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Rent Seeking and Endogenous Income Inequality

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Abstract

This paper studies the relationship between wealth inequality and occupational choice between rent-seeking and production. With imperfect credit markets and a fixed cost to rent-seeking, only wealthy agents choose to engage in rent-seeking as it enables them to protect their wealth from expropriation. Hence, initial wealth determines occupational choice and aggregate economic activity. The model also generates an unequal wealth distribution endogenously through fair gambles undertaken voluntarily, despite agents being identical ex ante. If agents have an altruistic bequest motive, income and occupational differences can be perpetuated from generation to generation.

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I. INTRODUCTION

The objective of this paper is to present an economic model of rent seeking that highlights a phenomenon observed in many countries: often it is the relatively wealthy who choose rent seeking activities such as the government bureaucracy, army, and police rather than engaging in productive and entrepreneurial activities.[2] In other words, the rent seekers are exactly those who might otherwise become the first capitalists.

Baumol (1990) notes that in Mandarin China and in medieval Europe, government service with its potential for illegal personal enrichment was the principal career choice for many wealthy individuals. Braudel (1983) notes that in seventeenth century France, the purchase of government offices and tax farming was commonplace among the upper classes. Root (1994) observes that during the reign of Louis XIV, families of the French aristocracy invested considerable time and money to obtain royal patronage and official positions or privileges with substantial rent potential. Levi (1988) states that an important prerequisite of engaging in tax farming in Republican Rome was the availability of sufficient capital that enabled wealthy Roman citizens to advance funds to rulers and to collect taxes. The Ottoman Empire relied heavily on tax farming, auctioning off the rights to the highest bidders (Azabou and Nugent, 1988).

Among more recent practices, Wade (1984) finds that individuals in India pay thousands of dollars for positions with the power to allocate supposedly free water to farmers, since these jobs give them monopoly rights to charge for water. In many developing countries civil service positions are purchased at high prices compared to the annual salary for the position (Alfiler, 1986). Casual observation suggests that in many countries it is common for government officials to own businesses run either by themselves or by their relatives, and to protect such businesses from corrupt practices and other forms of expropriation by virtue of their government positions.[3] In most of the cases mentioned above, rent seeking by the rich or powerful occurs in environments where law enforcement and property rights protection is weak or ineffective.

The model presented in this paper provides a theoretical explanation for the relationship between the distribution of individuals' initial wealth and their occupational choice between rent seeking and production. It determines endogenously the allocation of agents between the two occupations, the subsequent distribution of income and wealth, and

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[2] Rent seeking refers to all largely unproductive, expropriative activities, which bring positive return to the individual but not to society (Krueger (1974)).

[3] One example is the establishment of state trading monopolies by government officials in which one has a stake either directly or through relatives (Murphy, Shleifer and Vishny (1991)).

the overall income of the economy. We show that persons with initial wealth above a certain threshold become rent seekers and the rest become producers, and examine the role of lotteries and bequests in determining initial wealth in society.

The mechanism whereby initial inequality in wealth influences individuals' choice of occupation is as follows: by virtue of being a rent seeker an individual can protect himself against expropriation from other rent seekers. This incentive is relatively stronger for the wealthy who have more to lose from expropriation than individuals with lower wealth. With imperfect credit markets and a lump-sum entry fee for rent seeking, only the wealthy will have enough capital to pay for this right. The payment of the lump-sum fee can be viewed as analogous to the purchase of weapons used both for protection and for offense. In this interpretation, arms enable agents to protect their wealth from appropriation by others but also to extract rents from other agents.[4] Hence, when property rights protection is poor or ineffective, wealthy agents have an incentive to buy arms (i.e., paying the entrance fee to rent seeking). The purchase of these arms, however, also enables them to prey on the wealth of other agents in the economy.

The general framework of the paper is a simple overlapping generation model with the absence of labor and credit markets. Agents in this model have identical preferences and abilities and differ only with respect to their initial wealth. We assume that agents can operate in one of two sectors in the economy: rent seeking and production. Entry into rent seeking, however, requires the payment of a lump-sum cost. Payment of this cost enables rent seekers to appropriate some portion of the surplus generated by productive economic activity, to save a desired portion of their initial wealth (through hoarding), and, thereby, protect their wealth from expropriation by others. Rent seeking and production are assumed to be mutually exclusive activities, with the return to hoarding being lower than the return to production. This assumption captures the idea that rent seeking can compete with productive sectors for scarce resources, thereby, resulting in a misallocation of resources in the economy.[5] We show that for certain range of parameter values there will be a unique interior equilibrium with rent seeking. In an extension we also examine the possibility of multiple equilibria – one with no rent seeking and the other with a positive level of rent seeking.

The paper also provides implications for the distribution of initial wealth in society. We show that identical agents faced with the indivisibility in rent seeking (the lump-sum fee)

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[4] This is in contrast to Grossman and Kim's (1997) analysis of the relationship between weapons used either for predation or for defensive fortifications. An important distinction between our paper and theirs is that, here, predation and the deterrence of predation are viewed as complementary activities.

[5] In addition to misallocation of labor, capital and talent in the economy, rent seeking activities, such as corruption and tax farming, can reduce the aggregate level of economic activity by distorting incentives and opportunities for production and investment.

choose to accept fair gambles because the ability of rent seekers to protect their wealth creates differences in earned income across agents. These differences in earned income between rent seeking and production introduce incentives for gambles or lotteries even among risk-averse agents, resulting in an *ex post* unequal distribution of wealth in the economy. In this respect, the model follows Ng (1965), Garratt and Marshall (1994), Freeman (1996), and Saddler (2000). These papers demonstrate that in the face of consumption or production indivisibilities, agents chose to voluntarily assume risk to overcome the nonconvexity whereas in our paper the motive for such behavior derives from the fixed cost that needs to be incurred for rent seeking.

An extension of the model to allow for altruistic dynastic bequests demonstrates how differences in bequests can replace lotteries in determining the initial wealth of agents in society. Thus, wealth and occupational differences are perpetuated in equilibrium from parent to child.

This paper is related to several strands of research. The idea that occupational choice and the resulting level of aggregate economic activity depends on initial conditions is also demonstrated by some recent papers (see for example, Galor and Zeira (1993), Banerjee and Newman (1993), and Aghion and Bolton (1994)). Most of these papers rely on the assumptions of imperfect credit markets and indivisible inputs to arrive at this result. This paper illustrates this imperfection with the special case of no credit markets at all. We model the nonconvexity as a lump-sum cost, as in Greenwood and Jovanovic (1990).

The link between the relative rewards to rent seeking and productive activities is examined by Baumol (1990), Murphy et al (1991), and Acemoglu (1995), Acemoglu and Verdier (1999), Mehlum et al (2000) and Baland and Francois (2000). Many of these papers focus on the allocation of talent between rent seeking and productive activities as a determinant of the relative returns to engaging in the two activities. The contribution of this paper is to provide a theoretical explanation of the relationship between individuals' occupational choice and the level of their initial wealth in society.

The paper proceeds as follows. Section II specifies the basic model and examines the properties of equilibrium. Section III shows how the distribution of initial wealth can be generated endogenously through lotteries and looks at civil service exams as an example. Section IV shows that bequests can replace lotteries in sustaining the equilibrium dispersion of the ex ante identical agents into self-perpetuating income classes. Section V considers extensions to the basic model, and Section VI concludes.

