A Variety Expansion Model of Growth with Rent Seeking Activities*

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Abstract

The purpose of this paper is to examine how rent seeking activities affect on economic growth. We construct a model which incorporates two types of household based on Caselli and Ventura (2000) into a variety expansion model. The economic growth rate depends on the market share of a main firm in intermediate goods sector. Therefore, firms engage in rent seeking activities in order to keep their market share or monopolistic profit forever. Then, the bureaucracy can increase their utility from gift provided by the firms. Whether rent seeking activities may increase the rate of economic growth or not depends on source of rent seeking.

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1 Introduction

The purpose of this paper is to examine relationship between rent seeking[1] and economic growth. Rent seeking activities have a long history, and it has been repeated at each era, each place and each situation. Even recently, we remember Microsoft as an example. The article said that Microsoft, which is one of the biggest companies in the world, offers a big political contribution to Washington in 1997. When the administration of justice tries to strictly apply the Antimonopoly law to the company, in order to fight this, President Bill Gates offers about $200 millions for lobby activities in 1997. It is said that the sum of such activities is 67% up compared with 1996. This shows that the lobby activity is still useful for keeping their profit.

Therefore, many researchers have shed light on this problem since 1960' (Tullock(1967), Krueger (1973), Baumol (1990), and so on). However, it seems that the literatures disagree with the effect on economic growth of rent seeking. One view of these discussion is that rent seeking activities and corruption can promote economic growth, because such activities give bureaucracies incentives to remove cumbersome regulations or work speedy. Bardhan (1997) introduces historical episodes which rent seeking activities can enhance economic growth and Lui (1985) and so on argue such positive effect from theoretical aspect. The other point of view is that such activities lower growth rate, because they distort the allocation of resource. Mauro(1995) finds that such activities have a negative impact on the growth rate from evidence. Murphy et al.(1993) and Angeletos and Kollintzas(2000) show that the growth rate declines by rent seeking, because a part of workers is placed to nonproductive section, which is rent seeking activities, lobby activities and so on, inefficiency in this economy increases. Therefore, Hall and Jones(1997) say that corruption can be treated as one of extortionately tax.

While we find a great number of papers have been written on the subject, there are a few literature which argue rent-seeking and corruption in the framework of endogenous growth models. We find some paper based on the second view, that is, the distortion of resource allocation through rent seeking and corruption leads to the decline of economic

[1]We know similar words as rent seeking. That is, corruption, rent seeking and lobby activities. Wikipedia, the free encyclopedia by internet, says the difinition of three words as follws. Political corruption is the misuse of public office for private gain. Corruption arises in both political and bureaucratic offices and can be petty or grand, organized or unorganized.

The phenomenon of rent-seeking was first identified in connection with monopolies by Gordon Tullock, in a paper in 1967. It takes place when an entity seeks to extract uncompensated value from others by manipulation of the economic environment – often including regulations or other government decisions.

Lobbying is the practice of private advocacy with the goal of influencing a governing body, in order to ensure that an individual's or organization's point of view is represented in the government.

growth. What is resource for the growth in literatures of this topic? Sarte(2001) and Jalali-Naimi and Karimi (2003) consider it government spending, then they find the reason why the smaller provision of government spending. That is, agency problem between government and private sector result in reducing it, so that economic growth goes down compared with the case without such problem. Using the model based on human capital[2], Angeletos and Kollintzas(2000) argue that the existence of rent seeking and corruption distorts equilibrium allocation, as a result, the growth rate also goes down. In our paper, we consider the engine of growth as technological progress in order to analyze how rent seeking activities affect economic growth. We construct our model based on a variety expanding model, Romer (1990) and Grssman and Helpman(1991).

One of the most important characterization of discussion about rent seeking and corruption is that much existing literatures assume that just as if the resource disappear from the economy by such activities. That is, productive resource in the economy change in unproductive. For example, let us see Angeletos and Kollintzas. In their paper, intermediate good firms employ productive and unproductive workers, which engage in rent seeking activities and get demand from final goods firm. Since rent seeking activities reduce productive activities, the level of intermediate goods decreases. So that output of final goods also decreases, and the rate of growth rate goes down.

Certainly, rent seeking activities and corruption are the extra cost for the firm which burdens it. However, since people who can receive it may increase their utility by some presents from rent seeking activities, it is possible to say that such activities give some contribution to the economy. From this point of view, in our model, we introduce heterogenous agents based on Caselli and Ventura(2000). That is, there are two types of households which can or cannot get gift from rent seekers. The former people work at the government sector and the latter at the private. The former people have a power to keep market share of a fimr or determine which firm has infinite monopolistic right. Therefore, firms in private sector offer some bribe to the officials to keep their profit. On the other hand, the bureaucracy request some gift or presents to firms in order to raise his utility. Like this, the most different point in existing literatures is that we consider rent seeking activities and corruption as not unproductive activities but productive activities for a part of agents in this economy.

In this setting, the second purpose of this paper is to analyze dynamics of heterogeneous agent model based on Caselli and Ventura(2000). We show the economy has a unique balanced growth path, and investigate the characterization by comparative analysis.

This paper is organized as follows. In section 2, we construct the base model.

[2]They also argue the case where technological progress is the engine of growth, however, that is the extention of base model, and not comolete.

In section 3, we investigate the characterization of balanced growth path (BGP). In section 4, we expand the base model to incorporate three cases which are different source of rent seeking activities. In section 5, we examine the characterization of BGP which reduced from section 4. In section 6, concluding remarks will be shown.

2 The Base Model

We expand a variety expanding model to include heterogeneous agents and rent seeking activities. We assume that there are many infinitely lived consumers, indexed by j in this economy. We allow two types of agents, which are distinguished by working sector, workers in private and government sectors. We assume that the number of workers in the government sector are fixed. People in government sector, the bureaucracy or politicians, can get some contributions from intermediate goods firms. Since officials have a power to determine which firm should have the infinite patents to monopolistically produce ith good, the firm desiring to have the right are willing to offer a part of profit as bribe. Such gifts or presents increase the officials' utility.

