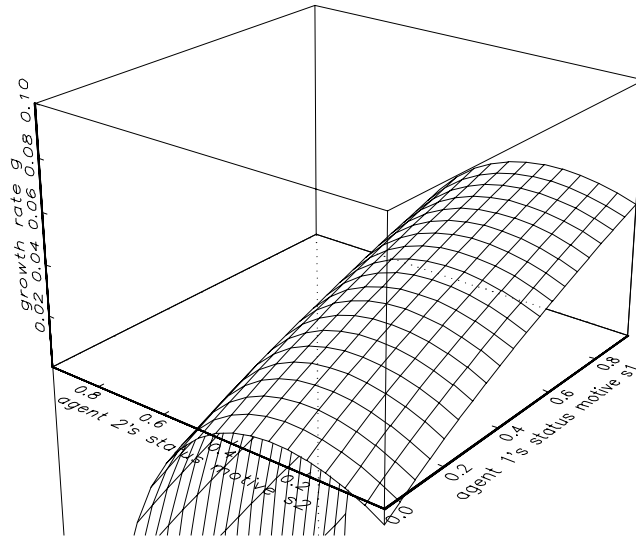


Figure 4. Political equilibrium growth as a function of status-seeking motive ( $\alpha = 0.6$ ,  $\delta = 0.4, \beta = 0.8, A = 3$ ).

<sup>11</sup>See also Lau (1995) for this line of discussion. This author considers that the stock of public infrastructure, instead of the flow used in Barro (1990), appears as an input in the production process. His results imply that empirically, if the government maximizes the welfare of the citizens, the share of public investment will be on the increasing part of the concave function of the growth rate (and the share of public consumption will be on the decreasing part of the growth rate function).

The growth impact of status-seeking of group 1 remains positive as it is found under exogenous fiscal policy regime. Group 1's status preferences are directed toward a producible asset (i.e. capital wealth). Her wealth accumulation in order to satisfy her desire for social status will keep expanding production and therefore economy will grow. On the contrary, group 2's status-seeking has two opposite effects on growth. On the one hand, a stronger status-seeking motive has a negative effect on the chosen tax rate. This reduces public capital and leads to lower output. On the other hand, a stronger status motive has a positive effect on private capital accumulation.<sup>12</sup> This leads to a higher output. Figure 4 shows that when status-seeking motive is sufficiently strong, the negative effect will dominate. This result suggests that a strong status motive might have a negative effect on growth in a democratic economy.

## 5 Conclusion

Status-seeking has received an increasing attention from the economic growth literature. Our contribution to this line of research is to investigate wealth distribution, endogenous fiscal policy, as well as political equilibrium growth rate in a two-classes growth model. We have extended the conventional model of Glomm and Ravikumar (1994) by assuming that individuals care about both consumption and social status.

Our first result underlines the crucial role of status-seeking behavior in explaining the long-run wealth distribution. Second, it is shown that a higher inequality will be associated with a higher growth if it is due to a stronger incentive to accumulate wealth of one class of agents. These findings suggest that redistributive policy, which aims to restore an egalitarian distribution by taxing agents with higher status motive and subsidizing agent with lower status motive, is not necessarily beneficial in terms of growth. A government intervention regarding individual preferences may be preferable. However this type of intervention is rather complex because it should act, through an adequate system of incentives, to “modify” individual motivation.

In this paper, it is argued that a higher growth rate may reduce welfare of one class of agents and raise welfare of other one. Finally, when fiscal policy is determined through a voting mechanism, higher status motive of majoritarian class may reduce political equilibrium growth. This result suggests that interpersonal dependency of preferences enhanced by competition to achieve social status may explain the disparity in government size across economies, and the disparity in long-run growth across economies.