II. Model

A. Environment and Technology

Consider an economy comprised of a continuum of two-period lived agents distributed over the interval [0,1]. Agents are assumed to have identical preferences and abilities and differ only in their initial wealth. The preferences of each agent are described by the twice-continuously differentiable quasi-concave utility function $U(c_1, c_2)$, where c_1 and c_2 denote consumption of the economy's single good in each period of life. The arguments of the utility function are gross substitutes with $\lim_{c_i \to \infty}[u_i(c_1, c_2)] = \infty$, and u_i represents marginal utility in period i, $i = 1,2$.[6] Each agent is endowed with $w > 0$ units of the consumption good when young. The initial distribution of goods endowment in the economy is represented by the cumulative distribution function $\Gamma : R_{++} \to [0,1]$.

There are two sectors in the economy: production and rent seeking. Each agent operates in one of these two sectors in the second period of his life; in the first period agents are not occupationally active. Each producer has access to a standard concave production technology that yields $f(i)$ units of the consumption good in period two of his life to an investment of i units when young (period 1), where $f(0) = 0$ and $f'(0) = \infty$. Producers, however, face appropriation of some share of their market production by rent seekers. There is no law enforcement and no government taxation. Let $0 < \gamma < 1$ denote the exogenously given proportion of market production that can be extracted from each producer in the form of bribes, taxes, or outright expropriation.[7]

The description of the rent seeking sector is as follows:[8] Let the probability of being approached by a rent seeker be denoted by π^P. The second period expected return to a producer is then given by $(1 - \pi^P \gamma)f(i)$. Let n denote the mass (fraction) of rent seekers in the economy. Each rent seeker can expropriate a share γ of the production of $\lambda \geq 1$ producers in the economy, where λ can be regarded as the efficacy of rent seeking. However, each producer is only approached by a single rent seeker.[9] The probability π^P can then be defined

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[6] A sufficient condition for gross substitutability is a separable utility function and a coefficient of relative risk aversion less than one.

[7] Here γ can be regarded as a tax on the proceeds of market production, or, alternatively, the cost of engaging in production in a rent seeking society. In reality, this fraction may depend upon a range of factors including the rent seeking technology, the level of economic development, and law enforcement.

[8] The description of the rent seeking sector is similar to that in Mehlum, Moene and Torvik (2000). Their paper, however, does not examine the relationship between initial wealth and occupational choice between rent seeking and production.

[9] In the model, there is no coordination issue so a producer never gets approached by more than one rent seeker. One interpretation of this assumption is that each rent seeker implicitly provides protection against extortion by others as in Mehlum, Moene and Torvik (2000). In our model, each rent seeker can extract rent from more than one producer, but we abstract from the issue of protection.

as the ratio of the total number of rent seeking cases in the economy divided by the mass of producers, $(1-n)$. Assuming full information, π^P can be defined as

$$\pi^P = \min\{\frac{\lambda n}{(1-n)}, 1\} \tag{1}$$

Entry into rent seeking requires payment of a lump-sum fee of θ units of the consumption good when young. Payment of this cost allows rent seekers to tax market production in the second period of their lives. Agents are assumed to be unable to borrow to finance entry into rent seeking.

Rent seekers save through a simple technology that returns (x*s*) goods in period 2 of their lives to an input of *s* units when young. The inputs of rent seekers are assumed to be unobservable, which implies that rent seekers cannot coordinate their saving decisions. Unobservability of a rent seeker's inputs also implies that a rent seeker cannot expropriate the goods controlled by another rent seeker. Therefore, one may think of x as the return on hoarding which allows rent seekers protection from theft by others.[10] We assume that $x < (1-\pi^P\gamma)f'(i)\ \forall\ i$ and n. Thus, the marginal productivity of the production technology is higher than the return on hoarding.[11]

The probability π^R that a particular rent seeker is the first to approach a producer is defined by the ratio of the total mass of producers, $(1-n)$, divided by the total number of rent seeking cases in the economy, λn. This probability can be expressed as

$$\pi^R = \min\{\frac{(1-n)}{\lambda n}, 1\} \tag{2}$$

The ratio $(1-n)/\lambda n$ also captures the degree of crowding out in the economy. To see this, note that for $(1-n) > \lambda n$, as the fraction of producers in the economy exceeds the fraction of rent seeking cases, with probability 1 each rent seeker can expropriate from a producer ($\pi^R = 1$). When there are fewer rent seeking cases in the economy than there are producers, each rent seeker can capture the full potential rent given by the rent seeking technology from the λ producers he approaches. However, when $\lambda n > (1-n)$, crowding out occurs as each rent

[10] The hoarded amounts are not used for productive investments in the economy. They can be regarded as cash drawn out of circulation ("hidden under the mattress"), consumption of luxuries, or investments abroad.

[11] Note that the same results follow for x equal to $(1-\pi^P\gamma)f'(i)$ for any $\theta > 0$. If x is assumed to be greater than $(1-\pi^P\gamma)f'(i)$, this leads to the uninteresting case of rent seeking always being profitable for individuals.

seeker competes with others for rents and the expected rent to each rent seeker falls below the full potential rent given by the rent seeking technology. One can view this as rent seekers coming up against a capacity constraint – when the capacity of rent seekers to expropriate from producers exceeds the number of producers, the expected rent collected by each rent seeker shrinks.

Let $\tilde{n}$ denote the value of n for which the total fraction of rent seeking cases in the economy just equals the fraction of producers. The probability π^{P} that a producer is approached by a rent seeker can then be expressed as

$$\pi^{P} = \begin{cases} \lambda n/(1-n) & \text{for } 0 \leq n < \tilde{n} \\ 1 & \text{for } n \geq \tilde{n} \end{cases} \tag{3}$$

and the probability π^{R} that a rent seeker expropriates from a producer as

$$\pi^{R} = \begin{cases} 1 & \text{for } 0 \leq n \leq \tilde{n} \\ (1-n)/\lambda n & \text{for } n > \tilde{n} \end{cases} \tag{4}$$

Note that $\tilde{n} = \dfrac{1}{1+\lambda} \leq 1/2$ for $\lambda \geq 1$. The second period expected return from rent seeking can then be written as $\pi^{R} \lambda\gamma f(i) + \mathrm{x}s$.

B. Equilibrium

In this section we describe individual decision making. First, consider the optimization problem faced by an agent who chooses to become a rent seeker. The budget constraints faced by a rent seeker in each period of his life, are

$$\mathrm{w} - \theta - s = c_1 \tag{5}$$

$$\pi^{R}\lambda\gamma f(i) + \mathrm{x}s = c_2 \tag{6}$$

where s represent the savings of the rent seeker. The first order condition for utility maximization for a rent seeker is given by the Kuhn-Tucker condition

$$-u_1^{R} + \mathrm{x}u_2^{R} \leq 0 \text{ for } s \geq 0 \tag{7}$$

If the agent's initial endowment w is sufficient to provide the desired first period consumption in light of the intertemporal tradeoff, equation (7) is always satisfied with equality and the agent hoards a positive amount. Suppose this is the case. Define as $V^{R}(\mathrm{w})$ the maximum utility attained by an agent if he chooses to engage in rent seeking (given an initial endowment, w). When instead the agent chooses to become a producer, he solves

$$\begin{aligned} V^{P}(w) &= \max_{c1,\,c2} U(c_1, c_2) \\ s.t. \quad & w - i = c_1 \\ & (1-\pi^{P}\gamma) f(i) = c_2 \end{aligned} \tag{8}$$

where $V^P(w)$ denotes the maximum utility attained by a producer taking w as given. The first order condition for utility maximization for a producer is

$$-u_1^{P} + (1-\pi^{P}\gamma) f'(i) u_2^{P} = 0 \tag{9}$$

The above equation holds with equality as a producer must invest when young to consume in the second period of his life.

