

## **A Theory of Complementarity Between Rent Seeking and Production**

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### **ABSTRACT**

This paper uses a formal model to analyze the effects of rent seeking contest on production when the contestants are both rent seekers and producers and production output is an input of rent seeking effort. Great economies of scale in rent seeking and an even distribution of rent seeking capability among the contestants generate intense rent seeking rivalry, strong concern for relative productive and rent seeking capability and, larger production. In the extreme when rent seeking contest is very tense, the relative size of production input to rent seeking input grows and the contestants paradoxically behave and look more like producers rather than rent seekers. As applications, the paper studies how rent seeking contest affects the productive and rent seeking behavior of members of society, corporate workers, firms, political parties and states.

Key Words: Rent Seeking, Production, Economies of Scale, Complementarity, Contest  
JEL CODES: D23, D74, H11, H56, N40, O11, O30

### **1. INTRODUCTION**

In current economic literature, rent seeking is understood to be the opposite of production: unlike production, it brings benefits to the undertakers without creating new wealth for society. Production and rent seeking undertaking are considered to be substitutes: resources expended on one activity are not available for the other.<sup>1</sup> Increase rent seeking reduces the resources available for production as well as lowers the incentive to undertake productive activities.<sup>2</sup>

Like production, rent seeking requires inputs, and these inputs could be the outputs of production activities. When rent seeking requires production output as one of its input, then it generates derived demand for production. Under such circumstances, the relationship between production and rent seeking needs not be purely that of substitutes.

This paper proposes a theory of complementarity between rent seeking and production. It uses a formal model to analyze the relationship between rent seeking contest and production when the contestants are simultaneously producers and rent seekers and output from production is input of

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1 Grossman and Kim (1995).

2 Buchanan et al. (1980).

rent seeking. Rent seeking contest refers to a situation where there are at least two contestants to resources and they must invest in rent seeking effort to settle the contest. In other words, rent seeking contest is a lack of property rights regime.<sup>3</sup>

The model follows the formulation of Hirshleifer (1988, 1989, 1991, 1995) that the ratio of rent seeking capability between the contestants decides the probability of victory between them or their respective share of the prize captured. This is named the ratio form of contest success function. The prize could be anything valuable, including cash, mineral deposit, elected office, land, population and monopoly rent of a market. By the ratio form of contest success function, the contestant with a larger rent seeking capability secures a larger share of the contested prize and, in the extreme the larger rent seeker takes all.

The model reveals that production and rent seeking interact in many intricate and interesting ways. They are not simply substitutes. A greater stake at rent seeking contest induces the contestants to put in both greater rent seeking and production efforts. Production and rent seeking efforts, the share of rent seeking expenditures in production and the concern for relative production and rent seeking efficiency are all at their maximum when the rent seeking contestants are equal in their rent seeking capability and therefore have equal chances of winning the contest. Besides, when the rent seeking contestants are closely matched, greater economies of scale in rent seeking contest lead to higher level of production, rent seeking expenditures and concern for relative production and rent seeking efficiency. Last but not least, when the contestants are closely matched and there is decreasing returns to scale in production, if there are very large economies of scale in rent seeking contest, then further increases in economies of scale in rent seeking contest cause the relative size of rent seeking expenditures to production input to decline.

Section 2 presents the model. Section 3 gives the comparative static analysis. Section 4 applies the insights generated to study the relationship between rent seeking contest and productive effort of individuals, firms, political parties and states. Section 5 concludes the paper.

## **2. THE MODEL.**

There are two contestants. In period zero, nature decides the respective endowment and rent seeking and production efficiency of the contestants, the utility functions of the contestants, the rent seeking contest technology and the production technology. In period one, the contestants allocate the endowment between direct consumption and input into production. Then the contestants allocate the output of production between consumption and rent seeking capability. In period two, the rent seeking capability of the contestants decide their probability of winning the

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<sup>3</sup> Tullock (1971, 1972, 1974, 1980), Bush (1974), Hirshleifer (1988, 1989, 1991, 1995), Grossman and Kim (1995), Grossman (2001, 2002) and Alesina and Spolaore (2005).

rent seeking contest between them.