Our results are obtained from logarithmic preferences and Cobb-Douglas technology. For a more general setting, we can compute the private decisions on the basis of numerical exercises. We may extend our study by examining the social justice through social mobility or redistributive policy, and its effects on individual welfare and long-run growth. It would

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<sup>12</sup>Notice that with endogenous fiscal policy, there are two effects of a higher value of  $s$  on private capital accumulation in one period. The direct effect stems from the higher importance of capital accumulation as compared to consumption in the individual quest for happiness. The indirect effect stems from a higher after-tax wealth due to a lower voted tax rate.

be also interesting to expand beyond the voting mechanism to incorporate lobbying into the political process of our model. In this case, tax rates will be determined in a political equilibrium which is based on lobbying activities instead of majority voting.

## 6 Appendix A: Model with segmented factor markets

This appendix presents the model used in section 2 but now with factor markets. It is assumed that in each sector, a representative producer uses capital and labor provided by the household in her sector. The consumption good price is normalized to unit. Apart from the inclusion of segmented factor markets and output market, the rest of the analysis framework remains unchanged, i.e. the economy is segmented and there are no transfers of production factors, as in the model of Glomm and Ravikumar (1994).

The household  $i$ 's budget constraint appeared in problem (P1) becomes

$$c_{it} + k_{it+1} = (1 - \tau) (w_{it} + r_{it}k_{it}) \quad (\text{A1})$$

where  $w_{it}$  and  $r_{it}$  are her wage rate and interest rate, respectively. The condition (7) resulting from the first order conditions for an interior solution to optimization problem becomes:

$$\frac{1 - s_i}{c_{it}} = \beta \left[ \frac{(1 - s_i)}{c_{it+1}} (1 - \tau) r_{it+1} + \frac{s_i}{k_{it+1}} \right] \quad (\text{A2})$$

As public investment is financed by income tax, its function given in (4) is rewritten as

$$I_t = \tau [\delta (w_{1t} + r_{1t}k_{1t}) + (1 - \delta) (w_{2t} + r_{2t}k_{2t})] \quad (\text{A3})$$

At time  $t$ , the firm  $i$ 's problem is

$$\begin{aligned} & \max_{\{k_{it}, l_{it}\}} AZ_t^\alpha k_{it}^{1-\alpha} l_{it}^\alpha - w_{it}l_{it} - r_{it}k_{it} \\ & s.t. \begin{cases} k_{it}, l_{it} \geq 0, \\ \text{given } w_{it}, r_{it}, k_{i0}, Z_0 \text{ and } \{\tau_t, Z_{t+1}\}_{t=0}^\infty \end{cases} \end{aligned}$$

This gives us

$$r_{it} = (1 - \alpha) AZ_t^\alpha k_{it}^{-\alpha} l_{it}^\alpha \quad (\text{A4})$$

$$w_{it} = \alpha AZ_t^\alpha k_{it}^{1-\alpha} l_{it}^{\alpha-1} \quad (\text{A5})$$

It should be noticed that in the model of Glomm and Ravikumar (1994), the economy is populated by a continuum of heterogeneous household-producers. Therefore, there are no production factor markets (see also e.g. Chatterjee, Cooper and Ravikumar, 1993; Glomm and Ravikumar, 1995; Lau, 1995; Mohtadi and Roe, 1998). Non-equalization of marginal products of factors across firms is possible in the segmented economy where there are no factor transfers. When we include the segmented factor markets in each sector of this model, the competitive economy implies that wage rate,  $w_{it}$  (interest rate,  $r_{it}$ ) of



household  $i$  in sector  $i$  will be equal to the marginal product of labor (marginal product of capital) in this sector. Therefore, non-equalization of factor marginal products across firms will imply non-equalization of factor incomes.

Substituting (A4) and (A5) in equations (A1) and (A3) gives the budget constraint appeared in the optimization problem (P1) and the public investment function (4). In addition, combining (A2), (A4), (A5) and the budget constraint gives the household  $i$ 's optimal choice at the intertemporal competitive equilibrium. This optimal choice is given by equations (8) and (9).