An equilibrium in this environment is given by an allocation of the population between rent seeking and production and values of *s* and *i* such that each agent maximizes his lifetime utility taking as given w, x, θ, λ and γ. To study the allocation of agents between rent seeking and production, we examine the relationship between $V^R(w)$ and $V^P(w)$ as a function of *n*.

We first examine the possibility of corner equilibria. We can show that there does not exist an equilibrium in which all agents engage in rent seeking. To see this, note that, for a given w, with $n = 1$ rent seekers and no production, $\pi^R = 0$ as rent seekers crowd each other out, while $\pi^P = 1$. As a result, the rent accruing to each rent seeker is zero. Because the return to hoarding is less than the return to production, for any given $\theta > 0$, the maximum utility attained by a producer, $V^P(w)$, exceeds the maximum utility attained by a rent seeker, $V^R(w)$.

Consider now an equilibrium in which there is no rent seeking. For such an equilibrium, it is necessary that the maximum utility from production, $V^P(w)$, is greater than or equal to the utility from being the only rent seeker, $V^R(w)$. At $n = 0$, equation (4) suggests that $\pi^R = 1$ and the first rent seeker to approach producers can capture $\lambda\gamma f(i)$ in rents, while $\pi^P = 0$. From equations (5), (6) and (8) it can be seen that a necessary condition for such an equilibrium is that the cost of entering into rent seeking, θ, is high relative to the expected return from rent seeking (determined by $\lambda\gamma$). The following example illustrates conditions under which an equilibrium with no rent seeking can arise.

Example: Assume a CRRA utility function $U(c_1, c_2) = \frac{c_1^{1-\delta}}{1-\delta} + \frac{c_2^{1-\delta}}{1-\delta}$, with $\delta = ½$, $f(i) = Ai$, and $A > 0$.[12] Given these specifications and the assumption that $x < (1-\pi^P\gamma) f'(i)$, the condition that $V^P(w)$ is greater than or equal to $V^R(w)$ at $n = 0$ becomes

[12] Note that the production function is not twice continuously differentiable, but this example is the simplest one to work with.

$$w \leq \frac{\theta}{\frac{A}{2x}\left[\lambda\gamma - \frac{x(2(1-x)+A)}{(1+x)A}\right]} \tag{10}$$

Note that for x < A, a sufficiently high θ or sufficiently low λ and γ make this equilibrium more likely. Intuitively, when costs to entering into rent seeking are high or the rent seeking technology inefficient, production will likely be relatively more attractive compared to rent seeking.

In what follows we assume that λ and γ are sufficiently high and/or θ > 0 is sufficiently low such that for a given w, at $n = 0$, $V^R(w) > V^P(w)$. In other words, at $n = 0$ the return to rent seeking exceeds the return to production. This ensures that an equilibrium in which there are only producers does not exist.[13] The derivatives of $V^R(w)$ and $V^P(w)$ with respect to n, the proportion of rent seekers in the economy, are given by[14]

$$\frac{\partial V^P}{\partial n} = \begin{cases} \frac{2\lambda\gamma f(i)(n-1/2)}{(1-n)^2} u_2^{\,P} < 0 & \text{for } 0 < n < \tilde{n} \\ 0 & \text{for } n > \tilde{n} \end{cases} \tag{11}$$

$$\frac{\partial V^R}{\partial n} = \begin{cases} 0 & \text{for } 0 < n < \tilde{n} \\ -\frac{\gamma f(i)}{n^2} u_2^{\,R} < 0 & \text{for } n > \tilde{n} \end{cases} \tag{12}$$

with $\frac{\partial^2 V^P}{\partial n^2} > 0$ for $0 < n < \tilde{n}$ and $\frac{\partial^2 V^R}{\partial n^2} > 0$ for $n > \tilde{n}$. Hence, V^P (w) is downward sloping in n for $0 < n < \tilde{n}$ and horizontal for for $n \geq \tilde{n}$. Similarly, V^R (w) is horizontal in n for $0 < n \leq \tilde{n}$ and downward sloping in n for $n > \tilde{n}$.

The intuition behind the shape of the curves is as follows. As the fraction of producers in the economy decreases and the fraction of rent seekers increases, production declines but rents accruing to each rent seeker depends upon whether or not crowding out sets in. As long as the fraction of producers in the economy exceeds the number of rent seeking cases (that is, $n \leq \tilde{n}$), there is no crowding out among rent seekers but producers

[13] The burden of the fixed cost to rent seeking relative to the return from rent seeking is likely to be low when the number of rent seekers in the economy is small and therefore productive investment is also high. We relax this assumption in Section IV in order to show the possibility of multiple equilibria in this environment.

[14] Note that the derivatives of V^P and V^R with respect to n are discontinuous at $n = \tilde{n}$.

face expropriation of their production with increasing probability $(\lambda n/(1-n))$, thereby, decreasing the second period return to production. As a result, in this range $V^R(w)$ is horizontal, while $V^P(w)$ is declining in n. At the point where $n = \tilde{n}$, the maximum utility from production $V^P(w)$ levels out as the probability of being approached by a rent seeker becomes one, while the probability that a rent seeker can expropriate from producers start to decline as rent seekers begin to crowd each other out.

We can now describe the interior equilibrium in this environment shown in Figure 1. Note that $\tilde{n}$ can never be a stable equilibrium. While $V^R(w)$ can equal $V^P(w)$ at $\tilde{n}$ as is the case when the V^P curve is tangential to the V^R curve (at $\tilde{n}$), such an equilibrium is unstable as a small change in n from its equilibrium value drives the economy to the corner solution with no rent seekers.

Given that $V^P(w) > V^R(w)$ at $n = 1$ and the assumption that $V^R(w) > V^P(w)$ at $n = 0$ the difference $V^R(w) - V^P(w)$ is maximized when $n = \tilde{n}$. This in addition to the continuity of the utility functions yield Proposition 1.

Proposition 1: In equilibrium there is a positive measure of agents engaging in rent seeking and of agents engaging in production.

Hence, a unique equilibrium occurs when $V^R(w)$ and $V^P(w)$ intersect at $n^* > \tilde{n}$.[15]

C. Properties of Equilibrium

In this section we examine the relationship between agents' wealth and their choice between rent seeking and production. In the presence of the lump sum cost θ in the rent seeking sector and in the absence of credit markets, it can be shown that only relatively wealthy agents will choose to engage in rent seeking. The following lemma states that the second period (earned) income of a rent seeker is higher than the earned income of a producer.

Lemma 1: Each agent enjoys a greater earned income if he engages in rent seeking than if he engages in production.

Proof: Given the assumption that producing has a higher marginal product than hoarding ($x < (1-\pi^P\gamma) f'(i)$), if an agent with a given endowment w chooses to become a rent seeker, it must be the case that $c_2^R > c_2^P$, which implies that $u_2^R < u_2^P$. Q.E.D.

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[15] Note that for λ sufficiently greater than 1, $\tilde{n}$ and, therefore, n^* would realistically be lower than ½, i.e., the majority of agents in the economy will be producers.