2.1 Household

We assume that the number of population in this economy, L, is large, constant and that each consumer is small in the sense that his or her choices have negligible effects on market equilibrium. Following Casse and Ventura (2000)[3], the consumer j maximizes his or her utility as follows,

$$U_j = \int_0^\infty \frac{(c_j + \left(\beta_j g\right)^\sigma)^{1-\theta}}{1-\theta} e^{-\rho t} dt \tag{1}$$

where c_j is consumption of consumer j, and g is the special service that some consumers receive from rent seeking firms. There are two kinds of consumer heterogeneity in this economy. Firstly, only people working at government sector can get some gift. σ is parameter which stands for how degree the receiver takes it into his or her utility. Larger σ means that officials feel happier than smaller σ when they get some bribe. Moreover, the second source of consumer heterogeneity is also represented by the degree of social power, as measured by β_j. The higher β_j, the stronger social power he has. That is, if he is a high class bureaucracy, he can get more large amount of special service provided by rent-seeker. On the contrary, if he is an young or lower class bureaucracy who does not have so much power, then β_j is smaller. We assume that the sum of β_j

[3]Although g is public goods in Casse and Ventura(2000), we define g as gift which only bureaucracies can get in this paper.

is equal to 1, that is $\int_0^L \beta_j dj = 1$. Since this service is not provided through market, consumers face to the following budget constraint,

$$\dot{s}_j = rs_j + wl_j - Pc_j, \tag{2}$$

where s_j denotes the asset holding of the household j, w is wage rate and P denotes the price of consumption good. We assume that in each moment household supplies l units of labor inelastically to private sector. The number of workers in government sector is fixed, μL, and they do not get any payment. Therefore, they have only asset. Setting and solving Hamiltonian as usual, the optimal conditions for this problem give the Euler equation,

$$\dot{c}_j = \frac{r - \rho - \Phi}{\theta}(c_j + \left(\beta_j\right)^\sigma g^\sigma) - \sigma \left(\beta_j\right)^\sigma g^{\sigma-1}\dot{g} \tag{3}$$

where $\Phi = \frac{\dot{P}}{P}$. This Euler equation shows that the growth rate of consumption depends on the degree of the social power. If he works at the private sector, in the case of $\beta_j = 0$, then the Euler equation comes back usual form.

2.2 Producers

2.2.1 Final goods

Final goods, Y is produced by intermediate goods. The production function is given by

$$Y = \left(\int_0^A x_i^{\frac{\varepsilon-1}{\varepsilon}} di\right)^{\frac{\varepsilon}{\varepsilon-1}}, \varepsilon > 1 \tag{4}$$

where x_i is intermediate good $i \in [0, A]$ and ε denotes the elasticity of substitution among intermediate goods. The range of intermediate goods, A, is expanding through R&D activities.

Considering cost minimization problem of final goods sector, we get the following inverse demand function,

$$x_i = \frac{P^\varepsilon}{p_i^\varepsilon} Y. \tag{5}$$

where P is price index, $P = \left(\int_0^A p_i^{1-\varepsilon} di\right)^{\frac{1}{1-\varepsilon}}$.

2.2.2 Intermediate goods sector

Firms producing intermediate goods produce their goods based on the design created by the R&D firm. We assume that one unit of intermediate good is produced with one

unit of labor. Each firm in intermediate goods sector engages in rent seeking activities in order to keep patent or permits necessary for the conduct of business or their marekt share. Even if the firm is a monopolistic producer for good i until t period, since the firm always faces to potential competitors which aim to get rid of the monopolistic profits. If a firm have almost market share of the goods, he also is always in danger to be took his market share from the competitors. Therefore, the monopolistic producer has incentive to engage in rent seeking activities, that is, they offer some type of gift to bureaucracies. If officials receive gifts, they accord facility for leaders of ith goods within that period. Therefore, the leader or a monopolistic firm are willing to burden this cost each period in order to keep his monopolistic profit forever.

Existing Firm Firstly, we consider the firm which is leader. The firm always faces to potential competitors which aim to get rid of the monopolistic profits. Therefore, the monopolistic producer has incentive to offer some type of gift to bureaucracies to keep their monopolistic profits. Following Jacquemin(1985), we consider the profits of intermediate goods sector as follows,

$$\pi_i = (p_i - w)(x_i - n_i) - b_i$$

where n_i is the output level of potential competitors and b_i is the rent seeking cost to keep their monopolistic profits, in other words, bribe. If the other firm enters the market, the existing firm looses his monopolistic power, and his profit is also reduced by n_i.

Potential Firm To determine the bribe level, we see the potential competitors. The potential competitors consider the profits after they can succeed in the entry of market, so we assume that the most simplest example of the entry rate is

$$\dot{n}_i = p_i n_i - w l_i - \eta b_i,$$

where $\dot{n}_i$ is the entry rate. The increase in profits raises the incentive of competitors. For entering this market, the competitors have to pay the extra bribe (b_i times η, $\eta > 1$) than existing firm. Since the existing firms set a bribe level in order to keep their market share unchanged each period, the competitor have to pay more bribes to get rid of the monopolistic position.