The utility functions of contestant 1 and contestant 2 are separable and composed of three parts:

$$U_1 = VP + \beta \ln C_1 + \gamma \ln L_1 \quad (1)$$

$$U_2 = V(1-P) + \beta \ln C_2 + \gamma \ln L_2 \quad (2)$$

$\gamma \ln L_i$  is the direct consumption component of the utility function. It is derived from consuming the endowed resources directly and  $L_i$  is the level of the endowed resources directly consumed. One interpretation of  $L_i$  is leisure.  $L_i$  could also be lands and natural resources used for consumption purposes rather than for production.  $\beta \ln C_i$  is the indirect consumption component of the utility function for consuming the production of the economy and  $C_i$  is the amount of production consumed.  $V$  is the stake of the rent seeking contest.  $P$  is the probability of victory by contestant 1 in the rent seeking contest between contestant 1 and 2.

The probability of victory by contestant 1 in a rent seeking contest between contestant 1 and 2 is

$$P = \frac{(q_1 F_1)^m}{(q_1 F_1)^m + (q_2 F_2)^m} \quad (3)$$

This is the Tullock-Hirshleifer ratio form of conflict technology function or contest success function or power function.  $P$  is the probability that contestant 1 will emerge triumphant in a rent seeking contest with contestant 2. Alternatively,  $P$  means the share of the prize of the contest that contestant 1 will capture in a rent seeking contest with contestant 2.  $F_1$  is the level of rent seeking expenditures of contestant 1 and  $F_2$  is the level of rent seeking expenditures of contestant 2.  $q_1$  is the efficiency of contestant 1 in turning rent seeking expenditures into rent seeking capability and  $q_2$  is the efficiency of contestant 2 in turning rent seeking expenditures into effective rent seeking capability. Therefore,  $q_1 F_1$  is the rent seeking capability of contestant 1 and  $q_2 F_2$  is the rent seeking capability of contestant 2.  $m$  is the mass factor.  $m$  measures the returns to scale in rent seeking contest. A larger mass factor enhances the relative advantage of the bigger contestant. If a larger rent seeking contestant can more easily overwhelm a smaller rent seeking contestant, then  $m$  is larger.

The budget constraints facing contestant 1 and 2 are:

$$L_i + I_i = E_i \quad (4)$$

$$C_i + F_i = Y_i(I_i) \tag{5}$$

$I_1$  is the level of production inputs of contestant 1.  $Y_1(I_1)$  is the production of contestant 1.

Production function is:

$$Y_i(I_i) = A_i I_i^h \tag{6}$$

$h$  is scale factor.  $A_1$  is the production efficiency of contestant 1 and  $A_2$  is the production efficiency of contestant 2. We assume  $0 < m, h, V, \beta, \gamma, q_1, q_2, A_1, A_2 < \infty$ .

Substituting the constraints into the objective functions we have:

$$\max_{F_1, I_1} U_1 = V \frac{(q_1 F_1)^m}{(q_1 F_1)^m + (q_2 F_2)^m} + \beta \ln(A_1 I_1^h - F_1) + \gamma \ln(E_1 - I_1) \tag{7}$$

The first order conditions are:

$$\frac{\partial U_1}{\partial F_1} = VmP(1-P)F_1^{-1} - \frac{\beta}{A_1 I_1^h - F_1} = 0 \tag{8}$$

$$\frac{\partial U_1}{\partial I_1} = \frac{A_1 \beta h I_1^{h-1}}{A_1 I_1^h - F_1} - \frac{\gamma}{E_1 - I_1} = 0 \tag{9}$$

Similarly contestant 2 solves

$$\max_{F_2, I_2} U_2 = V \frac{(q_2 F_2)^m}{(q_1 F_1)^m + (q_2 F_2)^m} + \beta \ln(A_2 I_2^h - F_2) + \gamma \ln(E_2 - I_2) \tag{10}$$

