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On institutions and endogenous technological change

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Abstract

This study investigates the effects of lobbying and institutions on the direction of technological change in a two-sector overlapping generations model. Simulation results suggest that in an environment with unbiased institutions, producers' rent-seeking activities direct the economy towards a labor-augmenting path, that is in contradiction with the capital-augmenting optimal path. On the contrary, rent-seeking activities within a capital-favoring institutional structure lead to a path along which capital is augmented the most. This result suggests that governmental inefficiencies can, partially, be corrected by appropriate institutional arrangements.

1. Introduction

The comforting belief that technological change is neutral has come under attack in recent years. While the evidence is by no means uniform, it appears to be sufficient to show that public inputs induce factor-saving technical changes that account for a significant part of sectoral differences in total factor productivity (Griliches, 1979; Gorter and Zilberman, 1985; Costello, 1993; Mamuneas, 1993;

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Nadiri and Mamuneas, 1994a, 1994b). Various studies in the literature have examined the role that public R&D investments, institutions, and resource endowments play in influencing the direction of technological change. One line of studies focuses on the government policies, in particular the role of public R&D investments (Alston, Chalfant, and Pardey, 1993), while a second line casts political factors in a leading role (De Janvry, Sadoulet, and Fafchamps, 1989; Li, 1993). The third line view is that resource endowments determine the nature of technological change (Hayami and Ruttan, 1971; Ruttan, 1978). Interestingly, no effort has been made so far to incorporate these three approaches and reinvestigate the nature of technological change in a general equilibrium model. The present study attempts to do so, emphasizing the key role of politically influenced decisions regarding the sectoral distribution of public inputs.

In this study, technological change is formulated within the context of endogenous industrial policy formation. The evidence that public inputs induce technological advances is modeled in a two-sector overlapping generations framework, which allows us to analyze intergenerational issues regarding the choice of technology type that will be available for future generations. The two sectors wish to be targeted for economic assistance as industries worthy of government assistance. Using different sector-specific public inputs in their production process, the industries get assistance in the provision of these inputs as the sectoral shares are determined by industries' lobbying activities. The fact that public inputs are both factor-augmenting and sector-specific creates motivation for industries to lobby. Public inputs augment private inputs such as capital and labor, and lead to their more efficient use. Recognizing market failure for public inputs, the government opens policy decision to the influence of political pressure, and that makes the sectoral distribution of public inputs an immediate outcome of the industries' lobbying efforts. Lobbying in our model conveys information about the nature of market failure and therefore has to be considered as producers' willingness to pay for the desired type of technology.

This study relates technology supply to producers' lobbying efforts that result in the supply of either a capital- or labor- augmenting public input (i.e., technology). The central issue addressed is how the path of technological change is influenced from the industries' political activities geared toward the obtaining of economic assistance in terms of public inputs. Having determined this path, the next step is to compare it with the optimal path that corresponds to the distribution of public inputs by an undistorted government. Integrating institutions into a general equilibrium approach, our model finally intends to explain the role these institutions might play in influencing the nature of technological change.

2. A model of lobbying economy

Industries. This is a two-sector, two-goods overlapping generations model. The two goods include a perishable consumption good, Y^1, and an investment good, Y^2. (For notational simplicity, all the variables should be considered as time t variables unless otherwise stated.) They are produced by labor-intensive (LI) and capital-intensive (CI) production technologies, respectively. Factor-augmenting public inputs, G^i, i=1,2, enter the production functions in the form of industry-specific knowledge and increases the productivity of private factors: capital K^i and labor L^i. The production functions exhibit decreasing returns with respect to private factors, allowing the industries to have resources for their lobbying activities.