The leader set a bribe level to keep their market share. The all demand for ith goods is x_i. Therefore, the leader sets a bribe level which the entry rate is equal to the growth rate of demand. That is,

$$\frac{\dot{n}_i}{n_i} = \frac{\dot{x}_i}{x_i} = p_i - w - \eta\frac{b_i}{n_i}.$$

Then, we can know the rent seeking cost for existing firm as follows,

$$b_i = \frac{n_i}{\eta}\left(p_i - w - \frac{\dot{x}_i}{x_i}\right). \tag{6}$$

Using this bribe level, the profit of the existing firm is

$$\pi_i = (p_i - w)(x_i - n_i) - \frac{n_i}{\eta}\left(p_i - w - \frac{\dot{x}_i}{x_i}\right).$$

Then, profit maximization gives

$$\frac{\partial \pi_i}{\partial x_i} = (p_i')(x_i - n_i) + (p_i - w) - \frac{n_i}{\eta}p_i' = 0$$

Since cost minimization of final goods sector gives the inverse demand function, $p_i = x_i^{\frac{-1}{\varepsilon}} PY^{\frac{1}{\varepsilon}}$, the price of ith is given by

$$p_i = \frac{\varepsilon}{\left(\varepsilon - 1 + \left(1 + \frac{1}{\eta}\right)\frac{n_i}{x_i}\right)}w.$$

where $\frac{n_i}{x_i}$ means the market share of competitors on ith goods. If their market share increases, then the price of leader will decrease.

Assuming symmetric equilibrium, we can eliminate subscript, i. Therefore, profit of the leader is

$$\pi = x\left\{\left(\frac{1 - \left(1 + \frac{1}{\eta}\right)\frac{n}{x}}{\left(\varepsilon - \left[1 - \left(1 + \frac{1}{\eta}\right)\frac{n}{x}\right]\right)} - 1\right)w(1 - \frac{n}{x} - \frac{n}{\eta x}) + \frac{n}{\eta x}\frac{\dot{x}_i}{x_i}\right\}. \tag{7}$$

2.3 R&D

The research and development sector creates the new design for the intermediate goods and is assumed to be competitive. The knowledge creation function is

$$\dot{A} = \delta L_R A, \tag{8}$$

where L_R stands for labor engaged in R&D activities and δ is the productivity of R&D. Profit ($\pi^R = v\dot{A} - wL_R$) maximization in this sector gives

$$w = \delta A v, \tag{9}$$

where v denotes the patent price. Moreover, the arbitrage condition is

$$r = \frac{\dot{v}}{v} + \frac{\pi}{v}. \tag{10}$$

2.4 Government

All things government in this economy do is to determine whether to give official approval or not. We assume that the payment for the bureaucracy is the same rate as private sector and this wage is determined by law. In Japan, when the National Personnel Authority determines the wage of officials, it refers to that of private sectors. Here, we assume that a gift is something to increase the officials' utility. We do not specify gift as goods or services, because there is no gift market. It is important that such present can increase utility of a part of people. Therefore, we assume that when bureaucracies put some source into a black box, they can increase their utility. However, since we confirm the existence of steady state in this economy, we use following type of black box. That is, this is a gift function.

$$g = \left(\int_0^A b_i^{\frac{\gamma-1}{\gamma}} d_i \right)^{\frac{\gamma}{\gamma-1}}, \gamma > 1 \tag{11}$$

where g stands for the total gifts in this economy and γ is parameter. If the bureaucracy or politicians get some gifts at a period, they permit the right which the briber can monopolistically produce the good within the period.o

2.5 Market Equilibrium

Now, note that market equilibrium in this economy. We assume that the number of population, L, is constant in each moment. Therefore, full employment condition is

$$L_I + L_G + L_R = L, \tag{12}$$

where L_I is labor for producing intermediate goods and is equal to Ax in symmetric equilibrium. L_G is the amount of the bureaucracy. In order to make our model analytically simple, we fix the amount of workers in government sector. That is,

$$L_G = \mu L,$$

where $\mu (0 < \mu < 1)$ is the constant ratio of workers in government sector in terms of labor supply.

The market clearing condition of final goods is

$$Y = \int_0^L c_j dj, \tag{13}$$

where $\int_0^L c_j dj = c$, c is aggregate consumption in this economy.

2.6 Dynamic System

Let us show dynamic system in this economy. We set the wage rate, w, as numerarire. When we examine the movement of this economy, we must consider not individual variables but the entire economy. As a result, we can analyze this model in the framework of representative consumer model. Equation (10) can be rewritten using (25),(7) and (12), (9),

$$r = -a + \frac{1}{V}\left(a - \frac{L}{\delta}\right)\left\{\left(\frac{1-\left(1+\frac{1}{\eta}\right)\frac{n}{x}}{\left(\varepsilon - \left[1-\left(1+\frac{1}{\eta}\right)\frac{n}{x}\right]\right)}\right)(1-\frac{n}{x}-\frac{n}{\eta x}) + \frac{n}{\eta x}\left(a - \frac{\dot{L}_I}{L_I}\right)\right\} \tag{14}$$

where $V = Av$, $a = \dot{A}/A = \delta L_R$ and $\frac{\dot{L}_I}{L_I} = -\frac{L_R}{L-L_R}\frac{\dot{L}_R}{L_R}$. (14) is the interest rate. Therefore, the interest rate can be expressed by

$$r = R(V, L_R).$$

We define $V = Av$ as the total asset in this economy. Assets are distributed to each household, $Av/L = s_j$, hence using the budget constraint, the movement of total asset is

$$\dot{V} = R_\iota(V, L_R)V + \delta VL - q, \tag{15}$$

where letting $q = Pc_jL$. V is only state variable in this economy.