The first order conditions are:

$$\frac{\partial U_2}{\partial F_2} = VmP(1-P)F_2^{-1} - \frac{\beta}{A_2 I_2^h - F_2} = 0 \tag{11}$$

$$\frac{\partial U_2}{\partial I_2} = \frac{A_2 \beta h I_2^{h-1}}{A_2 I_2^h - F_2} - \frac{\gamma}{E_2 - I_2} = 0 \tag{12}$$

Using the first order conditions, we have

$$\frac{F_1}{F_2} = \frac{Y_1}{Y_2} = \frac{A_1}{A_2} \left( \frac{I_1}{I_2} \right)^h = \frac{A_1}{A_2} \left( \frac{E_1}{E_2} \right)^h \tag{13}$$

$$R \equiv \left( \frac{q_1 A_1}{q_2 A_2} \right) \left( \frac{E_1}{E_2} \right)^h \tag{14}$$

$R$  is the ratio of rent seeking capability between the two contestants. The probability of victory by contestant 1 in a rent seeking contest with contestant 2 is therefore

$$P = \frac{R^m}{R^m + 1} = \frac{\left( \frac{q_1 A_1}{q_2 A_2} \right)^m \left( \frac{E_1}{E_2} \right)^{mh}}{\left( \frac{q_1 A_1}{q_2 A_2} \right)^m \left( \frac{E_1}{E_2} \right)^{mh} + 1} \tag{15}$$

### 3. COMPARATIVE STATICS.

Without loss of generality we focus our analysis on contestant 1. From previous results, we have

$$I_1 = \left[ \frac{h\beta(R^m + 1)^2 + hVmR^m}{(\gamma + h\beta)(R^m + 1)^2 + hVmR^m} \right] E_1 \tag{16}$$

$$F_1 = A_1 E_1^h \left[ \frac{VmR^m}{\beta(R^m + 1)^2 + VmR^m} \right] \left[ \frac{h\beta(R^m + 1)^2 + hVmR^m}{(\gamma + h\beta)(R^m + 1)^2 + hVmR^m} \right]^h \tag{17}$$

*Proposition 1:*

*Contestants care about relative production size and rent seeking capability and differences in growth rates of production and rent seeking efficiency and size of controlled resources.*

Proof:

Using the Envelope theorem, the first order conditions, and  $\frac{\partial R}{\partial q_2} = -Rq_2^{-1}$ ,  $\frac{\partial R}{\partial A_2} = -RA_2^{-1}$ ,  $\frac{\partial R}{\partial E_2} = -RE_2^{-1}$ ,  $\frac{\partial R}{\partial q_1} = -Rq_1^{-1}$ , and that in equilibrium,  $P = \frac{R^m}{R^m + 1}$ , we have

$$dU_1 = V \frac{\partial P}{\partial R} \frac{F_1}{Y_1} \frac{I_1}{E_1} \left[ \left( \frac{dq_1}{q_1} - \frac{dq_2}{q_2} \right) + \left( \frac{Y_1}{F_1} \frac{dA_1}{A_1} - \frac{dA_2}{A_2} \right) + h \left( \frac{Y_1}{F_1} \frac{E_1}{I_1} \frac{dE_1}{E_1} - \frac{dE_2}{E_2} \right) \right] \quad (18)$$

Q. E. D.

*Proposition 2:*

*An increase in the prize of rent seeking contest raises both production and rent seeking effort.*

Proof:

$$\frac{\partial(I_1/E_1)}{\partial V} = \frac{(\gamma h m R^m)(R^m + 1)^2}{((\gamma + h\beta)(R^m + 1)^2 + hVmR^m)^2} > 0 \quad (19)$$

$$\frac{\partial(F_1/Y_1)}{\partial V} = \frac{\beta m R^m (R^m + 1)^2}{(\beta(R^m + 1)^2 + VmR^m)^2} > 0 \quad (20)$$

Q. E. D.

This result is different from the current conventional view on rent seeking where it is held that an increase in the stake of rent seeking contest raises rent seeking effort but lowers production effort.<sup>4</sup>

*Proposition 3:*

*The size of production, the size of rent seeking expenditures, the share of rent seeking expenditures in production and the concern for relative production and rent seeking efficiency are at their maximum when the rivals are equal in rent seeking capability.*