Industry *i*'s profit maximization problem and first-order conditions (FOCs), given in the Appendix, are reduced to

$$k^i = \left[\frac{\theta^i \omega}{(1-\theta^i)\, e^{\rho^i(1-2\lambda^i)}} \right]^{\frac{1}{(1-\rho^i)}} \equiv k^i(\omega; G^i)$$

where $k^i \equiv (K^i/L^i)$ is industry *i*'s capital-labor ratio. Notice that, given factor prices and other parameters, the sectoral capital-labor ratio, $k^i(\omega;G^i)$, only depends on public input G^i. The derivative of $k^i(\omega;G^i)$ with respect to G^i yields

$$\frac{\partial k^i(\omega;G^i)}{\partial G^i} = \left[\frac{e^{(-1-2\lambda^i)\rho^i}(-1+2\lambda^i)\rho^i\theta^i\omega}{(1-\rho^i-\theta^i+\rho^i\theta^i)} \right] \left[\frac{\omega\theta^i e^{(-1+2\lambda^i)\rho^i}}{(1-\theta^i)} \right] \frac{\rho^i}{(1-\rho^i)}$$

where $\partial k^i / \partial G^i > 0$ if $\lambda^i > 0.5$ (i.e., sector *i* is capital-intensive), and $\partial k^i / \partial G^i < 0$ if $\lambda^i < 0.5$ (i.e., sector *i* is labor-intensive).

It should be noted that the factor-intensity parameter, λ^i, determines the capital-labor ratio. We construct a lobbying model in such a way that the capital-intensive (labor-intensive) sector receives the public input that augments capital (labor) much more than labor (capital) in that sector. This assumption is incorporated into the model through the parameter λ^i, which can only take on values greater than 0.5 if the sector is capital-intensive and less than 0.5 if it is labor-intensive. In the case of λ^i=0.5, sectoral capital-labor ratio remains unchanged.

Endogenous policies. The policy is determined by the following three institutional rules: (*i*) producers, knowing that the government accepts any outcome of lobbying, influence government policy decision via lobbying, (*ii*) the

government considers the influence of the already existing institutional structure on its policy decision, and (*iii*) relative lobbying governs the sectoral distribution of public input. These rules are more formally discussed in Becker (1983). Here is the construction of endogenous policy formation.

We assume a linear pressure function, $B^i = \Phi^i s^i \overline{Y}^i$, and an influence function,

$$I^i = (\Phi^i s^i \overline{Y}^i / \Sigma_I \Phi^i s^i \overline{Y}^i)$$

where $\overline{Y}^i \equiv s^i[\theta^i(e^{\lambda^i G^i} K^i)^{\rho^i} + (1-\theta^i)(e^{(1-\lambda^i)G^i} L^i)^{\rho^i}]^{\frac{\gamma^i}{\rho^i}}$ and $\Sigma_i I^i = 1$. The parameter Φ^i, $\Phi^i > 0$, denotes the influence of the current institutions on government policy and s^i, $s^i \in [0,1]$, denotes the proportion of output allocated for lobbying. By construction of the influence function, higher lobbying by sector *i* increases its effectiveness. The concavity of the influence function, however, implies that after a certain level of lobbying, influence gets weaker. The outcome of lobbying is a set of weights, I^i. For the sectoral distribution of the public input, we specify a *policy decision rule*[2], $G^i = I^i G$. Endogenous policy in this context means nothing more than endogenizing these weights.

Substituting the policy decision rule into $k^i(\omega; G^i)$ results in $k^i(\omega; I^i G)$ and taking the derivative of it with respect to the parameter Φ^i quantifies the influence of institutions on the sectoral capital-labor ratio,

$$\frac{\partial k^i(\omega; I^i G)}{\partial \Phi^i} = N^i M^i \left[\frac{(-1+2\lambda^i)\rho^i s^i \overline{Y}^i \theta^i s^{-i} \Phi^{-i} \overline{Y}^{-i} \omega G}{(1-\rho^i)(1-\theta^i)(\Sigma_i \Phi^i s^i \overline{Y}^i)^2} \right] > 0, \text{ if } \lambda^i > 0.5$$

$$N^i = \text{Exp}\left[\frac{(-1+2\lambda^i)\rho^i s^i \overline{Y}^i \Phi^i G}{\Sigma_i \Phi^i s^i \overline{Y}^i} \right] \text{ and } M^i = \left[\frac{N^i \theta^i \omega}{1-\theta^i} \right] \frac{\rho^i}{(1-\rho^i)}$$