Denoting $m = \frac{g^\sigma}{c}$, the movement of gift is derived by taking the time derivative of (4), (11) and (13), and combining them

$$\frac{\dot{g}}{g} = \frac{\gamma}{\gamma-1}\delta L_R + \frac{1}{(1+\sigma m)}\left\{\frac{r-\rho}{\theta}(1+m) + \frac{1}{(\varepsilon-1)\theta}\delta L_R(1+m) - \left(\frac{\sigma\gamma}{\gamma-1}m + \frac{\varepsilon}{\varepsilon-1}\right)\delta L_R\right\} \tag{16}$$

Differentiating m with respect to time and using (3) gives

$$\begin{aligned}\frac{\dot{m}}{m} &= \sigma\frac{\dot{g}}{g} - \frac{\dot{c}}{c} \\ &= \frac{(\sigma-1)(1+m)}{(1+\sigma m)}\frac{r-\rho}{\theta} \\ &\quad + \frac{(1+m)}{(1+\sigma m)}\left[\sigma\left\{\frac{(1+m)}{(\varepsilon-1)\theta} - \left(\frac{\sigma\gamma m}{\gamma-1} + \frac{\varepsilon}{\varepsilon-1}\right)\right\} - \left(\frac{1}{(\varepsilon-1)\theta} - \frac{\sigma\gamma}{\gamma-1}\right)(1+\sigma m)\right]\delta L_R\end{aligned} \tag{17}$$

Following the same step for m, differentiating q with respect to time and using (16) gives

$$\begin{aligned}\frac{\dot{q}}{q} &= \frac{1}{1-\varepsilon}a + \frac{\dot{c}}{c} \\ &= \Gamma^q(m, L_R)\end{aligned} \tag{18}$$

Moreover, the movement of labor employed in R&D sector is determined by the full employment condition and the definition which is that one unit of intermediate goods is produced by one unit of labor, that is, $x_i = \frac{L_I}{A}$. We obtain the movement as follows;

$$\begin{aligned}\frac{\dot{L}_R}{L_R} &= -\frac{(1-\mu)L - L_R}{L_R} \\ &\times \left[\frac{1}{(1+\sigma m)}\left\{\frac{r-\rho}{\theta}(1+m) + \frac{1}{(\varepsilon-1)\theta}(1+m)\delta L_R - \left(\frac{\sigma\gamma m}{\gamma-1} + \frac{\varepsilon}{\varepsilon-1}\right)\delta L_R\right\} + \delta L_R\right].\end{aligned} \tag{19}$$

These four variables, V, m, q and L_R, show dynamics in this economy.

3 Characterization on Balanced Growth Path (BGP)

In this section, we consider characterization of this economy along balanced growth path.

3.1 The Long-Run Growth Rate

Let see the long run growth rate on each case. This economy shows that the various quantities flow at constant rates, for this, (15), (17) (18) and (19) must be zero at the steady state. At the steady state, the existing firm pays the cost to keep his or her market share constant. That is, the entry rate is equal to $-a$. From (6), the cost is determined as

$$b_i = \frac{n_i}{\eta}(p_i - w + a)$$

Proposition 1 *There are two steady states in this economy. One of steady states is stable, the other is unstable.*

Proof. *Substituting (14) into $\dot{m} = 0$ condition,*

$$f(a) = \frac{n}{\eta x}a^2 - \left[1 + \delta(1-\mu)L\frac{n}{\eta x} + \left(\frac{B^2}{\varepsilon - B}\right) + \frac{1}{\varepsilon - 1}(\theta - 1)\right]a + \delta(1-\mu)L\left(\frac{B^2}{\varepsilon - B}\right) - \rho = 0 \tag{20}$$

where

$$B = 1 - \left(1 + \frac{1}{\eta}\right)\frac{n}{x}$$

The coefficients of a is positive and the constant term is also positive. Therefore,

we can find two growth rates[4] *to be satisfied with (20). The growth rates are follows:*

$$a = \frac{\left[1+\delta(1-\mu)L\frac{n}{\eta x}+\left(\frac{B^2}{\varepsilon-B}\right)w+\frac{1}{\varepsilon-1}(\theta-1)\right] \pm \sqrt{\left[1+\delta(1-\mu)L\frac{n}{\eta x}+\left(\frac{B^2}{\varepsilon-B}\right)w+\frac{1}{\varepsilon-1}(\theta-1)\right]^2-4\frac{n}{\eta x}\left[\delta(1-\mu)L\left(\frac{B^2}{\varepsilon-B}\right)-\rho\right]}}{2\frac{n}{\eta x}}. \tag{21}$$

■

Corollary 2 *On the stable equilibrium, market share of the leader is larger, then the growth rate may increase.*

We show the numerical example in Table 1. If the leader has a small market share, then he has to set a lower price. Therefore, he get relatively small profit, and this lowers incentives to promote technological progress in R&D sector[5].

4 Source of rent seeking

4.1 Intermediate goods sector

In above section, we show that if the leader have more lager part of the market share of the goods, then the growth rate increases. So, from following section, we consider the leader engage in rent seeking activities from the starting point. Therefore, they already have 100% share on the goods. Then, we consider how different of source on rent seeking activities affects economic growth.

Each firm in intermediate goods sector must offer some type of bribes to bureaucracies in order to keep patent or permits necessary for the conduct of business[6]. Even if the firm is a monopolistic producer for good i until t period, since the firm always faces to potential competitors which aim to get rid of the monopolistic profits. Therefore, the monopolistic producer has incentive to offer some type of gift to bureaucracies. If officials receive gifts, they do not give others permits to produce ith goods, in other words, they prevent others from entering the market of ith goods within that period.

[4] We assume that $\left[1+\delta(1-\mu)L\frac{n}{\eta x}+\left(\frac{B^2}{\varepsilon-B}\right)w+\frac{1}{\varepsilon-1}(\theta-1)\right]^2-4\frac{n}{\eta x}\left[\delta(1-\mu)L-\rho\right]>0$.

[5] If the existing firm has the market share 100%, then the growth rate is

$$a^* = \frac{1}{\varepsilon+(\theta-1)}\left[\delta(1-\mu)L-(\varepsilon-1)\rho\right].$$

[6] This is also along the line which corruption imposes an extortional tax.

Therefore, the firm which already has a patent must pay this cost each period in order to keep his monopolistic profit forever.

The existing firms set this bribe level by various ways. We investigate three scenarios, according to how the firm producing intermediate goods offers bribes to the bureaucracies. In other word, the difference among three scenarios depends on the source of gifts.

