

# Rent Seeking, Market Structure and Growth\*

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## Abstract

We construct a model where firms compete in both political and economic markets. In political markets, firms compete for influence over government transfer policy (rents). This activity can be beneficial for the firm, but is purely wasteful from the point of view of society because resources are utilized to achieve a redistribution of income. In the economic market, firms compete for market share through cost reducing technological innovation. Market structure plays an important role in this economy because competition drives firms to invest more in innovation resulting in higher growth. Rent-seeking affects economic growth in two important ways. It diverts resources away from innovation and it affects the number of firms that are supported in equilibrium. The former has a negative effect on growth while the latter effect is ambiguous, depending on whether rent seeking induces entry or exit. This market structure effect depends on a combination of political and economic factors that the theory highlights.

*Keywords:* Rent Seeking, Market Structure, R&D Investment, Growth, Welfare

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## 1 Introduction

In the pursuit of profits, firms seek to gain any advantage over competitors. One way to accomplish this is to invest in research and development (R&D) that may result in the discovery of new products or improved production technologies. It is this innovative activity that drives economic growth. Furthermore, the firm, by pursuing its own interests, serves society at large by introducing new and improved products or providing existing products at lower cost. But there are other, less productive ways in which firms can seek an advantage over competitors. What Baumol (1990) describes as

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“unproductive entrepreneurship” can take many forms including lobbying, tax evasion, litigation, or theft and can achieve a variety of goals which are generally profitable for the firm, but wasteful from the point of view of society. This type of activity, which we will refer to as rent seeking, will have important effects on the structure of the market, the rate of innovation and, consequently, on the rate of growth of the economy.

The literature on rent seeking and economic performance has focused on two main channels through which unproductive activity can have long run consequences. The private advantage a firm can obtain from innovation is significantly greater when the innovating firm has monopoly power over the new product or improved technology. Rent seeking activity can then be devoted to ensuring that property rights over the innovation are protected and their value not diminished by newer technologies. For example, Parente and Prescott (1994) argue that, when monopoly rights are very strong, firms do not need to innovate in order to maintain market share. Firms may find it more profitable to devote resources to the protection of existing monopolies than to R&D. Overall effort in innovation falls as a result of rent seeking.

A second way of ensuring monopoly rights is to prevent the adoption of new technologies. Schumpeter (1942) was among the first to argue that innovation can occur through a process of “creative destruction” whereby new technologies or products eliminate the market for older vintages. Clearly, the owners of the older technology have an interest in limiting this process. Mokyr (1998) provides ample historical evidence of this resistance to innovation and, more recently, Bellettini and Ottaviano (2005) model this tension as a dynamic common agency problem between overlapping generations and policy makers.<sup>1</sup> Olson (1982) similarly argues that economic growth itself leads to the creation of vested interests which act to hinder future growth.

Inherent in these arguments is the assumption that perfectly enforceable monopoly rights can be assigned to the innovator in order to restrict the market and make it a local monopoly. The industrial organization literature, however, finds that characteristics of market structure, including barriers to entry and the number and size of firms, play an important role in the rate of innovation.<sup>2</sup> This suggests that a deeper understanding of the relationship between rent seeking, market structure and innovation is required in order to analyze the effect of rent seeking on economic growth.

We build on contributions by Peretto (1996 and 1998) and consider oligopolistic markets with an endogenous number of firms undertaking in-house R&D. Each firm carries out three different activities: it produces a differentiated good that is sold in the (economic) market; it carries out R&D which generates cost reducing innovations; and it engages in rent seeking activities in the political

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<sup>1</sup>For a different approach, see Bridgman, Livshits and MacGee (2004).

<sup>2</sup>For a survey of this literature, see Baldwin and Scott (1987). Recent work on this topic includes Nickell (1996) and Aghion et. al. (2004 and 2005). The literature linking growth theory to IO is discussed in Aghion and Howitt (2005).

market. R&D results in cost-saving innovation for the firm as well as non-specific knowledge that can be used in future R&D. This characterization, combined with the assumption that patent protection is not perfect, implies that firms will want to carry out R&D in-house and that R&D will have positive spillover effects on the economy.