Lobbying process. Each sector represented by a lobby group confronts the governance function announced at the beginning of time t. Thereafter, given the parameters in the influence function, lobbyists extend resources, $s^i \overline{Y}^i$, to influence the policy decision, G^i. Finally, the government makes public input available to the sectors in such a way that it cannot incur a fiscal deficit.

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[2] Simultaneous no-lobbying can be incorporated in the lobbying model by the following alternative formulation of the policy decision rule, $G^i = [1/(1+e^{(B^2-B^1)})]G$ for i=1,2 (Hirshleifer, 1989).

Consumers. The economy consists of overlapping generations of two-period-lived consumers identical across time. In the first period, individuals born at time $t \geq 1$ supply their unit-endowment of labor inelastically; earn labor income and obtain profits; make savings for the next period and pay labor income tax. In the second period, they retire and earn income from savings; pay capital income tax. There is also an initial old generation at time $t = 1$ that spends its income on second period consumption. Each generation consists of a single individual. We assume perfect foresight, $E(p_{t+1}) = p_{t+1}$, where p_{t+1} is the relative output price. Gross interest rate and capital tax at time t+1 are assumed to be known by both borrowers and lenders at time t.

In the lobbying model, the young generation's savings of the time t investment goods, $S=Y^2$, become the next period capital stock, $K_{t+1}=S$. Namely, lobbying by producers in sector 2 determines the path of both capital accumulation and technological change.

Distorted government. A distorted government is one that only carries out the outcome of lobbying, and that does not represent any political parties. Such a government is nothing more than an intermediary institution that responds to lobbying activities to the extent that the predetermined policy decision rule allows. Following a balanced budget policy, it finances the production of public inputs by collecting labor and capital income taxes from the young and old generations, respectively.

In the literature of rent-seeking theory, there are two strands of modelling efforts with respect to the government decision rule. The first line of work considers lobbying as a political contest between political parties (Magee, Brock, and Young, 1989), while the second one views the government as a revenue-maximizing "selfish" agent: the (Hillman and Ursprung, 1988). Both of these approaches introduce a third agent: the "political government". This would make the analysis of technology supply-demanding because the influence of the third agent on technology is difficult to isolate. In our model, however, we introduce a distorted government that would allow the examination of the net impact of producers lobbying on technology supply.

Political-economic equilibrium. The initial labor and capital endowments, $(\overline{K}_0, \overline{L}_0) > 0$, are exogenously given. The economy-wide labor force is also exogenous. $\overline{L} = 1$ for all t. An allocation $(c_t(t), c_{t-1}(t), S, Y^i, G^i, K^i, L^i, s^i, K^g, L^g, G \ \forall_{i,t}\}$ is feasible if $s^i \in (0,1))$,

$$Y^i = (1 - s^i)[\theta^i (e^{\lambda^i G^i} K^i)^{\rho^i} + (1 - \theta^i)(e^{(1-\lambda^i)G^i} L^i)^{\rho^i}]^{\frac{\gamma^i}{\rho^i}} \quad \text{for } i=1,2, \text{ and}$$

$$G = g(K^g, L^g).$$

A political-economic equilibrium is *a feasible allocation* with an accompanying price system $\{w, r, p, p^g\}_{t=1}^{\infty}$, a lobbying system $\{s^1, s^2\}_{t=1}^{\infty}$, and a tax scheme $\{\tau^K, \tau^L\}_{t=1}^{\infty}$ such that (i) representative firms solve [Problem 1]; (ii) consumers solve [Problems 2 and 3]; (iii) distorted government solves [Problem 4]; (iv) the capital market satisfies $K_{t+1}=S$ for all t; and (v) input and output markets clear: $\overline{K} = K^1+K^2+K^g$, $\overline{L} = L^1+L^2+L^g$, $G = G^1 + G^2$, $S=Y^2$, and $c_1(t)+c_{1-1}(t)=Y^1$.