Case 1: extra labor
Case 2: a part of intermediate goods
Case 3: a part of sales

In Case 1, we may think the extra labor make more goods to present to the bureaucracies or they work for increasing in officials' utility, for example, they go golfing with officials. Case 2 is that a constant quantity of intermediate goods offered to officials . Then, firms increase prices to compensate profits because of reducing their goods which they can freely sell in the market. So that the price for final goods sector and producer price become different. This type of bribes is like consumption tax. Case 3 is that bureaucracies request a part of sales to firms

Case 1 Following scenario 1, the existing firms determine his bribe level, then, $b_i = \phi_1 l_i$. Then, the profit is written by

$$\pi_{1i}^{\phi} = p_{1i}x_i - w(1+\phi_1)l_i, \tag{22}$$

$\phi_1 w l_i$ is the extra cost for the firm having the ith patent. If the firm can protect his profit without paying extra cost, it would not be a rent-seeker. Therefore, the condition for willing to burden ϕ_ι[7] is

$$\int_0^t \pi_{\iota i}(\tau)e^{-rt}d\tau + \int_t^\infty \pi_{\iota i}^C(\tau)e^{-rt}d\tau < \int_0^\infty \pi_{\iota i}^{\phi}(\tau)e^{-rt}d\tau, \iota = 1,2 \tag{23}$$

where $\pi_{\iota i}$ is the monopolistic profit without any bribe and $\pi_{\iota i}^C$ denotes the profits which the firm get in the case where he does not offer any gift. From profit maximization of each firm, we can show the optimal pricing formula such that

$$p_{1i} = \frac{\varepsilon}{\varepsilon - 1}(1+\phi_1)w. \tag{24}$$

This shows that the price of good i is determined by marginal cost of labor input, w, times (1+ ϕ_1) , multiplied by the mark-up ratio, $\frac{\varepsilon}{\varepsilon-1}$. That is, the cost of rent seeking

[7] In both cases, we asssume that the rate is constant over time for analytical simplicity.

is shifted on the intermediate good price, and the marginal revenue is equal to the marginal cost. An increase in price leads to a decreasing demand for intermediate goods from (5). As a result, the production of final goods also decreases. Therefore, rent-seeking activities, in addition to distortion derived from this monopolistic market, lead to more distortion to resource allocation in this economy. The fact that corruption reduces the output level of intermediate goods is the same mechanism as Angeletos and Kollintzas.

Case 2 Let us consider Case 2. Similarly to Case 1, the monopolist determines a bribe in order to prevent any firms from getting rid of his market. Then, he decides a bribe level as follows,

$$s_{2i} = \phi_2 x_i$$

Then, the profit of the firm producing intermediate good i is given by

$$\pi_{2i}^{\phi} = (p_{2i} - \phi_2)x_{2i} - w_i l_i. \tag{25}$$

The firm burdens rent seeking cost on each goods. In this case ϕ_2 represents the same bribe rate imposed on all goods. That is, this type of bribe resembles consumption tax. Then firms can receive profits $(p_i - \phi_2)x_i$. From profit maximization of each firm, we can show the optimal pricing formula such that

$$p_{2i} = \frac{\varepsilon w + \phi_2}{\varepsilon - 1}. \tag{26}$$

This shows that the price of good i is determined by marginal cost of labor input, w, plus the rent-seeking costs, ϕ_2. That is, the cost of rent seeking is shifted on the intermediate good price, and the marginal revenue is equal to the marginal cost.

Case 3 Let us consider Case 3. As said above, in this case, the bribe level is $s_{3i} = \phi_3 p_{3i} x_{3i}$.Therefore, the profits of this type are

$$\pi_{3i} = p_{3i}\left(1 - \phi_3\right) x_{3i} - w x_{3i} \tag{27}$$

This means that bribes are a some ratio of sale. In this case ϕ_3 represents the bribe rate imposed on goods. The bribe rate is the same for all goods. Then firms can get profit $p_{3i}\left(1 - \phi_3\right) x_i$. From profit maximization of each firm, we can show the optimal pricing formula such that

$$p_{3i} = \frac{\varepsilon}{\varepsilon - 1}\left(\frac{1}{1 - \phi_3}\right) w. \tag{28}$$

This shows that the price of good i is determined by marginal cost of labor input, w, multiplied by the mark-up ratio, $\frac{\varepsilon}{\varepsilon-1}$. Since the firm decreases intermediates which he can sale, the price increases by $\frac{1}{1-\phi_3}$. That is, the cost of rent seeking is shifted on the intermediate good price, and the marginal revenue is equal to the marginal cost.

In all cases, the price is independent of i, so we eliminate subscription i from now.

4.2 The other sectors

Final goods, government and R&D sectors behave as the same in the base model, respectively. Therefore, conditions for market equilibrium are also unchanged. Note that, $\iota(\iota = 1, 2, 3)$ represents Case 1, Case 2 and Case 3. respectively.

4.3 Dynamic System

Let us show dynamic system in this economy. The difference between base model and three cases in the following model is only intermediate goods sector. Therefore, it is shown in the interest rate in dynamic system. Equation (10) can be rewritten using (22),(25),(27) and (12), (9),

$$r_1 = -\left[1+\left(\frac{1}{\varepsilon-1}\right)\right]a+\left(\frac{1}{\varepsilon-1}\right)(1-\mu)L, \tag{29}$$

$$r_2 = -\left[1+\left(\frac{1}{\varepsilon-1}\right)\frac{(\delta V+\phi_2)}{\delta V}\right]a+\left(\frac{1}{\varepsilon-1}\right)\frac{(\delta V+\phi_2)}{V}(1-\mu)L, \tag{30}$$

$$r_3 = -\left[1+\left(\frac{-\varepsilon\phi_3+1}{(\varepsilon-1)(1-\phi_3)}\right)\frac{1}{V\delta}\right]a+\left(\frac{-\varepsilon\phi_3+1}{(\varepsilon-1)(1-\phi_3)}\right)\frac{1}{V}(1-\mu)L \tag{31}$$

These four variables, V, m, q and L_R, show dynamics in this economy.