Lemma 2 states for a given w, at the point where agents are indifferent between rent seeking and production, the consumption of a rent seeker when young is lower than the consumption (period 1) of a producer. This result occurs due to the presence of the lump sum cost required to enter into rent seeking.

Lemma 2: For a given endowment, w, if an agent is just indifferent between rent seeking and production, it must be true that $u_1^R > u_1^P$.

Proof: At the point where agents are just indifferent between rent seeking and production, $V^R(w) = V^P(w)$, for any given endowment w. It follows from Lemma 1 that the earned income of a rent seeker is higher than the earned income of a producer, for any given w. Therefore, $u_2^R < u_2^P$ and $\theta > 0$ implies that $u_1^R > u_1^P$. Q.E.D.

Let $\Omega(w)$ denote the difference between the utility of an agent with endowment w if he chooses to engage in rent seeking and his utility if he chooses to become a producer.

$$\Omega(\mathrm{w}) \equiv U(\mathrm{w}-\theta-s^*, \pi^R\lambda\gamma f(i^*)+\mathrm{x}s^*) - U(\mathrm{w}-i^*, (1-\pi^P\gamma f(i^*)) \qquad (13)$$

where s^* denotes the value of saving that satisfies with equality the first order condition for a rent seeker (equation (7)) and i^* represents the value of a producer's investment that satisfies his first order condition (equation (9)). Therefore, $\Omega(w)$ represents the difference between the maximum utility obtained from rent seeking, $V^R(w)$, and the maximum utility obtained from production, $V^P(w)$.

The derivative of $\Omega(w)$ with respect to w is given by

$$\Omega'(\mathrm{w}) = u_1^R - u_1^P \qquad (14)$$

where u_1^R and u_1^P represent the marginal utility from engaging in rent seeking and in production, respectively. From Lemma 2 we know that at the point where agents are indifferent between the two occupations, the marginal utility of consumption when young is higher for a rent seeker than for a producer, so that $u_1^R > u_1^P$ and $\Omega'(\mathrm{w}) > 0$. Because in equilibrium some agents follow each career path (from Proposition 1), there must exist some borderline endowment $\bar{\mathrm{w}}$ defined by $\Omega(\bar{\mathrm{w}}) = 0$, such that agents are indifferent between rent seeking and production. The above analysis indicates that $\Omega(.)$ has a positive slope at $\mathrm{w} = \bar{\mathrm{w}}$; that is, when rent seeking and production offer nearly the same utility, the relative attraction of rent seeking to production increases with an increase in initial wealth. Therefore, Lemma 2 along with the continuity of the utility functions ensures that $V^R(w)$ and $V^P(w)$ have a single crossing.

We can now characterize the allocation of agents between rent seeking and production. There exists a unique level of endowment such that for $\mathrm{w} \geq \bar{\mathrm{w}}$, agents will choose to engage in rent seeking, and for all $w < \bar{w}$, they will choose production. This result is summarized in Proposition 2.

Proposition 2: In equilibrium, the greater the initial income of an agent, the more attractive is a career in rent seeking relative to producing.

Proposition 2 states that the rich become rent seekers. Rent seeking is limited to agents with relatively high initial income due to the presence of the lump sum cost required to enter this sector. Note that it is not the higher wealth itself that creates incentives for wealthy agents to enter into rent seeking but the ability to protect their wealth from expropriation by others. Payment of the fixed cost enables rent seekers not only to extract some portion of the proceeds from market production but also ensures protection of their wealth. The rich, by virtue of their higher initial income, therefore, have a greater incentive to engage in rent seeking.

Thus, despite the fact that agents are *ex ante* identical in terms of preferences and abilities, two classes of agents emerge in equilibrium. It is the initial income (w) of an agent that determines his (or her) decisions whether to engage in rent seeking or production, and how much to consume and save. Hence, the initial distribution of endowments determines aggregate output in the economy and the measure of agents engaged in rent seeking.

$$\int_{\bar{w}}^{\infty} d\Gamma(w) = n \tag{15}$$

and in production

$$\int_{0}^{\bar{w}} d\Gamma(w) = (1 - n) \tag{16}$$

Given that hoarding has a lower marginal product than production, the greater the proportion of rent seekers in the economy, the smaller is aggregate output. Hence, the total level of output in the economy is negatively related to the size of the rent seeking sector.

III. LOTTERIES

The analysis in Section II assumed that the distribution of initial income was exogenous. This section relaxes that assumption and shows how income inequality can be generated endogenously.[16] It demonstrates that differences in the expected marginal utility of income between rent seeking and production creates incentives for agents to take fair gambles. Specifically, we show that the lump sum fee introduces a nonconvexity in rent seeking. Since only rent seekers can protect their wealth, this leads to differences in earned

[16] See Freeman (1996) and Garratt and Marshall (1993).

income between the two occupations. As a result, identical agents have an incentive to accept gambles or lotteries as a way of dispersing their initial wealth or income. This dispersion of income leads agents to randomly sort themselves between rent seeking and production so that income inequality is generated endogenously.

One example of a lottery could be entry into the civil service. A number of government positions provide discretionary power with potential for receiving bribes. As is the case in many developing countries, these positions could be allocated to civil servants through the results of a civil service entrance examination. The scores on the exam and hence the subsequent distribution of government positions could to some extent be random and unrelated to the specific skills needed for the work of the civil servant.[17] Another related example is that for an entry level civil servant it would be very difficult to project his or her future career path, and the chance of getting a position with potential for receiving bribes could appear largely random. In that sense the decision of the new civil servant is similar to entering into a lottery. The outcome of the lottery leads to inequality in wealth with only the winners being in a position to pay the entrance fee θ to further rent seeking.

In what follows, we demonstrate that even when all agents have the same initial wealth w, the inequality in the distribution of income will emerge as an equilibrium phenomenon. To see this suppose that all agents have the same initial wealth. In equilibrium, therefore, all agents must have the same utility, that is $V^R(w) = V^P(w)$. Proposition 1, however, implies that although agents are indifferent between rent seeking and production, in equilibrium some agents will choose to engage in rent seeking and others in production. This, in turn, implies that the second period income of a rent seeker will be greater than the second period income of a producer (from Lemma 1). Therefore, the unequal distribution of earned income in society is an equilibrium phenomenon. This leads to Proposition 3.

Proposition 3: There exists endogenous income inequality even if all agents have the same initial wealth.

In the presence of the lump sum cost (θ) of entering into rent seeking and in the absence of capital markets, we can show that there is an incentive for agents to enter into actuarially fair gambles whereby those who receive the good outcome, pay a fee and enter the rent seeking sector, and those who receive the bad outcome, invest and engage in production. To see this, suppose that prior to making his saving decision (when young), an agent is offered a gamble that pays ε units of the consumption good with probability ϕ and

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[17] If the scores on the civil service exam actually indicate talent in rent seeking, the incentives for entering into the public sector contingent on performance in the civil service exams is even greater. See Section V for a discussion of differences in ability among individuals.