Rent seeking takes place in the political market. Firms lobby the government for direct transfers which are financed by taxing consumer incomes. In order to focus on the effects of rent seeking on market structure, we consider a simple lump-sum tax so that the policy which firms attempt to influence is not directly distortionary or costly. The model we employ captures the fact that modern corporations conduct at the same time productive and unproductive activities.<sup>3</sup> The choice between R&D and lobbying is, therefore, internal to the firm. The model allows us to study how this choice depends on characteristics of the economic and political markets and how firms' decisions on R&D investment and rent seeking feed back into the structure of markets and affect economic growth and welfare.

We consider the joint determination of market structure and the rate of growth in a symmetric model. Market structure, which can be summarized by the number of firms, has an effect on economic growth because it determines the level of rivalry in the market and influences the private costs and benefits of innovation. Furthermore, R&D spending makes up one part of firms' total costs and plays a role in the entry/exit decision. The growth path of the economy depends on the intensity of R&D competition that this interaction generates. Rent seeking plays an important role in this interdependence for two reasons. Transfers to firms are financed by taxing consumers. Because firms are owned by households, any profits from rent seeking should make their way back into consumers' pockets. But in free entry equilibrium, profits are forced to zero and the size of the economic market is reduced by the total amount of transfers to firms. This has a negative effect on the return to R&D and induces firms to reduce expenditures on innovation, thus leading to lower growth. Secondly, rent seeking also has an effect on market structure by changing the incentives to enter the market. In particular, the direct gains from rent seeking increase profits for the typical firm while the decrease in market reduces them. The net effect on profits will determine whether rent seeking induces entry or exit, with further repercussions for growth.

In principle, rent seeking can have either a positive or negative impact on economic growth. There is a negative impact from the effect of a shrinking market. This effect can either be reinforced by the exit of firms or counteracted by entry. A natural question arise: what determines the direction of the effect? The answer will depend on the characteristics of both the political and economic markets. Unfortunately, while we have provided justification for describing the market

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<sup>3</sup>Data on lobby expenditures by firms are only publicly available in the US (even there, official data are likely to represent only a fraction of total spending for rent seeking). For example, AT&T spent more than US\$36 million in political contributions to finance the electoral campaigns of candidates in national elections from 1990 to 2006. Microsoft spent US\$15 million and Enron US\$6.5 million (Source: [www.opensecrets.org](http://www.opensecrets.org)).

as a differentiated oligopoly, there is no consensus on the type of political market that may best describe the competition for rents. As Bardhan (1997) and Bardhan and Mookherjee (2005) suggest, the way in which corruption and rents are determined varies on a case by case basis. We consider first a general market for rents and describe the characteristics that will determine the net effect of rent seeking on growth. We then study three examples based respectively on a specific rent seeking technology, on the rent seeking model by Tullock (1980) and on the lobbying model by Grossman and Helpman (1994).

Our work is related to the large literature that studies the effect of lobbying and rent seeking on economic performance. In addition to Baumol (1990) and Prescott and Parente (1994), classic works include Krueger (1974), Murphy, Shleifer and Vishny (1991) and Krusell and Rios-Rull (1996).<sup>4</sup> Differently from the previous literature, we consider the effect of rent seeking on the structure of markets. An exception is Bliss and Di Tella (1997), who study the effect of corruption on the equilibrium number of firms, but do not address the effects on economic growth.

The paper is organized as follows. Section 2 presents the formal model. In section 3, we solve the model, establish general results on the effects of rent seeking on market structure and growth. Section 4 provides three examples based on specific rent seeking games. Concluding remarks follow.

## 2 The model

Consider an economy composed of a population of  $L$  identical individuals. Consumers have symmetric preferences over differentiated goods supplied by oligopolistic producers and are endowed with one unit of labor each. We abstract from labor-leisure decisions, so that total labor supply is  $L$ . Firms engage in production, R&D and rent seeking activities.

### 2.1 Preferences

The typical consumer maximizes lifetime utility

$$u(t) = \int_t^\infty e^{-\rho(\tau-t)} \log C(\tau) d\tau \quad (1)$$

subject to the intertemporal budget constraint

$$\int_t^\infty e^{-\int_t^\tau r(s)ds} [E(\tau) + T(\tau)] d\tau \leq \int_t^\infty e^{-\int_t^\tau r(s)ds} [W(\tau) + D(\tau)] d\tau + A(t),$$

where  $\rho > 0$  is the individual's discount rate,  $E$  is per capita expenditure and  $T$  represents per capita taxes.  $W$  is the wage rate that we take as the numeraire and assume equal to unity. Finally,

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<sup>4</sup>There is a large recent empirical literature using subjective indices of perceived corruption that shows economic growth is negatively affected by corruption (see, for instance, Mauro, 1995).