5 Characterization on Balanced Growth Path (BGP)

In this section, we consider characterization of this economy along balanced growth path.

5.1 The Long-Run Growth Rate

Let see the long run growth rate on each case.

Case 1 This economy shows that the various quantities flow at constant rates, for this, (15), (17) (18) and (19) must be zero at the steady state. Substituting (29) into $\dot{m} = 0$ condition gives us the rate of technological progress at the balanced growth path,

$$a_1 = \frac{(1-\mu)\,\delta L - \rho(\varepsilon - 1)}{\varepsilon + (\theta - 1)}. \tag{32}$$

In order to define a feasible steady state, the parameter values should satisfy the following conditions,

$$(1-\mu)\,\delta L - \rho(\varepsilon - 1) > 0,$$

and

$$\varepsilon + (\theta - 1) > 0.$$

Under these conditions, we ensure the technological progress expressed by (32) is positive. From (32), we find that if the number of bureaucracy that are unproductive workers in this model increases, then the growth rate decreases. This may imply that the small government will be better than big one for the economic growth rate. We find that the long run growth rate in Case 1 is independent ϕ_1.

Case 2 Similarly to Case 1, substituting (30) into $\dot{m} = 0$ condition gives us the rate of technological progress at the balanced growth path,

$$a_2 = \frac{(1+\phi_2)\,(1-\mu)\,\delta L - \rho(\varepsilon - 1)}{\{\varepsilon + \phi_2 + (\theta - 1)\}}. \tag{33}$$

When the feasible condition is satisfied in Case 1, at the same time, (33) is positive.

To analyze the characterization of the steady state, we assume $\theta > 1$[8] and use the following lemma.

Lemma For the existence of feasible steady sate, $\sigma = \frac{\gamma - 1}{\varepsilon - 1}$ is required.

Proof. From $\dot{q} = 0$ condition, the following relationship is allowed at the steady state,

$$\frac{\dot{c}}{c} = \frac{1}{\varepsilon - 1} a. \tag{34}$$

As technological progress proceeds, the economic growth rate increases from final goods market clearing condition, $\frac{\dot{Y}}{Y} = \frac{\dot{c}}{c}$. The less competitive the market of intermediate goods is, the faster the growth rate increases. At the BGP, from (17) $\dot{m} = 0$ condition says that the growth rate of gift is σ times as that of consumption goods, $\sigma \frac{\dot{g}}{g} = \frac{1}{\varepsilon - 1} a$.

[8] This condition is required on welfare analysis.

The growth rate of gift is derived from differentiating (11) with respect to times. Thus, we obtain

$$\begin{aligned} \frac{\dot{g}}{g} &= \frac{\gamma}{\gamma-1}a + \frac{\dot{x}_i}{x_i} \\ &= \frac{1}{\gamma-1}a. \end{aligned} \tag{35}$$

Substituting (34) and (35) into $\dot{m}=0$ condition, we find that $\sigma = \frac{\gamma-1}{\varepsilon-1}$ is required for existence of the BGP. ■

Let us consider $\sigma = 1$ is the benchmark case. Smaller $\sigma(<1)$ means that the degree of contribution in their utility is small. For example, suppose that an official is given beer by the firm. If the person prefers wine over beer, then his utility will not likely increase. We may say that small σ may reflect this situation. Similarly to this, when the bureaucracy receives chocolates, and like them very much their utility will increase more than the firms expected. This case may be captured by bigger $\sigma(>1)$.

Case 3 Similarly to Case 1, substituting (31) into $\dot{m}=0$ condition gives us the rate

of technological progress at the balanced growth path,

$$a_3 = \frac{(-\varepsilon\phi_3+1)\,\delta\,(1-\mu)\,L-(\varepsilon-1)\,\rho}{\{\varepsilon\,(1-\phi_3)+(\theta-1)\}}. \tag{36}$$

When the feasible condition is satisfied in Case 1, at the same time, (36) is positive.

5.2 The Effect of rent-seeking activities

Next, let us consider how the higher the rate of bribe affects on the economic growth rate. We can obtain the following proposition between rent seeking level and economic growth.

Proposition 3 *When the firm offers more bribes to the bureaucracy, whether it can promote economic growth or not depends on the type of bribe.*
(1)Rent-Seeking activities have no impact on economic growth, when intermediate goods firms give bureaucracy more workers as a bribe (Case 1).
(2)Rent-Seeking activities have a positive impact on economic growth, when intermediate goods firms give bureaucracy a part of intermediate goods as a bribe(Case 2).
(3)Rent-Seeking activities have a negative impact on economic growth, when intermediate goods firms give bureaucracy a part of their sales as a bribe (Case 3).

Proof. Firstly, we find that the long run growth rate in Case 1 is independent ϕ_1 in (32). Therefore, the increase of rent seeking cost cannot affect economic growth in Case 1.

Next, differentiating a_2 with respect to ϕ_2, we obtain

$$\frac{\partial a_2}{\partial \phi_2} = \frac{\delta\left(1-\mu\right)L\left(\theta-2\right)-\rho}{\left\{\varepsilon+\phi_2+\left(\theta-1\right)\right\}^2} \tag{37}$$

To analyze (37), let us focus on the numerator. Even if $\delta\left(1-\mu\right)L\left(\theta-2\right)-\rho<0$, then $\varepsilon^*\left(=-\frac{\delta(1-\mu)L(\theta-2)-\rho}{[\delta(1-\mu)L+\rho]}\right.$ is given by $\left.f(\varepsilon^*)=0\right)$ is always smaller than 1, therefore (37) is always positive, because we assume that $\varepsilon>1$. Then, we can draw Figure 1. When the firm offers more bribes to the bureaucracy, it can promote economic growth. However, the impact is getting smaller as ϕ_2 is larger.