$\frac{-\varepsilon}{1-\phi}\phi$ with probability $(1 - \phi)$. From Proposition 2 we know that a career in rent seeking is more attractive the greater the initial income of an agent. An agent will, therefore, enter the rent seeking sector if he wins the gamble and engage in production if he loses. Let $W(\varepsilon,\phi)$ denote the expected utility of an agent if he takes the gamble

$$\begin{aligned} W(\varepsilon,\phi) = {} & \phi U[\mathrm{w} + \varepsilon - \theta - s^*, \mathrm{x}s^* + \pi^{R}\lambda\gamma f(i^*)] \\ & +(1-\phi)U[\mathrm{w} - \frac{\varepsilon\phi}{1-\phi} - i^*, (1-\pi^{P}\gamma) f(i^*)] \end{aligned} \tag{17}$$

where s^* and i^* satisfy the equilibrium first order conditions (equations (7) and (9)) for rent seekers and producers, respectively, for given values of ε and ϕ. The above equation states that with probability ϕ an agent receives the good outcome and enters the rent seeking sector; and with probability $(1-\phi)$ an agent receives the bad outcome and engages in production. Differentiating the above expression with respect to ε and applying the envelope theorem gives

$$\frac{\partial W(\varepsilon,\phi)}{\partial \varepsilon} = \phi[u_1^{R} - u_1^{P}] \tag{18}$$

From Lemma 2 we know that $u_1^{R} > u_1^{P}$, implying that $\frac{\partial W(\varepsilon,\phi)}{\partial \varepsilon}$ is positive. Therefore, for $\varepsilon > 0$, agents will accept fair gambles that increase their expected utility. Proposition 4 follows.

Proposition 4: Agents will gamble until $u_1^{R} = u_1^{P}$, if given an opportunity to take fair gambles.

Proposition 4 suggests that agents will have no further incentives for gambles when the marginal utility of first period consumption from rent seeking equals the marginal utility of first period consumption from production.[18]

An equilibrium lottery should also choose odds (ϕ) that maximize expected utility (equation (17)) for a single agent. Differentiating expected utility with respect to ϕ and applying the envelope theorem yields

$$\frac{\partial W(\varepsilon,\phi)}{\partial \phi} = \mathrm{V}^{R} - \mathrm{V}^{P} - \varepsilon u_1^{P} \frac{1}{(1-\phi)} \tag{19}$$

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[18] This implies that the first period consumption for a rent seeker and a producer will be the same.

The presence of the lump sum fee in rent seeking introduces an nonconvexity in consumption possibilities; identical agents faced with this nonconvexity choose occupations that offer different marginal utilities. These differences in the marginal utility of consumption introduce incentives for agents to take gambles despite agents being *ex ante* identical. An important property of this model is that it generates risk-taking behavior even among risk-averse agents.

This analysis shows that in equilibrium, rent seekers not only enjoy higher second period incomes than producers (if $s > 0$), but, by winning the lottery, also benefit from greater initial wealth. In Section II, we discussed how rent seeking enables wealthy agents to protect their own wealth while allowing them to extract rents from other agents in the economy. A rent seeker who does not save (engage in hoarding) enjoys higher consumption when young but has a lower second period income than the case in which he allocates a positive amount of his initial wealth to saving. In the absence of credit markets, a higher initial income is of greater value to rent seekers than to producers because it allows them to devote a positive amount of their endowment to hoarding while allowing them to finance a higher consumption when young. Agents, therefore, have an incentive to accept gambles that allow them to protect their wealth (through hoarding) if they win at the risk of engaging in production and exposing their wealth to other rent seekers if they lose.

IV. Bequests and Income Classes

In this section we show that in addition to lotteries, the initial wealth distribution for subsequent generations may represent bequests received when young from an agent's parents. The important question then is which sort of parent will leave bequests to induce their children to choose a career in rent seeking versus production? We therefore examine equilibrium behavior in the face of a bequest motive on the part of parents.

As in Barro (1974), we assume that parents value the utility of their children, such that an individual born at time t has the utility function:

$$V_t = U_1(c_{1,t}) + U_2(c_{2,t+1}) + \beta V_{t+1} \tag{20}$$

where $0 < \beta < 1$. The budget constraints for producers can be written as:

$$w_t - i_t = c_{1,t} \tag{21}$$

$$(1-\pi^P\gamma)f(i_t) = c_{2,t+1} + w_{t+1} \tag{22}$$

and, for rent seekers as:

$$w_t - \theta - s_t = c_{1,t} \tag{23}$$

$$\pi^{R}\lambda\gamma f(i_t) + xs_t = c_{2,t+1} + w_{t+1} \tag{24}$$

where w_{t+1} is the parents' bequest to their children. Assume that bequests are nonnegative (parents cannot extract goods from their children) and there are no lotteries. For both agents, the first order maximization condition with respect to the choice of bequest, w_{t+1}, is given by

$$-u_{2,t} + \beta u_{1,t+1} = 0 \tag{25}$$

with the other conditions remaining the same as in Section 2. The above equation holds with equality as an agent can only finance his consumption when young through a bequest from his parents.[19] This leads to Lemma 3:

Lemma 3: Agents will leave larger bequests if they are rent seekers than producers.

Proof: In the absence of bequests (i.e., $w_{t+1} = 0$), we know from Lemma 1 that $u_2^{R} < u_2^{P}$. From equation (25), this implies that for any given value of $u_{1,t+1}$ a rent seeker having a lower marginal utility of consumption when old will choose to leave a larger bequest than a producer. Q.E.D.

Proposition 5: In a stationary equilibrium where both agents leave bequests, rent seekers will only engage in hoarding if the amount expropriated from producers is sufficiently low.

Proof: In a stationary equilibrium with positive bequests, equation (25) implies that $u_1 / u_2 = 1/\beta$.[20] Since both rent seekers and producers must leave positive bequests to finance their children's' consumption when young, the assumption that $x < (1-\pi^{P}\gamma) f'(i)$ implies that either (i) $u_1 / u_2 = (1-\pi^{P}\gamma) f'(i) = 1/\beta$ and $x < 1/\beta$ or (ii) $u_1 / u_2 = (1-\pi^{P}\gamma) f'(i) > 1/\beta$ and $x = 1/\beta$. From lemma 3 we know that agents will leave larger bequests if they are rent seekers than producers. Therefore in the steady state, (i) suggests that for $\theta > 0$, the rent expropriated from producers $((1-n)/n)\gamma f(i)$) is sufficient to provide all desired consumption when old and to leave larger bequests than producers. As a result, the rent seeker does not need to engage in hoarding ($s = 0$). However, if the rent expropriated from producers is low, due to a low proportion extracted γ relative to the degree of crowding out among rent seekers, (ii) implies that a rent seeker must hoard to consume when old and leave a bequest. Q.E.D.

[19] We can think of lotteries as a mechanism for generating differences in initial wealth in period $t = 0$.

[20] Notice that saving from youth to old age requires that $u_1 / u_2 = (1-\pi^{P}\gamma) f'(i)$ for a producer and $u_1 / u_2 = x$ for a rent seeker.

As noted earlier, given the lump sum cost θ, a rent seeker who does not save (engage in hoarding) enjoys higher consumption when young but has a lower second period income than the case in which he allocates a positive amount of his initial wealth to saving. As a result, in an equilibrium with more pervasive rent seeking or a sufficiently low γ, which imply lower rents, a rent seeker will choose to save when young. However, if the rent expropriated from producers is sufficiently high, by choosing not to engage in hoarding, he will enjoy a higher consumption when young.

We also know from Lemma 3 that those receiving a larger bequest are more likely to be rent seekers. Since the children of rent seekers are the ones to receive larger bequests, they will, therefore, become rent seekers themselves as they will be able to meet the lump sum cost required to enter into rent seeking. Similarly, the children of producers will choose to be producers themselves as the bequests they receive may not be sufficient to meet the lump sum cost to rent seeking. Therefore, the children of rent seekers will become rent seekers and the children of producers will become producers.