Proof:

$$\frac{\partial(I_1/E_1)}{\partial R} = \frac{hm^2 \gamma V R^{m-1} (1 - R^{2m})}{((\gamma + h\beta)(R^m + 1)^2 + hVmR^m)^2} \quad (21)$$

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<sup>4</sup> Grossman and Kim (1995).

$$\frac{\partial (F_1/Y_1)}{\partial R} = \frac{Vm^2 \beta R^{m-1} (1-R^{2m})}{\left(\beta (R^m + 1)^2 + VmR^m\right)^2} \quad (22)$$

$$\frac{\partial F_1}{\partial R} = Y_1 \frac{\partial (F_1/Y_1)}{\partial R} + \left(\frac{F_1}{Y_1}\right) \frac{\partial Y_1}{\partial R} \quad (23)$$

Note that  $\frac{\partial Y_1}{\partial R} = A_1 E_1^h \left(\frac{I_1}{E_1}\right)^{h-1} \frac{\partial (I_1/\partial E_1)}{\partial R}$ .

From equation 18 and note that

$$\frac{\partial (Y_1/F_1)}{\partial R} = -\left(\frac{F_1}{Y_1}\right)^{-2} \frac{\partial (F_1/Y_1)}{\partial R} \quad (24)$$

and

$$\frac{\partial ((Y_1 E_1)/(F_1 I_1))}{\partial R} = -\left(\frac{F_1 I_1}{Y_1 E_1}\right)^{-2} \left[ \frac{I_1}{E_1} \frac{\partial (F_1/Y_1)}{\partial R} + \frac{F_1}{Y_1} \frac{\partial (I_1/E_1)}{\partial R} \right] \quad (25)$$

The above are positive for  $R < 1$ , zero for  $R = 1$ , and negative for  $R > 1$ .

Q. E. D.

Only among equals are there real contests. If the difference in capability is too great, then there will not be any real contest and anarchy itself might give way to hierarchy.<sup>5</sup> The more closely matched the two rivals are, the greater the concern for relative production and rent seeking strength. When rivals are equally matched, the incentive to outdo each other is at its greatest. For instance, the concept of balance of power invariably entered the mind of statesmen in the ancient Greek city state system, the medieval Italian city state system and the modern European state system.<sup>6</sup>

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<sup>5</sup> Hirshleifer (1995).

<sup>6</sup> The Peloponnesian War (B.C. 431 to B.C. 404) was caused by the wary that Greek city states had about the ascendancy of Athenian power. Refer to Thucydides, Blanco and Roberts (1998). Refer to Grieco (1988a, 1988b, 1990), Gowa (1989, 1994), Baldwin (1993), and Gowa and Mansfield (1993) for discussions on the concerns of states for relative capability.

*Proposition 4:*

*An increase in the mass factor results in a higher (lower) level of production, a larger (smaller) rent seeking expenditures, and greater (smaller) concern for relative production and rent seeking efficiency when rivals are about equal (greatly unequal) in rent seeking capability.*

Proof:

$$\frac{\partial(I_1/E_1)}{\partial m} = \frac{(\gamma VhR^m) \left[ (R^m + 1)^2 + m(1 - R^{2m}) \ln R \right]}{\left( (\gamma + h\beta)(R^m + 1)^2 + hVmR^m \right)^2} \tag{26}$$

$$\frac{\partial(F_1/Y_1)}{\partial m} = \frac{(V\beta R^m) \left[ (R^m + 1)^2 + m(1 - R^{2m}) \ln R \right]}{\left( \beta(R^m + 1)^2 + VmR^m \right)^2} \tag{27}$$

$$\frac{\partial F_1}{\partial m} = Y_1 \frac{\partial(F_1/Y_1)}{\partial m} + \left( \frac{F_1}{Y_1} \right) \frac{\partial Y_1}{\partial m} \tag{28}$$

From equation 18 and note that

$$\frac{\partial(Y_1/F_1)}{\partial m} = - \left( \frac{F_1}{Y_1} \right)^{-2} \frac{\partial(F_1/Y_1)}{\partial m} \tag{29}$$

and

$$\frac{\partial((Y_1 E_1)/(F_1 I_1))}{\partial m} = - \left( \frac{F_1 I_1}{Y_1 E_1} \right)^{-2} \left[ \frac{I_1}{E_1} \frac{\partial(F_1/Y_1)}{\partial m} + \frac{F_1}{Y_1} \frac{\partial(I_1/E_1)}{\partial m} \right] \tag{30}$$

The above are negative for  $R$  close to zero or very large and positive for  $R$  close to one.