Finally, differentiating a_3 with respect to ϕ_3, we obtain

$$\frac{\partial a_3}{\partial \phi_3} = \frac{(-\varepsilon)\left\{\delta\left(1-\mu\right)L\left(\varepsilon+\theta-2\right)+\left(\varepsilon-1\right)\rho\right\}}{\left\{\varepsilon\left(1-\phi_3\right)+\left(\theta-1\right)\right\}^2}<0.$$

So, in this case, the more bribe has a negative impact on economic growth. ■

What occurs when ϕ_2 increases? Then, the economy is affected by two channels: the positive and negative impact. Price of intermediate goods increases, $dp_{2i}=\frac{\varepsilon}{\varepsilon-1}d\phi_2$, and this leads to decrease in demand, $dx_i=-\varepsilon P^{\varepsilon}p_i^{-\varepsilon-1}Ydp_{2i}$ from final goods sector. Decrease in demand leads to decrease in labor demand. That is, labor employed in intermediate goods sector decreases. As a consequence, labor will shift from the production activities to R&D sector, which can promote economic growth. This is the positive impact on the long run growth rate. On the other hand, these change affect the profit of intermediate goods sector. The profit decreases by

$$d\pi_{2i}^{\phi}=-x_i d\phi_2.$$

Decrease in profit of intermediate goods sector makes the value of this firm decrease. This leads to a decrease in the wage rate of labor in the R&D sector. Then, labor will shift R&D sector to production sector. This is negative impact on economic growth. The effect on rent seeking activities depends on which effect dominates in this economy. In this monopolistic competitive economy, the first impact always dominates the second effect. However, the size of the impact depends on market structure. Using (12) and (33), we obtain labor in intermediate goods sector at the steady state as follows:

$$L_I=\frac{\left[\varepsilon+\theta-2\right]\delta\left(1-\mu\right)L-\rho(\varepsilon-1)}{\delta\left\{\varepsilon+\phi_2+\left(\theta-1\right)\right\}}. \tag{38}$$

where $L_I > 0$. If rent seeking cost increases, the labor in this sector decreases. The impact in less competitive economy is larger than more competitive. Therefore, the former effect may easily dominate in less competitive economy rather than more one.

In the standard variety expansion model, increasing in price of intermediate goods through a rise in wage decreases profit of this sector, and it reduces demand from final goods sector. However, a rise in wage in R&D sector increases in incentive to move to this sector, so that the growth rate will go up. If we assume that wage is numerarie in the standard model, then we do not analyze a rise in productive cost in intermediate goods sector. In the rent seeking economy, if increase in price occurs through the change in officials' attitude, then growth rate increases in more competitive rather than less one. Since the bribe in this economy is required in order to keep his monopolistic position, it is the barrier to entry.

Note that Case 1 and Case 3. From above discussion, we find that the bribe can reallocate labor from intermediate goods to R&D sector[9]. However, when extra labor is required for rent seeking activities, the effect of reallocation is cancelled out. Since rent seeking cost is treated as unproductive factors in existing literatures, one more unit of cost will make the growth rate decrease. On the other hand, in this paper, such cost is productive cost for a part of people, it may increase in the growth rate. Therefore, the positive and negative effect is cancelled out, so that bribe does not have any effect on economic growth.

In Case 3, since the existing firm loose a part of sales, their monopolistic profits decreases. This leads to decreasing their value and wage for labors. Therefore, labors move to more attractive firms, which is intermediate goods sector. Therefore, growth rate will decrease.

Corollary 4 *The less competitive economy, the larger the impact on economic growth is.*

Proof. Moreover, let us focus on ε in Case 2.

$$\frac{\partial}{\partial \varepsilon}\left(\frac{\partial a_2}{\partial \phi_2}\right) = \frac{-2\left\{\varepsilon + \phi_2 + (\theta - 1)\right\}\left\{\delta\left(1-\mu\right)L\left(\theta - 2\right) - \rho\right\}}{\left\{\varepsilon + \phi_2 + (\theta - 1)\right\}^2} \tag{39}$$

We can obtain Figure 2, that is, the bigger ε is, the smaller the value of $\frac{\partial a_2}{\partial \phi_2}$ is. This shows that the economy with the less competitive market can enjoy more rapid growth rate when they offer one more unit bribe to bureaucracies. ■

[9]Futagami and Doi (2004) have shown that an increase in commodity tax rates reduces the demand for consumption goods and reallocates laobr from production of the goods to R&D activities, as a result, the growth rate in long run increases.

5.3 Dynamics

Let us examine the stability property of our dynamic system.

Proposition 5 *The stability of the long run equilibrium is saddle point stability.*

Proof. This economy has one state variable V, and three jump variables (m, q, L_R). The variable V is always constant from definition, $V\delta = 1$. Moreover, the dynamic behavior of m, q,and L_R are independent of variable q. Since we know the steady state value of q using $\dot{V} = 0$ and the growth rate at the steady state derived from conditions $\dot{m} = 0$ and $\dot{L}_R = 0$. We may focus on the dynamics of m and L_R. Applying Taylor expansions to equations (17) and (19) around the steady state $(\bar{m}, \bar{L}_R)$ and rearranging the terms, we obtain the following :

$$\begin{bmatrix} d\dot{z} \\ d\dot{L}_R \end{bmatrix} = \begin{bmatrix} d_{11} & d_{12} \\ d_{21} & d_{22} \end{bmatrix} \begin{bmatrix} m - \bar{m} \\ L_R - \bar{L}_R \end{bmatrix},$$