Therefore, the inclusion of segmented factor markets in this economy segmented without factor transfers does not modify the main results of the paper. Instead, only intermediate calculations are slightly modified. Household optimal choice at the intertemporal competitive equilibrium is exactly her choice at the intertemporal equilibrium without segmented factor markets considerations. The steady state of the economy is unchanged. In other words, the Glomm and Ravikumar (1994)'s results and the findings of this paper are independent on the assumption of no factor markets. Instead, they are dependent on the assumption of no factor transfers. We expect that releasing the no transfer hypothesis will completely modify the analysis, and this is beyond the scope of this paper.<sup>13</sup>

## 7 Appendix B: Proof of the Proposition 1

i) We have

$$\begin{cases} \frac{q_1}{q_2} = \frac{h(s_1)^{1/\alpha}}{h(s_2)^{1/\alpha}} \\ \delta q_1 + (1 - \delta) q_2 = 1 \end{cases}$$

The first equation of the above system comes from Eq. (15) by considering  $R_{12} = q_1/q_2$ .

This system gives us

$$\begin{aligned} q_1 &= \frac{h(s_1)^{1/\alpha} h(s_2)^{-1/\alpha}}{1 - \delta + \delta h(s_1)^{1/\alpha} h(s_2)^{-1/\alpha}} \\ q_2 &= \frac{1}{1 - \delta + \delta h(s_1)^{1/\alpha} h(s_2)^{-1/\alpha}}. \end{aligned}$$

Notice that

$$\frac{\partial h(s)}{\partial s} = \frac{\alpha(1 + \beta s - s) + (1 - \beta)(1 + \alpha s - \alpha)}{(1 + \beta s - s)^2} > 0.$$

Therefore if  $s_1 > s_2$ , this implies  $h(s_1) > h(s_2)$ . We will then obtain  $h(s_1)^{1/\alpha} h(s_2)^{-1/\alpha} > 1$ . This means that if the status-seeking motive of agent 1 is stronger than that of agent 2, then agent 1 holds a higher share of total wealth at the steady-state.

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<sup>13</sup>See, for example, Chatterjee, Cooper and Ravikumar (1993) for an segmented economy with two sectors where economic agents are both households and producers. Agents derive utility from the consumption of the output produced in other sector. There is then the transfer of output between from a sector to another.

ii) It is straightforward to verify that

$$\begin{aligned}\frac{\partial q_1}{\partial s_1} &= \frac{(1-\delta)h(s_1)^{1/\alpha}h(s_2)^{-1/\alpha}}{\alpha\left(1-\delta+\delta h(s_1)^{1/\alpha}h(s_2)^{-1/\alpha}\right)}\frac{\partial h(s_1)}{\partial s_1} > 0, \\ \frac{\partial q_2}{\partial s_1} &= \frac{-\delta h(s_1)^{1/\alpha}h(s_2)^{-1/\alpha}}{\left(1-\delta+\delta h(s_1)^{1/\alpha}h(s_2)^{-1/\alpha}\right)^2}\frac{\partial h_1}{\partial s_1} < 0\end{aligned}$$

as  $\partial h_1/\partial s_1 > 0$ . By analogy, we obtain  $\partial q_2/\partial s_2 > 0$  and  $\partial q_1/\partial s_2 < 0$ .

## 8 Appendix C: Fiscal policy under majority voting

The preferred fiscal policy is determined by choosing  $\{\tau_t\}_{t=0}^\infty$  to