As in the case of lotteries, a higher initial income through bequests enables rent seekers to devote a positive amount of their endowment to hoarding, while allowing them to finance a higher consumption when young. Since those who receive a bequest in equilibrium are also the ones most willing to give a bequest, we can have a class structure of income and occupational choice between rent seeking and production that, in equilibrium, is self-generating and self-perpetuating.

V. Extensions

A. Multiple Equilibria

In the previous sections we abstracted from multiple equilibria in order to focus on the relationship between agents' initial wealth and their choice between rent seeking and production. To illustrate the possibility of multiple equilibria in rent seeking and production, we modify the assumption that $V^R(w) > V^P(w)$ at $n = 0$. Such a situation may arise if , for example, the amount expropriated from producers γ is low or if the cost to enter into rent seeking, θ, is sufficiently high (see Example in Section II.B). If $V^P(w) > V^R(w)$ at $n = 0$, such that production is relatively more attractive than being the only predator, and $V^R(w) > V^P(w)$ for some $0 < n < 1$, $V^P(w)$ and $V^R(w)$ can intersect twice (Figure 2). If $V^P(w) > V^R(w)\ \forall\ 0 \leq n \leq 1$, the two curves will not intersect at all (Figure 3).

Consider first the case where they intersect twice as in Figure 2. As discussed in Section II.A, the return to production is decreasing in the number of rent seekers in the economy for $n < \tilde{n}$. However, an increase in production may also increase the expected return to rent seeking since rents increase, and for $n > \tilde{n}$ the crowding out among rent seekers becomes less severe. Hence, a decline in rent seekers stimulates production and increases returns to both activities, giving rise to multiple equilibria in rent seeking and production.[21] One corresponds to an equilibrium with positive levels of rent seeking as discussed in Section II.B. A second is an equilibrium with no rent seeking. There is a third equilibrium with a positive level of rent seeking and production where $V^P(w) = V^R(w)$. Such an equilibrium is unstable as a small change in n from its equilibrium value drives the economy to one of the two stable equilibria of positive or no rent seeking.

The multiplicity of equilibria suggests that two economies with identical technologies of production and rent seeking may arrive at entirely different outcomes. If an economy starts out with few rent seekers ($n < \underline{n}$ in Figure 2), as the relative return to production exceeds that to rent seeking, all agents choose to become producers. If $n > \underline{n}$, rent seeking is more attractive than production, and the economy ends up in an equilibrium with a positive level of rent seeking and smaller aggregate output.

Note that it is possible that $V^P(w) > V^R(w)\ \forall\ 0 \leq n \leq 1$ as in Figure 3. In this case the only stable equilibrium is the one with no rent seeking. Such a situation may arise if, for example, the fixed cost to entering into rent seeking, θ, is sufficiently high for any given w or the fraction γ expropriated from producers is sufficiently low.

B. Endogenous θ

The equilibrium allocations between production and rent seeking in our analysis so far relied on the assumption of a fixed cost θ of entering into rent seeking. However, the model could easily be extended to endogenize θ. In all cases considered below, it is assumed that there is a maximum potential number of rent seeking cases (R^*) which is ultimately a function of the existing set of rules and regulations and the degree of discretionary power of public officials. R^* is assumed to be at least as large as the maximum number of rent seeking cases in the economy given the rent seeking technology and the fraction of rent seekers (i.e., $R^* \geq n^* \lambda$).

Consider a two stage game in which a self-interested higher authority in the first stage decides on the size of the rent seeking sector, n. In the second stage there is free competitive bidding for the rent seeking positions, such that all successful bidders pay the same price and agents choose their profession. Assume that there is no taxation in the economy. The central authority then acts as a revenue maximizing Stackelberg leader, choosing the optimum n to maximize its revenues, $n\theta(n)$.[22] Given that the central authority takes into account the

[21] Our model then delivers qualitative outcomes comparable to Murphy et al. (1993), Mehlum, Moene and Torvik (2000) and Baland and Francois (2000).

[22] In the absence of effective monitoring and weak law enforcement, the central authority would essentially be extracting some of the rents that accrue to rent seekers. If, for instance, the specific source of bureaucratic inefficiency in the economy is corruption by tax

(continued…)

responsiveness of θ to n, the equilibrium size of the rent seeking sector will be equal to or greater than $\tilde{n}$.

Suppose instead, in the absence of a strong centralized authority a (relatively large) number of decentralized government units effectively have power to charge agents an entrance fee into rent seeking, each one in its own area, and the number of potential entrants into rent seeking R^* is the same as in the previous case. Each unit can grant one agent the right to engage in rent seeking and it acts independently of the other units. Hence, it does not take into account the effect on the entrance fee θ of increasing the number of rent seekers. Intuitively, the number of rent seekers will be larger, and the equilibrium entrance fee and the threshold initial wealth level ($\overline{w}$) lower than in the previous case. In other words, the revenue maximizing central authority will choose a smaller, more exclusive and wealthier club of rent seekers.

This feature of a small group of wealthy elite engaging in rent seeking is observed in a number of developing countries as well as in medieval Europe. Examples of uncoordinated solicitation of bribes and other forms of rent seeking by a large number of government units are seen in many African countries.[23] The large number of units with this power reflects their own low entrance costs into rent seeking. As noted by Shleifer and Vishny (1993), the resulting effect can be an even heavier burden on private producers of rent seeking, and this is even more detrimental to private investment and economic growth.

In the above discussion, it is implicitly assumed that the free competitive bidding in the second stage raises the entrance fee θ to the level where the marginal bidder's excess utility from rent seeking relative to production is reduced to zero. Hence, if all agents had the same initial wealth (say the same $\overline{w}$) there would be no rent seekers. This would be the case regardless of the higher authority's decision in stage 1 about the size of the rent seeking sector. Only individuals with initial wealth higher than $\overline{w}$ would have positive excess utility from rent seeking relative to production at that level of θ. In other words, an important implication of our model is that there must be initial inequality in wealth for rent seeking to take place.

C. Differences in Ability

The model can easily be extended to assume differences in abilities across individuals leading to differing returns in each sector. The link between rent seeking and misallocation of resources in the economy is then reinforced by the finding that the most able persons become rent seekers. In addition, it can be shown that incentives for gambles remain as long as

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collectors, then tax farming may be a preferred regime from the point of view of tax revenues raised.

[23] See O. H. Fjeldstad (1999).

differences in ability cause inequality in the marginal utility of first period consumption across the two activities. In this case, the winners of the lottery (i.e., the most able ones that score highest on the civil service entrance exam) become wealthy rent seekers in the civil service while the losers become producers.[24]

Differences in ability can be incorporated in a number of ways in our model. Suppose that more able individuals have lower costs of entering into rent seeking (lower θ). Assume that an individual's ability a is drawn from a continuous density function $q(a)$, where agents with high a have a comparative advantage for rent seeking relative to production. In this case, it can be shown that the return to rent seeking becomes more attractive for individuals above some average ability a^* and less attractive for those below average ability.[25]

Suppose there exists productivity differences among individuals in both rent seeking and production such that persons with higher ability have higher productivity in both rent seeking and in production than less able individuals. We can formalize this by considering an amended production function, $af(i)$, and rent seeking function, $a\lambda\gamma f(i)$ as in Murphy, Shleifer and Vishny (1991). Both rent seeking and production show increasing net returns to ability. This reflects the existence of a cost element in both sectors that is fixed with regard to variations in the level of ability (the entrance fee θ and the investment I, respectively) whereas revenue in rent seeking and output in production both vary with ability. If the elasticity of the net return to ability is higher in rent seeking than in production, rent seeking will be relatively more attractive to the highly able individuals.