3. Qualitative results from a numerical example

The objective of this example is to present qualitative results as to how institutions might play a role in the determination of the path of technological change. To have a better view of institutions and their influence on technology supply, we analyze this path under three scenarios: (1) lobbying-driven path of technological change under unbiased institutions, (2) lobbying-driven path under biased institutions, and (3) the optimal path.

Case 1. *Lobbying-driven path under unbiased institutions*, $\Phi^1 = \Phi^2$.

With this specification of institutions, we aim at controlling their influence on the sectoral allocation of public inputs. Setting $\delta = 0.5$ in the government's problem further helps eliminate any bias on the sectoral capital-labor ratios, that might be introduced by the government. To this end, the resulting allocation would then be purely attributed to producers' lobbying activities. Using the parameters $\{\rho^1 = -1, \lambda^1 = \theta^1 = 0.6, \gamma^1 = 0.8, \rho^2 = 0.3, \lambda^2 = \theta^2 = 0.4, \gamma^2 = 0.8, \alpha = 0.95, 1.8 > \overline{K} > 0.7, \overline{L} = 1, \tau^K = \tau^L = 0.275\}$, the lobbying model is solved for a unique steady-state equilibrium.

Simulation results are twofold. The first result is that technological change follows the path in which the government increasingly supplies the labor-augmenting public input (Figure 1). As a result of exogenous increases in $\overline{K}$ that correspond to the relative abundance of capital, the wage-rental ratio rises. Thus, producers of labor-intensive goods are induced to compensate their increasing cost of production by lobbying government for labor-augmenting public input. Responding to the pressures by this sector, the government supplies public input in accordance with its policy decision rule. Lobbyists representing the capital-intensive sector, however, prefer not to exert any significant pressure on the government because of their declining cost of production.

The second result is that technological change that makes the old (young) generation worse (better) off is welfare improving. The old generation will be worse off only if his/her income, $\bar{r}\,S$, declines. Given S, any form of technological

change yielding lower after-tax rental rate of capital $\bar{r}$ will be deleterious for the old generation. The equilibrium condition, $\bar{r} = (1-\tau^K)(1+i)$, implies that lower income is possible either with a falling interest rate, i, or with an increasing capital tax rate, τ^K. It is implicit in our second result that declining $\bar{r}$, which will lessen the production cost of the capital-intensive goods, will result in the supply of labor-augmenting technology that is beneficial for the young generation. This is confirmed by a downward shift in lobbying frontiers (or zero-profit conditions) when the rental rate of the capital is arbitrarily lowered (see Figure 2 for $A_1>A_2$).

The second result follows from the first one where capital abundance lowers the rental rate of capital. It appears from the equilibrium condition that the older generations welfare can be kept unchanged only if the capital income tax and interest rates change proportionally.

Case 2. *Lobbying-driven path under biased institutions*, $\Phi^1 = 1 < \Phi^2 = 5$.

In this specification, the existing institutions favor the capital-intensive sector. The parameters, $\Phi^1 = 1 < \Phi^2 = 5$, show that the capital-intensive sector will benefit more from a unit of lobbying expenditure than will the labor-intensive sector. The rest of the parameters used take on the same values as in Case 1.