$$\begin{aligned}\max_{\{\tau_t\}_{t=0}^\infty} & \sum_{t=0}^\infty \beta^t \left[ (1-s_i) \ln(c_{it}) + s_i \ln\left(\frac{k_{it}}{k_t^\theta}\right) \right] \\ \text{s.t.} & \begin{cases} \tau_t \in [0, 1], \\ k_t = \delta k_{1t} + (1-\delta)k_{2t} \\ c_{it} = \frac{\beta(1-\alpha)(1-\tau_t)AZ_t^\alpha k_{it}^{1-\alpha} c_{it-1}}{k_{it} - \frac{s_i\beta}{1-s_i}c_{it-1}} \\ k_{it+1} = (1-\tau_t)AZ_t^\alpha k_{it}^{1-\alpha} \left(1 - \frac{\beta(1-\alpha)c_{it-1}}{k_{it} - \frac{s_i\beta}{1-s_i}c_{it-1}}\right) \\ Z_{t+1} = \tau_t AZ_t^\alpha [\delta k_{1t}^{1-\alpha} + (1-\delta)k_{2t}^{1-\alpha}], \\ \text{given } k_0, Z_0 \end{cases}\end{aligned}$$

Then we solve for the preferred tax rate at period  $t$  for any  $t \geq 0$  by formulating the following program

$$\max_{0 \leq \tau_t \leq 1} \left[ (1-s_i) \ln c_{it}(\tau_t) + s_i \ln\left(\frac{k_{it}(\tau_{t-1})}{k_t^\theta(\tau_{t-1})}\right) \right] + \beta \left[ (1-s_i) \ln c_{it+1}(\tau_t, \tau_{t+1}) + s_i \ln\left(\frac{k_{it+1}(\tau_t)}{k_{t+1}^\theta(\tau_t)}\right) \right]$$

$$\text{s.t.} \begin{cases} k_t = \delta k_{1t} + (1-\delta)k_{2t} \\ c_{it} = \frac{\beta(1-\alpha)(1-\tau_t)AZ_t^\alpha k_{it}^{1-\alpha} c_{it-1}}{k_{it} - \frac{s_i\beta}{1-s_i}c_{it-1}} \\ k_{it+1} = (1-\tau_t)AZ_t^\alpha k_{it}^{1-\alpha} \left(1 - \frac{\beta(1-\alpha)c_{it-1}}{k_{it} - \frac{s_i\beta}{1-s_i}c_{it-1}}\right) \\ Z_{t+1} = \tau_t AZ_t^\alpha [\delta k_{1t}^{1-\alpha} + (1-\delta)k_{2t}^{1-\alpha}], \\ c_{it+1} = \frac{\beta(1-\alpha)(1-\tau_{t+1})AZ_{t+1}^\alpha k_{it+1}^{1-\alpha} c_{it}}{k_{it+1} - \frac{s_i\beta}{1-s_i}c_{it}} \\ \text{given } k_0, Z_0 \end{cases}$$

where

$$\begin{aligned}k_{it+1} - \frac{s_i\beta}{1-s_i}c_{it} &= (1-\tau_t)AZ_t^\alpha k_{it}^{1-\alpha} \left[1 - \left(1 + \frac{s_i\beta}{1-s_i}\right)E_i\right] \\ \text{and } E_i &= \frac{\beta(1-\alpha)c_{it-1}}{k_{it} - \frac{s_i\beta}{1-s_i}c_{it-1}}.\end{aligned}$$

Substituting constraints into the value function gives us the equivalent program

$$\max_{0 \leq \tau_t \leq 1} \alpha\beta(1-s_i) \ln \tau_t + [(1-s_i)(1+\beta-\alpha\beta) + s_i\beta(1-\theta)] \ln(1-\tau_t) + D_i.$$

where  $D_i$  contains other variables and parameters independent of  $\tau_t$ ,

$$\begin{aligned} D = & [(1-s_i)(1+\beta-\alpha\beta) + s_i\beta] \ln y_{it} - s_i\theta\beta \ln [\delta y_{1t}(1-E_1) + (1-\delta)y_{2t}(1-E_2)] + \\ & + \alpha\beta(1-s_i) \ln y_t + s_i \ln k_{it} - s_i\theta \ln k_t + \beta(1-s_i) \ln(1-\tau_{t+1}) + \\ & + (1+\beta)(1-s_i) \ln E_i + [\beta(1-s_i)(1-\alpha) + \beta s_i] \ln(1-E_i) - \\ & - \beta(1-s_i) \ln \left[ 1 - \left( 1 + \frac{s_i\beta}{1-s_i} \right) E_i \right] + \beta(1-s_i) \ln \beta(1-\alpha) A \end{aligned}$$

where  $y_{it} = AZ_t^\alpha k_{it}^{1-\alpha}$  and  $y_t = \delta y_{1t} + (1-\delta)y_{2t}$ , and  $k_t = \delta k_{1t} + (1-\delta)k_{2t}$ .