Q. E. D.

An increase in the economies of scale in contest has two effects on the marginal effect of relative rent seeking capability on probability of victory. One is the scaling effect and the other is the unbalancing effect.



$$\frac{\partial^2 P}{\partial R \partial m} = \frac{R^{m-1}}{(R^m + 1)^2} + \frac{mR^{m-1}(1 - R^m)}{(R^m + 1)^3} \ln R \tag{31}$$

In equation 29, the first term on the right-hand side is the scaling effect and the second term is the unbalancing effect. By the scaling effect, given an increase in mass factor both contestants try to increase their rent seeking efforts as size confers greater advantage. By the unbalancing effect, the bigger contestant becomes more powerful and the weaker contestant weaker given the greater economies of scale in contest. The unbalancing effect makes both contestants put in less effort in rent seeking. The greater the asymmetry in capability, the greater the unbalancing effect. The unbalancing effect is zero if the two rivals have equal capability. Therefore, if there is a rough balance (great disparity) in the relative capability of the contestants, then an increase in economies of scale in contest increases (reduces) the concern for relative capability since the scaling effect dominates (is dominated by) the unbalancing effect. That is, the total effect is negative for  $R$  close to zero or very large and positive for  $R$  close to one.

*Proposition 5:*

*When the two rivals are about equal in rent seeking capability and there are decreasing returns to scale in production, if the mass factor is sufficiently large then an increase in the mass factor causes the relative size of rent seeking expenditures to production input to decline.*

Proof:

$$\begin{aligned} \frac{\partial (F_1/I_1)}{\partial m} &= AE^{h-1} \left[ \frac{h\beta(R^m + 1)^2 + hVmR^m}{(\gamma + h\beta)(R^m + 1)^2 + hVmR^m} \right]^{h-1} \left[ \frac{VR^m}{(\beta(R^m + 1)^2 + VmR^m)^2} \right] \\ &\times \left[ \beta + (h-1) \frac{mh^2\gamma VR^m}{(\gamma + h\beta)(R^m + 1)^2 + hVmR^m} \right] \left[ (R^m + 1)^2 + m(1 - R^{2m}) \ln R \right] \end{aligned} \tag{32}$$

For  $R$  close to one,  $\left[ (R^m + 1)^2 + m(1 - R^{2m}) \ln R \right] > 0$  and an increase in  $m$  results in a larger

$\frac{mh^2\gamma VR^m}{(\gamma + h\beta)(R^m + 1)^2 + hVmR^m}$ . Given that  $(h-1) < 0$ , if  $m$  is large enough such

that  $\left[ \beta + \frac{m(h-1)h^2\gamma VR^m}{(\gamma + h\beta)(R^m + 1)^2 + hVmR^m} \right] < 0$ , then  $\frac{\partial (F_1/I_1)}{\partial m} < 0$ .

Q. E. D.

The output of production is an essential input in rent seeking effort. In very intense rent seeking contests, a very high level of production is required to support the extremely high level rent seeking effort. If there are decreasing returns to scale in production, then the increase in productive effort would be greater than the increase in rent seeking effort. Consequently, contestants in very intensely competed rent seeking activities paradoxically look and behave more like producers rather than rent seekers.

#### 4. APPLICATIONS

We now apply the insights generated by the model to study the relationship between rent seeking and productive effort of individuals, firms, political parties and states.