As seen in Figure 3, bias in favor of the capital-intensive sector leads that sector to obtain more public input than it would otherwise obtain. This bias directs the economy towards the capital-augmenting path. Along this path, the capital-intensive sector experiences increased output (Y^2). This is what we call the positive *technology effect*. In order to examine the consequences of biased institutions for the gross national product $Y (= pY^1+Y^2)$, one needs to have a closer look at the two components of Y. First, institutions favoring the capital-intensive sector cause rising relative price p and output Y^2; the second effect is declining output of the labor-intensive sector, Y^1, for the insufficient supply of labor-augmenting public input. Consequently, depending on changes in the price and output the total revenue pY^1 will be different. This is what we call the indirect effect of institutional arrangements. Obviously when indirect effects are negative and dominate the technology effect, which is possible in our model for some parameter specifications, the gross national product would decline. In other words, biased institutional arrangements might lower economic growth despite the increases in sector-specific productivity of public inputs. This is what we call *immiserizing institutional arrangements*. (A similar argument has been made by Bhagwati (1958) and Matsuyama (1991) within the context of international trade and economic growth while Barrett (1998) has argued immiserized growth in a closed economy model).

Figure 1 $\{\Phi^1=\Phi^2\}$
Unbiased Institutions

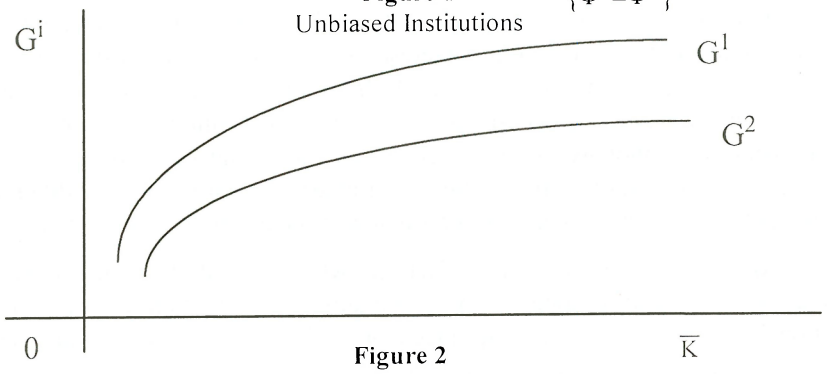


Figure 2
Lobbying Frontiers
$\{r^1>r^2, w=0.64\}$

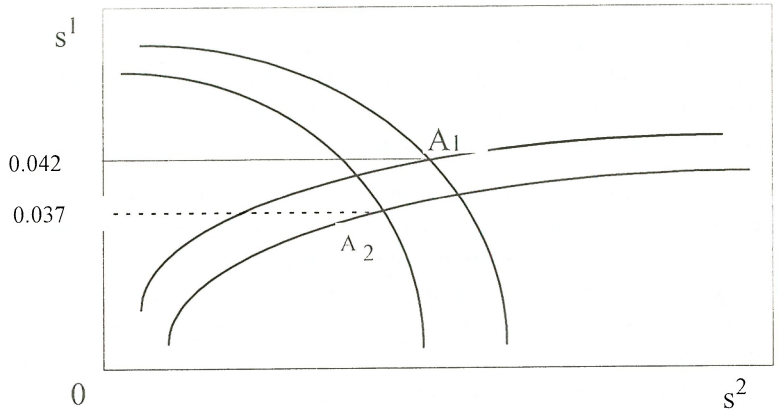
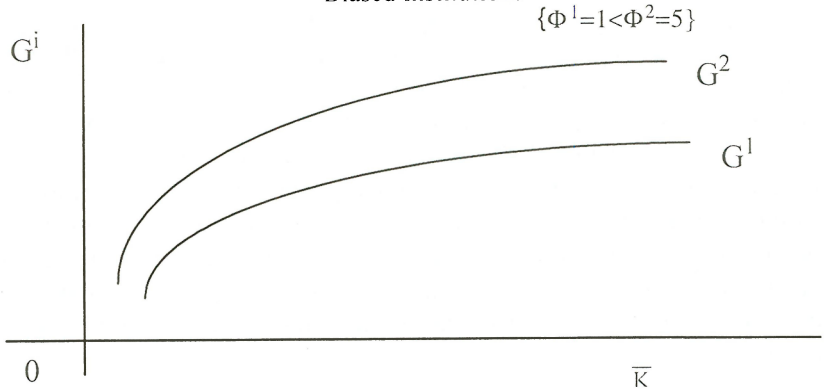


Figure 3
Biased Institutions
$\{\Phi^1=1<\Phi^2=5\}$



Case 3. *Optimal path of technological change*

In this scenario, an undistorted government determines the direction of technological change by maximizing the gross national product. The implied direction is called the *optimal path.* The undistorted government decides both the total production of public input, $\hat{G}$, and its sectoral allocation, $(\hat{G}^1, \hat{G}^2)$. Producers are not involved in lobbying at all.