where

$$\begin{aligned}
d_{11} &= \frac{\sigma}{\gamma - 1}\delta L_R - \frac{r_\iota - \rho}{\theta} - \frac{1}{\theta}\frac{1}{\varepsilon - 1}\delta L_R \\
&\quad + \frac{\sigma\,(1+m)}{(1+\sigma z)}\left\{\sigma\delta L_R + \frac{r_\iota - \rho}{\theta} + \frac{1}{(\varepsilon-1)\,\theta}\delta L_R - \frac{\sigma\gamma}{\gamma - 1}\delta L_R\right\}, \\
d_{12} &= \frac{1+m}{(1+\sigma z)}\left\{(\sigma - 1)\left(\frac{r'_\iota}{\theta} + \frac{1}{(\varepsilon-1)\,\theta}\right) + \frac{\sigma\gamma}{\gamma - 1}\left(\frac{\gamma}{\gamma - 1} - \frac{\varepsilon}{\varepsilon - 1}\right)\right\}, \\
d_{21} &= \frac{\sigma}{1+\sigma z}\delta L_R + \frac{1}{(1+\sigma z)}\left\{\frac{r_\iota - \rho}{\theta} + \frac{1}{(\varepsilon-1)\,\theta}\delta L_R - \frac{\sigma\gamma}{\gamma - 1}\delta L_R\right\}, \\
d_{22} &= \frac{r'_\iota}{\theta} + \frac{1}{(\varepsilon-1)\,\theta}\,(1+m)\,(1-\theta) < 0, \\
r'_1 &= -\left[\frac{\varepsilon}{\varepsilon - 1}\right]\delta, \\
r'_2 &= -\left[1 + \left(\frac{1}{\varepsilon - 1}\right)(1+\phi)\right]\delta. \\
r'_3 &= -\left[1 + \left(\frac{-\varepsilon\phi_3 + 1}{(\varepsilon-1)\,(1-\phi_3)}\right)\frac{1}{V\delta}\right]\delta
\end{aligned}$$

It is easy to find that the eigenvalues of this system are 0 and negative, evaluated the steady state. In this economy, we have one state variable and three jump ones. Now, since we find one negative eigenvalues, this system exhibit saddle point stability in long run equilibrium. ■

6 Conclusion

We have constructed a model based on a variety expansion model incorporating two types of agents, simple workers and the bureaucracy. We assume that some people who have a special social power, like the bureaucracy or politicians, can get some gifts from rent seekers, but others cannot get any gift. Utility of the bureaucracy is created by such gift and consumption subject to their budget constraint, on the other hand, since the other people who do not have any special power (simple workers) cannot get any gifts, their utility is from only consumption goods.

Based on this setting, we firstly have considered that how rent seeking activities affect on economic growth, when the leader tries to keep their market share constant. If the market share of leader is small, the profit is also small, and the rate of technological progress is smaller. Therefore, the existing firm try to keep their market share using rent seeking activities.

Second, we have investigated that how rent seeking activities affect on economic growth according to three scenarios. That is, firms in intermediate goods sector pays rent seeking cost as workers (Case 1), intermediate goods or something like a specific tax (Case 2) and a part of sales (Case 3). This economy has a unique balanced growth path in three cases. Although such activities do not have any impact on the long run economic growth in Case 1, Case 3 shows that they have negative impact on the economic growth. However, we find that such activities have a positive impact on the growth rate along the path in Case 2. The less competitive market the economy is, the bigger impact they have. That is, rent seeking cost plays a role of reallocation of labors. This may be the adverse result from existing literatures which consider rent seeking as unproductive activities for the economy. In other words, they consider that just as if some resource may disappear from the economy. In this paper, we think rent seeking as not unproductive resource but productive for a part of people in the economy. In this setting, while resource does not disappear from the economy, it is also the barrier for the potential competitor who try to get rid of monopolistic profits, and such activities play a role to reallocate labors. On the stability of long run equilibrium, Caselli and Ventura (2000) confirm the saddle point stability under Ramsey-Cass-Koopmans technology. We also show that the stability is kept under a variety expansion model.

In this model, we treat the officials request as exogenous. How do propositions change introducing bureaucracies' optimization? This is left for the further work.

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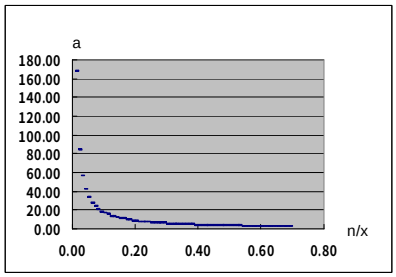
Table 1: Numerical Example



μ	η	ε	θ	ρ	w	L
0.20	1.50	13.00	1.5	0.05	1.00	10.00

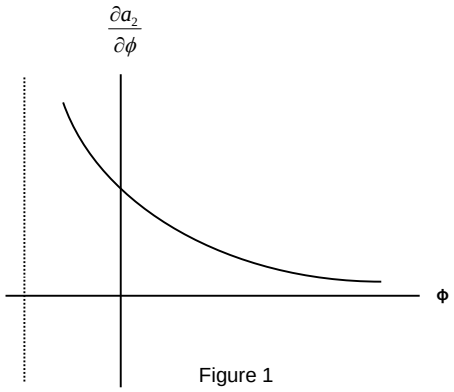


Figure 1

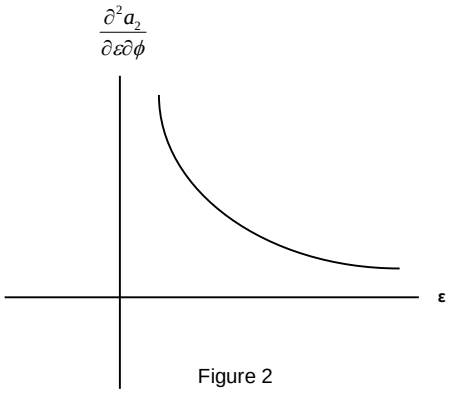


Figure 2