The first derivative of the value function is given by

$$\frac{\alpha\beta(1-s_i)}{\tau_t} - \frac{(1-s_i)(1+\beta-\alpha\beta) + s_i\beta(1-\theta_i)}{1-\tau_t}.$$

Then, the preferred tax rate is

$$\tau_t \equiv \tau(s_i, \theta) = \frac{\alpha\beta(1-s_i)}{1-s_i + \beta(1-s_i\theta)}, \text{ for } i = 1, 2.$$

$$\begin{aligned} \frac{\partial \tau_t}{\partial s_i} &= -\frac{\alpha\beta(1-\theta)}{[1-s_i + \beta(1-s_i\theta)]^2} < 0, \\ \frac{\partial \tau_t}{\partial \theta_i} &= \frac{\alpha\beta^2 s_i(1-s)}{[1-s_i + \beta(1-s_i\theta)]^2} > 0. \\ \frac{\partial^2 \tau_t}{\partial s_i \partial \theta_i} &= \frac{\alpha\beta^2 [1+\beta + \beta s_i\theta - s_i(1+2\beta)]}{[1-s_i + \beta(1-s_i\theta)]^3} < 0 \text{ if } \theta_i < \frac{s_i(1+2\beta) - (1+\beta)}{\beta s_i} \end{aligned}$$

## References

- Barro, R.: 1991, Economic growth in a cross section of countries, *Quartely Journal of Economics* 106, 407–443.
- Benjamin, D., Brandt, L. and Giles, J.: 2004, The evolution of income inequality in rural china, Discussion paper no. 04-01, University of Toronto, Department of Economics.
- Cardak, B. A.: 1999, Heterogeneous preferences, education expenditures and income distribution, *The Economic Record* 75, 63–76.
- Chatterjee, S., Cooper, R. and Ravikumar, B.: 1993, Strategic complementarity in business formation: Aggregate fluctuations and sunspot equilibria, *Review of Economic Studies* 60, 795–811.
- Clark, A. E. and Oswald, A. J.: 1996, Satisfaction and comparison income, *Journal of Public Economics* 61, 359–381.
- Corneo, G. and Jeanne, O.: 1997, On relative wealth effects and the optimality of growth, *Economics Letters* 54, 87–92.