Simulation results are twofold. First, the benevolent government favors the capital-augmenting path of technological change; that is, $\hat{G}^2 > \hat{G}^1$. This contradicts with the finding in Case 1 that the distorted government operating with unbiased institutions supports the labor-augmenting path; that is, $\tilde{G}^1 > \tilde{G}^2$. These opposing directions in technology supply suggests that the public input distribution mechanism, a policy decision rule in the lobbying model, matters in characterizing the type of technology. This is not really a surprise to us because lobbying distorts industries' true demand for factors of production. Nonetheless, it is interesting to investigate whether or not the distorted government can correct this distortion and put the economy in the optimal path. The only means that the government has is fiscal policy. Simulations of the lobbying model under two different fiscal policies $\{\tau^K > \tau^L, \tau^K < \tau^L\}$ indicate that alternative fiscal policies are not sufficient to pull the economy towards the optimal path.

Second, lobbying leads to the overproduction of public input, that is, $\tilde{G} > \hat{G}$, suggesting that the distorted government favors more public input production than does the undistorted government (Table 1). Connected to this result is that the undistorted government prefers lower taxes while the distorted government likes higher taxes. This is because producers determine the level of public input to be produced, but consumers finance its production through taxes. In this setup, producers do not pay for the production of public inputs and this is common knowledge. Thus, they tend to over-lobby to increase their share.

Table 1

Production of Public Input

	$\{\tau^L=0.275, \tau^K=0.275\}$		$\{\tau^L=0.25, \tau^K=0.30\}$		$\{\tau^L=0.30, \tau^K=0.25\}$	
$\overline{K}$	$\hat{G}$	$\widetilde{G}$	$\hat{G}$	$\widetilde{G}$	$\hat{G}$	$\widetilde{G}$
0.7	0.229156	0.232112	0.226511	0.229314	0.231867	0.234969
0.8	0.245610	0.247943	0.242875	0.245093	0.248391	0.250847
0.9	0.260979	0.262802	0.258191	0.259916	0.263822	0.265738
1.0	0.275452	0.276850	0.272614	0.273939	0.278331	0.279805
1.1	0.289153	0.290206	0.286284	0.287281	0.292060	0.293170
1.2	0.302191	0.302964	0.299309	0.300033	0.305111	0.305928
1.3	0.314650	0.315197	0.311758	0.312268	0.317573	0.318155
1.4	0.326596	0.326967	0.323703	0.324045	0.329514	0.329911
1.5	0.338086	0.338321	0.335200	0.335412	0.340990	0.341247
1.6	0.349165	0.349302	0.346293	0.346410	0.352050	0.352205
1.7	0.359874	0.359944	0.357021	0.357073	0.362733	0.362821
1.8	0.370245	0.370277	0.367418	0.367431	0.373073	0.373123

4. Concluding remarks

The objective of this paper has been to investigate the interrelationship between lobbying, institutions, and technological change in a two-sector overlapping generations model. The path of technological change is characterized by the type of public input (or technology) which is either capital- or labor-augmenting. The allocation of public input is often cast into a framework where a benevolent government behaves as though it seeks to maximize social welfare. In our model, we relax the assumption of the benevolent government and suppose that the government is open to producers' collective action for the provision of these inputs. The goal is to provide a qualitative assessment of the lobbying-driven path, contrast it with the optimal path of technological change, and then investigate if institutional arrangements might help correct the inefficiencies introduced by distorted governments.