##### 1. Social status and production

In economic literature, the main stream understanding is that people care about their absolute income. However, individuals rarely exist in isolation and their social relationship and status naturally have great bearing on their happiness. Unsurprisingly, research shows that people also care about their social standing and therefore their relative income and relative consumption.<sup>7</sup> In the language of our model, social standing is the prize of the rent seeking contest individuals engaged in and absolute income is the input of rent seeking efforts of the individuals. Cultural and institutional factors decide how effectively and decisively relative income is related into relative social status. When relative income is very important in deciding social status, as in a very materialistic society, the model predicts that contests for social status generate greater production effort.<sup>8</sup> Furthermore, factors which determine social status through non materialistic criteria such as politics and traditional cultural values lower production effort as they lower the economies of scale in rent seeking contests for social status.

##### 2. Tournaments and performance

The effects of rent seeking contests on production efforts have long been noticed by the corporate world. The modern corporate, with its hierarchy and huge and complex structure faces gigantic problems of how to motivate employee to perform. As productive effort at works typically brings workers no direct satisfaction, workers have little incentive to perform unless closely supervised (which involves huge costs) or given right incentives. Consequently, firms design incentive schemes with large components of relative performance criteria as basis for rewards and promotion and tournaments, or rent seeking contests, are widely used to encourage better performance at work. Although the competition for tournament itself is a rent seeking contest and

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7 Frank (1999) and Alpizar et al. (2005).

8 Coelho (1985) and Neumark and Postlewaite(1998).

produces no new wealth for the firm, but if all or part of the criteria for deciding victor include productive activities performed, then, as illustrated in the model, such tournaments could induce greater production efforts.<sup>9</sup>

### 3. X-Efficiency

Traditionally there are two opposing views on the relationship between monopoly and innovation. On the one hand, Schumpeter (1950) argues that there is a positive relationship between monopoly rent and innovation: Monopoly is more innovative because it could capture the whole quasi rent created by innovation, besides having superior access to capital, the ability to pool risk and economies of scale in the maintenance of R&D facilities. On the other hand, there is the classical view that monopoly firms lack incentive to promote innovations and invest in expensive R&D projects for lack of competition.<sup>10</sup> This paper agrees with the classical view. Intense rent seeking contests for larger market share and market power could induce greater productive effort including innovations. Although the fight for larger market share and power is rent seeking, part of the inputs might be output of productive efforts, such as innovations. Consequently, firms that compete intensively for market share and quasi monopoly rent have strongest incentive to innovate.

### 4. Electoral contests

Elections are well known rent seeking contests. Electoral competition tends to be very costly (as in the American presidential elections) and generates no new wealth for society. So will societies be better off to do away with elections? The model suggests otherwise. The reason is that electoral competition among political parties predisposes the government to provide better and more public goods and services, another example of rent seeking contests inducing greater production efforts. This is especially if the major parties are about equally powerful, such as in the American bipartisan system.<sup>11</sup> Parties need more than just propaganda to win elections. Parties also need output of productive efforts as input of electoral endeavors, for the electorates will be more motivated to vote for a party if it could deliver tangible benefits, especially public goods and services, either directly by itself or indirectly through the government when it holds office. Consequently, parties endeavor to provide more and better public goods and services to the electorate to ensure their support.

### 5. International political military competition and economic performance of states.

The argument that international political military competition leads to better economic performance of states is a recurrent theme in economic history and economic development.<sup>12</sup>

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9 Bognanno (2001) and DeVaro (2006).

10 Dewey (1959) and Scherer (1984).

11 Stokes (1999) and Edwards et al. (2009).

12 Smith (1776, Vol. 2, 253), Gibbon (1787, Vol. VI, Chapter 38: 328), Weber (1923, p. 249), Wesson (1967,

One of the names for this argument is the Hume-Kant hypothesis. The Hume-Kant hypothesis argues that political military competition between states and political authorities, such as that existed within the early modern European competitive state system leads to innovations and superior economic growth and produced the European miracle. It is another example of rent seeking contests inducing greater productive efforts. Early modern Europe of course was not the only instance where intense rent seeking contests at the international arena induced the states to exert gigantic productive efforts and generated spectacular cultural and economic achievements. Other well known instances include Greece, Ganges India and China during the classical era, China and the Islamic world during the medieval era and, Italy during the late medieval era.<sup>13</sup>