We see that the most able individuals will be attracted to rent seeking, resulting in a misallocation of talent. Aggregate economic activity is decreased because the number of individuals and the amount of capital invested in production is lower; and, for a given number of persons engaged in production, the average ability—and hence productivity—is lower since the most able are engaged in rent seeking.

VI. Conclusion

This paper provides a theoretical explanation for the relationship between the distribution of initial wealth and the occupational choice of production or rent seeking. We show that in the absence of credit markets, only wealthy agents can overcome the nonconvexity in consumption possibilities. The wealthy are, therefore, 'born into rent

[24] Further, if one assumes that the link between parents' abilities and their children's is stronger than a purely random distribution, there will be an endogenous formation of a rent seeking class over generations since these families will on average possess more of the two key factors for entry into rent seeking—wealth and ability.

[25] This is similar to Acemoglu and Verdier (1998) but they assume that the decreasing cost of human capital investment applies to production.

seeking'. We analyze a model in which rent seeking enables agents not only to extract some portion of the proceeds from market production but also ensures protection of their wealth from appropriation by others. Therefore, wealthy agents avoid the tax from rent seekers by becoming rent seekers themselves, a result that accords well with both historical evidence and casual observation from developing countries today.

The results of the model are robust to alternative specifications of the rent seeking technology. Allowing rent seekers to expropriate a proportion of producers' output simplifies our analysis, but does not affect any of the major results.[26] The model also assumes a specific form for the function that relates the amount of rent obtained by each rent seeker from expropriation to the proportion of rent seekers in the economy. This assumption implies that the amount expropriated by each rent seeker is decreasing in n because of increased competition among rent seekers. This extreme form of crowding-out, however, is not crucial for the results of this model.

In the model agents are assumed to be unable to finance their entry into rent seeking through borrowing. Credit markets in many developing countries are typically characterized by high collateral requirements. An agent seeking to obtain a loan to finance the entrance fee into rent seeking would need to have substantial capital to meet the collateral requirements. This suggests even with perfect capital markets, it is the relatively wealthy who will be able to obtain such loans.

The model also abstracts from law enforcement as the rent seekers' probability of being caught and punished is implicitly set equal to zero. Clearly, effective law enforcement would reduce the attractiveness of engaging in rent seeking. Law enforcement can easily be captured in the model by making γ a decreasing function of the economy-wide resources devoted to enforcement. If, for instance, such enforcement is financed through a lump sum tax on producers, the larger the size of the rent seeking sector, the larger would be the tax required to finance a given level of enforcement. As a result, even with positive law enforcement, the implied tradeoff for producers between lower expropriation and higher taxes suggests that rent seeking will not be eliminated in equilibrium.

Our results require two crucial assumptions, namely that there are indivisibilities in rent seeking and that rent seekers have access to a "protection" technology. These assumptions together ensure that the distribution of initial wealth determines the choice between rent seeking and production. The assumption that rent seekers can protect their wealth is important because it creates differences in the earned incomes across career paths. This introduces incentives for gambles even among risk-averse agents and allows initial income inequality to emerge endogenously in equilibrium. Alternatively, if agents have an

[26] For instance, even if rent seekers extract a fixed fee instead of expropriating a proportion of market production, the model's implications concerning the relationship between initial income and occupational choice are unchanged.

altruistic bequest motive, differences in bequests can replace lotteries in determining the distribution of initial wealth in society and can explain the perpetuation of rent seeking in society.

The model presented is essentially static in nature in that it describes the short-run equilibrium effect of income distribution on occupational choice, output and investment. An important extension would be to consider the dynamics of the relationship between income distribution and rent seeking as an economy develops. Such an extension would allow us to examine the relationship between income distribution, occupational structure and economic growth.