Simulation results indicate that producers' lobbying behavior in an environment with neutral institutions directs the economy towards a labor-augmenting path. This contradicts with the optimal path in which capital is augmented. On the other hand, lobbying under an institutional structure favoring the capital-intensive sector agrees with the optimal path. This result suggests that governmental inefficiencies can be, partially, corrected by institutional arrangements.

Appendix

Industries. Given $(w,r,p,Y^2,s^2,\Phi^2,G^2,G)$ and $(\overline{K}_0,\overline{L}_0)>0$,12 a representative firm in industry 1 chooses (Y^1,K^1,L^1,s^1) to maximize its profit:

Problem 1

$$\text{Max } \Pi^1 = p^1Y^1 - wL^1 - rK^1$$

subject to

$$Y^1 = (1-s^1)[\theta^1(e^{\lambda^1 G^1}K^1)^{\rho^1} + (1-\theta^1)(e^{(1-\lambda^1)G^1}L^1)^{\rho^1}]^{\frac{\gamma^1}{\rho^1}} \quad (1)$$

$$G^1 = \left[\frac{\Phi^1 s^1 \overline{Y}^1}{\Sigma_i^2 \Phi^i s^i \overline{Y}^i}\right]G \quad (2)$$

$$Y^1 \geq 0, K^1 \geq 0, L^1 \geq 0, 0 \leq s^1 \leq 1 \quad (3)$$

where Y^1 = output, K^1 = capital, L^1 = labor, G^1 = public input, s^1 = share of output allocated for lobbying activities, Φ^1 = measure of lobbying efficiency, θ^1 = parameter of capital intensity, λ^1 = efficiency parameter of the capital-augmenting public input, γ^1 = parameter of returns to scale, and $\sigma^1 = \sigma^1(\rho^1)$ the elasticity of substitution between K^1 and L^1. $\overline{K}_0$ and $\overline{L}_0$ stand for initial endowment of labor and capital, respectively. G denotes the economy-wide supply of public input. The terms $e^{\lambda^1 G^1}$ and $e^{(1-\lambda^1)G^1}$ are capital and labor augmentation functions, respectively. $P \equiv (p^1/p^2=1)$ is the relative price of output where the investment goods are numeraire; $\omega \equiv (w/r)$ is the ratio of the wage rate of labor (w) to the rental rate on capital (r). Industry 2 similarly solves an identical maximization problem without the relative price of output p.

Consumers. Given $(w, r_{t+1}, p, p_{t+1}) > 0$, $(\tau_{t+1}^K, \tau^L) \geq 03$, and $\Pi \geq 04$, a young person at time $t \geq 1$ chooses $(c_t(t), c_t(t+1), S)$ to maximize his/her utility:

Problem 2

$$\text{Max } U_t = \ln(c_t(t)) + \alpha \ln(c_t(t+1))$$

subject to

$$pc_t(t) + S \leq \overline{w}\overline{L} + \overline{\Pi} \quad (1)$$

$$p_{t+1}c_t(t+1) \leq \bar{r}_{t+1}S \quad (2)$$

$$c_t(t) \geq 0, c_t(t+1) \geq 0, \overline{L} = 1. \quad (3)$$

where $c_t(t)$ denotes time t consumption of the person born at time t, $c_t(t+1)$ time t+1 consumption of the person born at time t, S savings at time t, p_{t+1} the expected relative price at time t of the consumption good in terms of investment goods, $(1+i) = r$ gross interest rate, $\bar{w} = (1-\tau^L)w$ effective wage rate where τ^L is the labor tax rate, $\bar{r} = (1-\tau^K)r$ the effective rental rate where τ^K capital tax rate, and $\bar{\Pi} = (\pi^1 + \pi^2)$ the total profit generated by the two industries. The solution to Problem 2 is

$$(c_t(t), c_t(t+1), S) = \left(\frac{\bar{w}+\bar{\Pi}}{(1+\alpha)p}, \frac{\alpha\bar{r}_{t+1}(\bar{\Pi}+\bar{w})}{(1+\alpha)p_{t+1}}, \frac{\alpha(\bar{w}+\bar{\Pi})}{(1+\alpha)} \right).$$