- Corneo, G. and Jeanne, O.: 1999, Pecuniary emulation, inequality and growth, *European Economic Review* 43, 1665–1678.
- Corneo, G. and Jeanne, O.: 2001a, On the relative-wealth effects and long-run growth, *Research in Economics* 55, 349–358.
- Corneo, G. and Jeanne, O.: 2001b, Status, the distribution of wealth and growth, *Scandinavian Journal of Economics* 103, 283–293.
- Easterlin, R. A.: 1974, Does economic growth improve the human lot? some empirical evidence, in P. David and M. Reder (eds), *Nations and Households in Economic Growth*, Academic Press.
- Fershtman, C., Murphy, K. M. and Weiss, Y.: 1996, Social status, education and growth, *Journal of Political Economy* 106, 108–132.
- Fields, G. S.: 1989, Changes in poverty and inequality in developing countries, *World Bank Research Observer* 4, 167–185.
- Fisher, W. H. and Hof, F. X.: 2000, Relative consumption, economic growth and taxation, *Journal of Economics (Zeitschrift für Nationalökonomie)* 73, 241–262.
- Futagami, K. and Shibata, A.: 1998, Keeping one step ahead of the joneses: Status, the distribution of wealth, and long-run growth, *Journal of Economic Behavior and Organization* 36, 109–126.
- Glomm, G. and Ravikumar, B.: 1992, Public versus private investment in human capital: Endogenous growth and income inequality, *Journal of Political Economy* 100, 818–834.
- Glomm, G. and Ravikumar, B.: 1994, Growth-inequality trade-offs in a model with public sector r-d, *Canadian Journal of Economics* 27, 485–493.
- Glomm, G. and Ravikumar, B.: 1995, Endogenous public policy and multiple equilibria, *European Journal of Political Economy* 11, 653–662.
- Gong, L. and Zou, H.: 2002, Direct preferences for wealth, the risk premium puzzle, growth, and policy effectiveness, *Journal of Economic Dynamics and Control* 26, 247–270.
- Gradstein, M.: 2003, The political economy of public spending on education, inequality, and growth, Working Paper 3162, World Bank Policy Research.
- Hirsch, F.: 1976, *The Social Limits to Growth*, Cambridge, Massachusetts: Harvard University Press.
- Hosoya, K.: 2002, Non-separable utility, wealth effects, and economic growth in a monetary economy, *Economics Bulletin* 15, 1–7.

- Jellal, M. and Rajhi, T.: 2003, Croissance et statut social, *Revue d'Économie Politique* 113, 87–103.
- Justino, P. and Litchfield, J.: 2003, Welfare in vietnam during the 1990s: Poverty, inequality and poverty dynamics, PRUS working paper no. 8, University of Sussex.
- Kapteyn, A., Van de Geer, S., Van de Stadt, H. and Wansbeek, T.: 1997, Interdependent preferences: An econometric analysis, *Journal of Applied Econometrics* 12, 665–686.
- Kluegel, J. R., Csepeli, G., Kolosi, T., Örkeny, A. and Neményi, M.: 1995, Accounting for the rich and the poor: Existential justice in comparative perspective, in J. R. Kluegel, D. S. Mason and B. Wegener (eds), *Social Justice and Political Change, Public Opinion in Capitalist and Post-Communist States*, New York, Aldine de Gruyter.
- Kreidl, M.: 1998, Changes in the perception of poverty and wealth: Czech republic between 1991-1995, *Czech Sociological Review* 6, 73–97.
- Lau, S.-H. P.: 1995, Welfare-maximizing vs. growth-maximizing shares of government investment and consumption, *Economics Letters* 47, 351–359.
- Long, N. V. and Shimomura, K.: 2004, Relative wealth, status seeking and catching-up, *Journal of Economic Behavior and Organization* 53.
- McBride, M.: 2001, Relative-income effects on subjective well-being in the cross-section, *Journal of Economic Behavior and Organization* 45, 251–278.
- Mohtadi, H. and Roe, T.: 1998, Growth, lobbying and public goods, *European Journal of Political Economy* 14, 453–473.
- Murphy, K., Sleifer, A. and Vishny, R.: 1989, Income distribution, market size and industrialization, *Quarterly Journal of Economics* 104, 537–564.
- Perotti, R.: 1996, Growth, income distribution and democracy: What the data say, *Journal of Economic Growth* 60, 149–187.
- Ramsey, F.: 1928, A mathematical theory of saving, *Economic Journal* 38, 543–559.
- Rauscher, M.: 1997, Conspicuous consumption, economic growth and taxation, *Journal of Economics (Zeitschrift für Nationalökonomie)* 66, 35–42.
- Smith, A.: 1759, *The Theory of Moral Sentiments*, Reprinted, Liberty Fund, Indianapolis, 1982.
- Veblen, T.: 1899, *The Theory of the Leisure Class*, Reprinted, Modern Library, New-York, 1934.
- Zou, H.: 1994, The 'spirit of capitalism' and long-run growth, *European Journal of Political Economy* 10, 279–293.