Figure 1: Unique Equilibrium with Rent Seeking

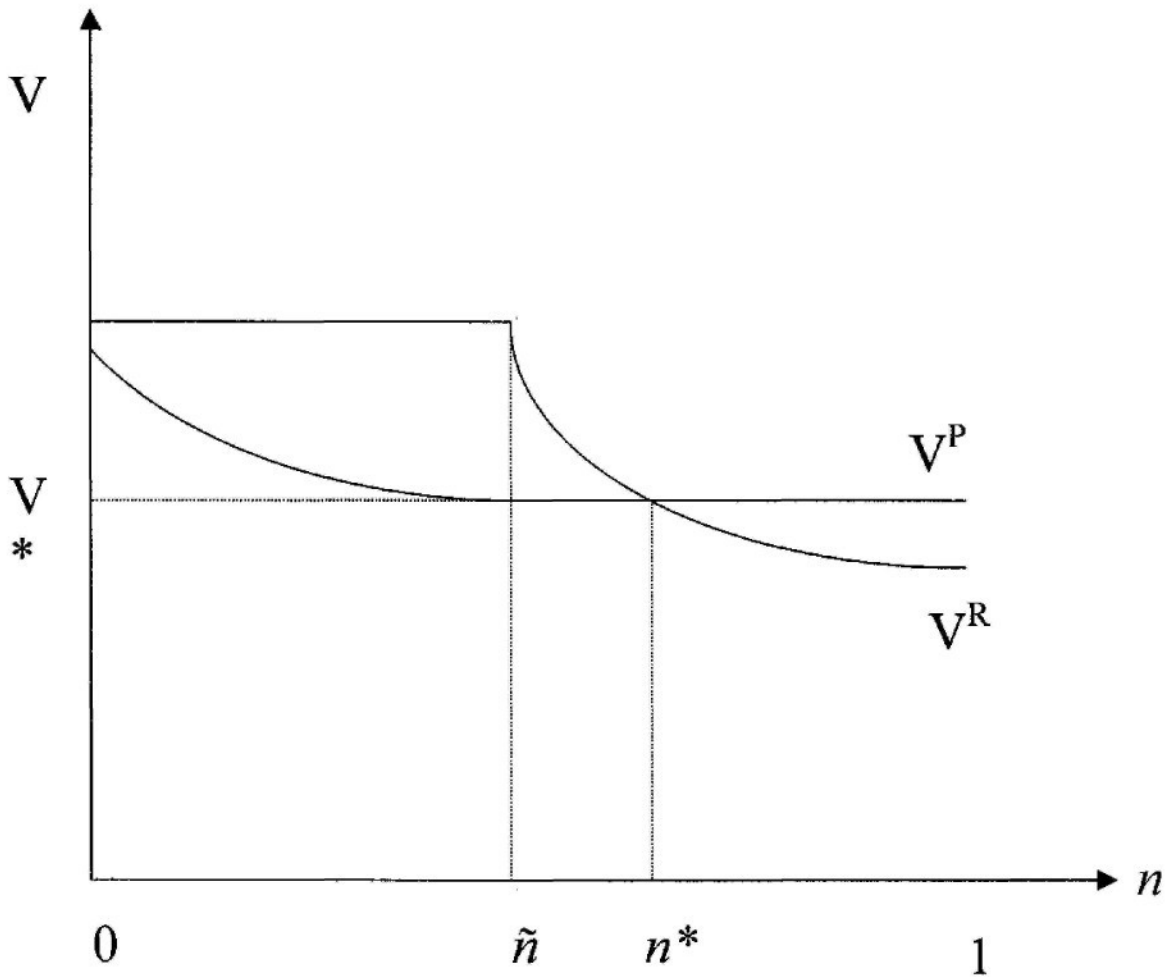


Figure 2: Multiple Equilibria

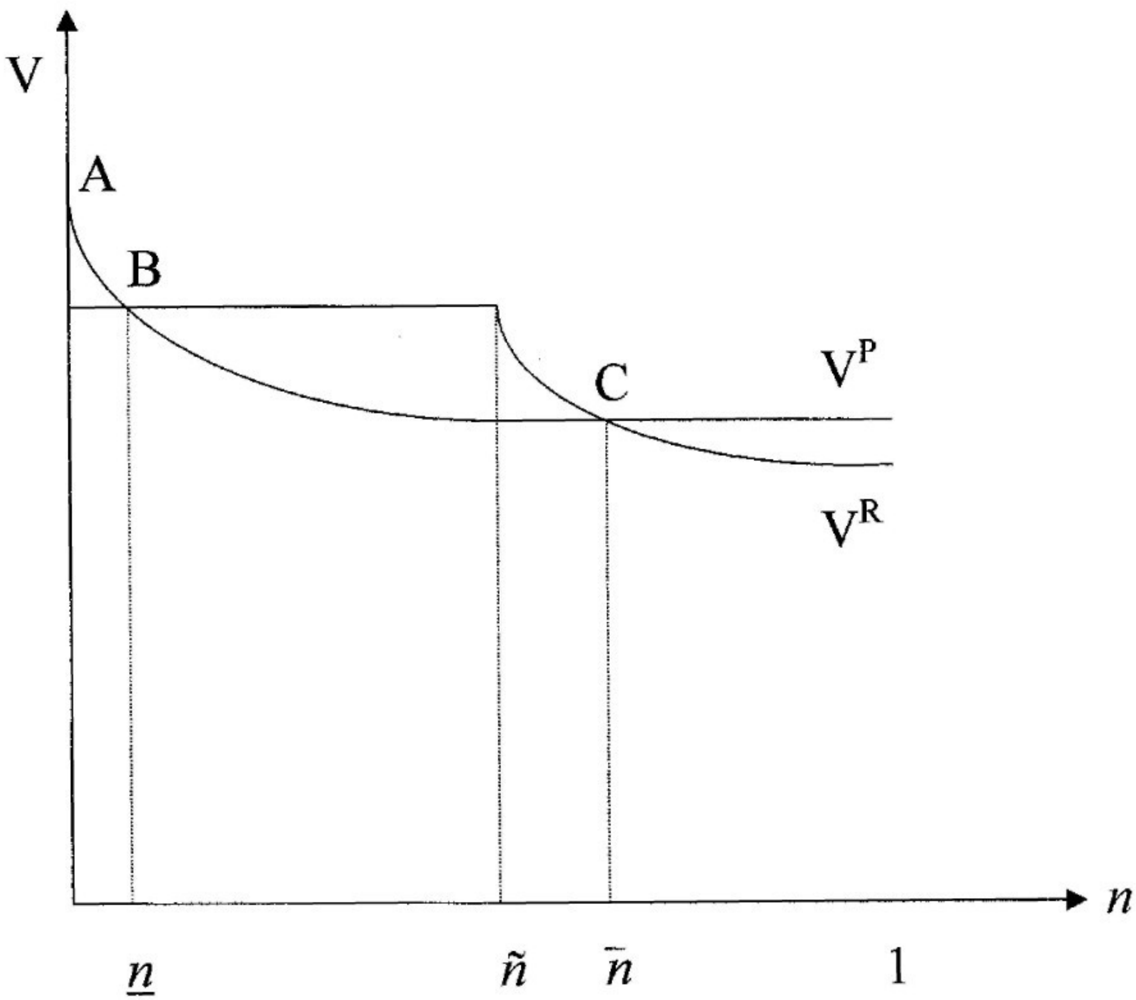
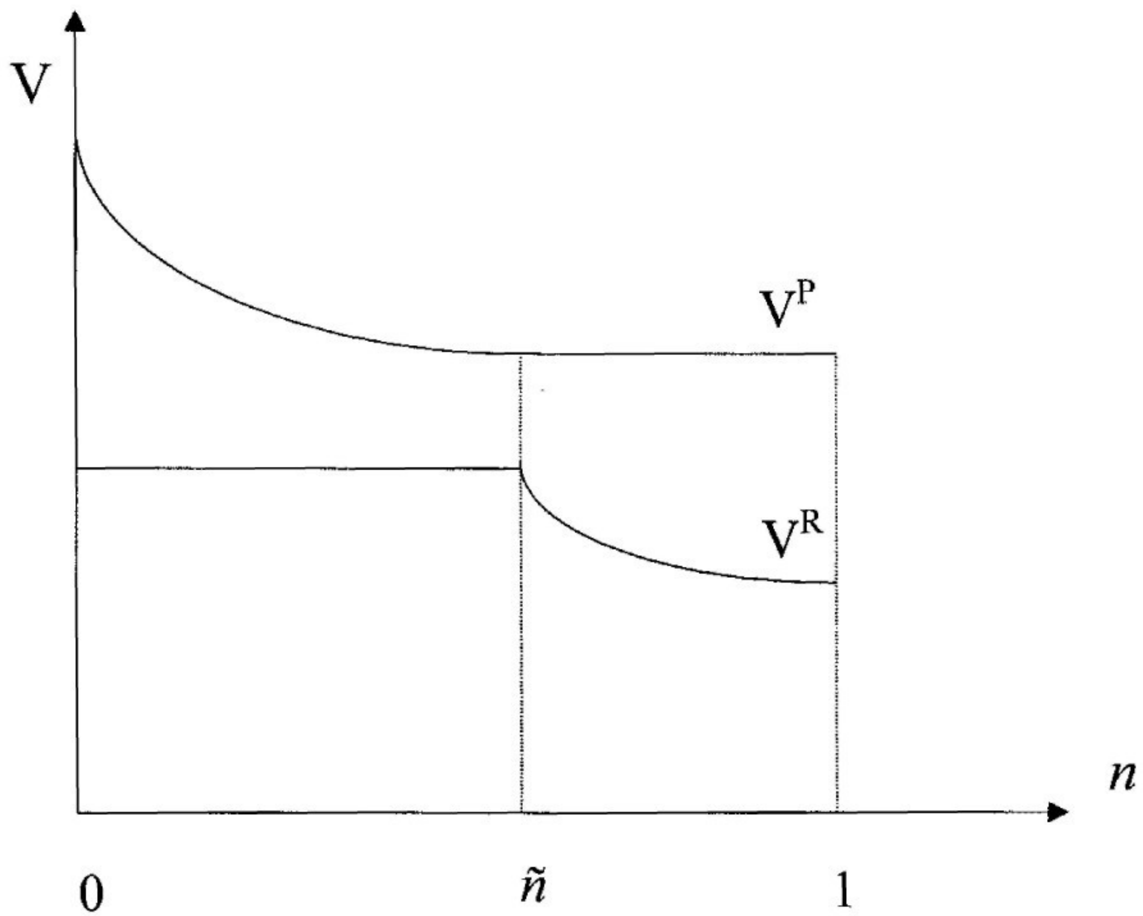


Figure 3: Unique Equilibrium without Rent Seeking



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