The story of the European miracle started with the gunpowder military revolution which increased the economies of scale in warfare and brought forth lasting continental size empires in China, India, Middle East, Persia and Japan. This process began around A.D. 1200 and gathered momentum especially around A.D. 1400. A similarity between these gunpowder empires was that they controlled an extensive territory or sphere of influence and had practically nothing to fear. They were complacent, lethargic states or revenue pumps.<sup>14</sup> They offered very few overhead services necessary for the proper functioning of the economy and society. Their governments were too small to be able to penetrate and mobilize the society for state purposes as well as simply too inefficient and corrupted. They were in general isolationist and anti commerce or did not put much emphasis on commerce or economic development. Consequently, the developmental momentum of the medieval era on these diverse lands died out. In fact, before the arrival of the Europeans, these gunpowder empires were entering into some kind of a synchronized decline. Asian trade was in general shrinking.<sup>15</sup>

Of the major civilizations, only the geographically fragmented Europe escaped the fate of the gunpowder empires. The gunpowder military revolution caused petty feudal estates and principalities to be consolidated into national states which continuously engaged each other in large scale warfare or other forms of interstate rivalry. The perpetual and intense interstate power struggles produced positive effects on the development of Europe, economic, political, social and cultural. Military technological changes since late medieval era that raised the scale of warfare in Europe led to greater revenue demand on the state and pushed the state to provide more public intermediate inputs and better institutions including property rights regime.<sup>16</sup> The absolutist states formulated forward-looking policies. Statesmen and scholars produced mercantilism for guiding public policy. Private individuals published exhortations to purposeful development. The English measured themselves by their successful Dutch cousins. France in turn was driven by her

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1978), Jones (1974, 1981, 1988, 1990), Baechler (1975), Kennedy (1987), North (1995, 1998), Weiss and Hobson (1995), Bernholz, Streit and Vaubel eds. (1998) and Bernholz and Vaubel eds. (2004).

13 Bernholz, Streit and Vaubel eds. (1998) and Bernholz and Vaubel eds. (2004).

14 Jones (1981, 1988).

15 Simkin (1968, p. 258-9) and Jones (1981, p. 170).

16 North (1995, p. 13-17; 1998, p. 16-19),

rivalry with England to promote manufacturing. The rivalry with Prussia led Austria to reform her laws and public administration. Russia under Peter the Great forcefully westernized and modernized to join the rank of the great powers. The interstate rivalry caused the European states to outdo each other in almost all fields of human endeavors: overseas explorations, manufacturing, scientific enquiries, technological innovations as well as improvements in laws, public administrations and the overall institutions of the state. In their effort to outdo each other, the European states produced the great cultural, economic, political and social achievements that we called industrialization and modernization.

The two key features of a modern society, the modern service state and the civilian control of the military were the results of this intense interstate rivalry. To support the massive military establishments ushered in by the gunpowder military revolution, states in Europe greatly expanded their services to the economy to boost productivity and raise revenue. In the language of the model, intense rent seeking contests induces greater productive efforts since output of production is used as input for rent seeking. This resulted in the well-known Wagner's law in public finance of a rise share of public sector in the economy as per capita income increases.<sup>17</sup> In fact, the expansion of the service state stimulated by the increasing scale in warfare went so far in Europe that it led to the civilianization paradox of war making and state making observed by Tilly (1992): the greater scale of warfare actually resulted in a smaller share of the military in the public sector in terms of both budget size and number of personnel and the civilian control of the military. This is exactly what proposition 5 says, given very intense rent seeking contests, greater economies of scale in rent seeking causes the relative size of rent seeking expenditures to productive input to decline and the contestants look more like producers than rent seekers.

## **5. CONCLUSIONS.**

The model demonstrates the complementarity between rent seeking and production when the contestants are both producers and rent seekers, production output is an input of rent seeking effort and there is intense rent seeking contest. The insights help to better our understanding of the intricate relationship between rent seeking and production at various levels, including the individual, firm, party and state levels. Therefore there should be more research along this line.

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<sup>17</sup> Bird (1971).

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