At time t=1, the initial old generation born at t=0 solves

Problem 3

$$\text{Max } U_0 = \alpha \ln(c_0(1))$$

subject to

$$p_1 c_0(1) \le \bar{r}_1 S_0 \quad (1)$$

$$c_0(1) \ge 0, S_0 = K_1 > 0 \quad (2)$$

where $c_0(1) = \frac{\bar{r}_1 K_1}{p_1}$ is optimal consumption of the initial older generation at time t, $\bar{r}_1$ after-tax rental rate of capital at time 1, and $S_0 = K_1$ savings of the old generation economy-wide capital stock at t=1.

Distorted government. Given (p^g, T, w, r, τ^L, τ^K), the passive government chooses (G, K^g, L^g) to maximize the value of its production,

Problem 4

$$\text{Max } p^g G$$

subject to

$$T = wL^g + rK^g \quad (1)$$

$$G = (L^g)^{\delta} + (K^g)^{1-\delta} \quad (2)$$

where p^g stands for the shadow price of public input, $T = (\tau^L w\bar{L} + \tau^K r\bar{K})$ the government's total tax return, $K^g = \frac{\delta T}{r}$ the government's demand for capital, $L^g =$

$\frac{(1-\delta)T}{w}$ the government's demand for labor, $G=T\left[\frac{\delta}{r}\right]^{\delta}\left[\frac{(1-\delta)}{w}\right]^{(1-\delta)}$ optimal provision of public input, and δ share of capital in total production of G.

Undistorted government. Given (p, $s^1=s^2=0$), the government chooses (Y^i, G^i, K^i, K^g, L^i, L^g, G for all i) to solve the following problem,

Problem 5

$$\text{Max} \sum_t Y^2 + pY^1$$

subject to

$$Y^1 = (1-s^1)[\theta^1(e^{\lambda^1 G^1} K^1)^{\rho^1} + (1-\theta^1)(e^{(1-\lambda^1)G^1} L^1)^{\rho^1}]^{\frac{\gamma^1}{\rho^1}} \quad (1)$$

$$Y^2 = (1-s^2)[\theta^2(e^{\lambda^2 G^2} K^2)^{\rho^2} + (1-\theta^2)(e^{(1-\lambda^2)G^2} L^2)^{\rho^2}]^{\frac{\gamma^2}{\rho^2}} \quad (2)$$

$$G = (L^g)^{\delta} + (K^g)^{1-\delta} \quad (3)$$

$$\overline{K} = K^1 + K^2 + K^g \quad (4)$$

$$\overline{L} = L^1 + L^2 + L^g \quad (5)$$

$$G = G^1 + G^2 \quad (6)$$

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Özet

Kurumlar ve endojen teknolojik değişme

Bu çalışma, kurumların ve lobi faaliyetlerinin teknolojik değişim yönü üzerindeki etkilerini iki sektörlü örtüşen kuşaklar modeli çerçevesinde incelemektedir. Simülasyon (benzetim) neticelerine göre, önyargısız kurumların olduğu bir ortamda, üreticilerin rantçı faaliyetleri ekonomiyi sermaye-çoğaltan (capital-augmenting) optimal yoldan çıkartır ve işçi-çoğaltan (labor-augmenting) yola sevkeder. Öte yandan, sermaye destekleyeci bir kurumsal yapı içinde bulunan rantçı faaliyetler ekonominin sermayenin en fazla artığı yoldan ilerlemesini sağlar. Bu sonuca göre, devlet sektöründe bulunan etkinsizliklerin uygun kurumsal düzenlemelerle kısmen düzeltilebileceği anlaşılmaktadır.