$A$  is per capita asset holding and  $D$  represents dividends.<sup>5</sup>

The consumption index  $C$  is given by

$$C = \left[ \sum_{i=1}^n c_i^{\frac{\epsilon-1}{\epsilon}} \right]^{\frac{\epsilon}{\epsilon-1}}, \quad (2)$$

where  $\epsilon > 1$  is the elasticity of product substitution,  $c_i$  is consumption of good  $i$  and  $n$  is the number of goods available for consumption.

Per capita expenditure is given by

$$E = \sum_{i=1}^n p_i c_i \quad (3)$$

where  $p_i$  is the price of good  $i$ . The price index of consumption goods is

$$P = \left[ \sum_{i=1}^n p_i^{1-\epsilon} \right]^{\frac{1}{1-\epsilon}}.$$

In this standard framework, households obtain the optimal expenditure plan by setting

$$\frac{\dot{E}}{E} = r - \rho \quad (4)$$

and, given this time path for expenditures, maximize (2) subject to (3). This yields the following instantaneous demand schedule:

$$c_i = E \frac{p_i^{-\epsilon}}{P^{1-\epsilon}}.$$

Using these individual demand curves, total demand faced by firm  $i$  is

$$x_i = L c_i = L E \frac{p_i^{-\epsilon}}{P^{1-\epsilon}} = \frac{L E}{p_i} \frac{p_i^{1-\epsilon}}{P^{1-\epsilon}} \equiv \frac{S_i L E}{p_i}, \quad (5)$$

where  $S_i \equiv \frac{p_i^{1-\epsilon}}{P^{1-\epsilon}}$  is the share of the market captured by firm  $i$ . Notice that firm  $i$  faces a price elasticity of demand given by

$$\xi_i \equiv \frac{\partial x_i}{\partial p_i} \frac{p_i}{x_i} = \frac{L E [\epsilon S_i - (\epsilon - 1)(S_i)^2]}{L E S_i} = \epsilon - (\epsilon - 1) S_i. \quad (6)$$

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<sup>5</sup>In free entry/exit equilibrium, profits will always be zero implying that this term can be omitted without loss of generality.

## 2.2 Technology

Each firm produces output with technology

$$x_i = z_i^\theta (L_{x_i} - \phi), \quad (7)$$

where  $x_i$  is the output of firm  $i$  and  $L_{x_i}$  is labor used in production, while  $\phi > 0$  is a fixed and sunk cost of production. The firm's knowledge (or patent) stock is given by  $z_i$ . The term  $z_i^\theta$  captures the idea that the marginal cost of production is decreasing in the firm's accumulated stock of knowledge.

Firms invest in R&D in order to accumulate cost reducing innovations that are patented. These innovations are specific to the firm, but the R&D process produces knowledge that is useful to other firms. Since  $\theta \in (0, 1)$ , labor productivity increases with the patent stock. Technological innovations evolve according to the following condition

$$\dot{z}_i = L_{z_i} \left[ z_i + \gamma \sum_{j \neq i}^n z_j \right] \equiv L_{z_i} Z_i, \quad (8)$$

where  $Z_i$  is the productivity of labour in R&D. This technology implies that individual firms benefit from the R&D of other firms in the market. The parameter  $\gamma \in (0, 1)$  determines the share of privately developed R&D that becomes publicly available. If the firm allocates  $L_{z_i}$  units of labor to R&D in an interval of time  $dt$ , it produces  $\dot{z}_i$  new patents. The R&D technology exhibits over all increasing returns to scale and constant returns to scale in knowledge.<sup>6</sup>

## 2.3 Government and rent seeking

We model a society where the government collects lump sum taxes from consumers and uses this common pool of tax revenues to provide transfers to firms. The key assumption is that the government allocates the revenues to firms in response to their rent seeking efforts. As discussed in the introduction, we wish to introduce a general rent seeking structure. This general representation will allow us to consider the effect of various different rent seeking games. In the last section we will provide three specific examples.

Formally, we assume that firms dedicate a given amount of labour to influencing the government. We posit that rent seeking cannot be separated from the other activities of the firm -in other words, only firms engaging in production can lobby the government.<sup>7</sup> This is meant to capture the

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<sup>6</sup>This model could be reinterpreted as a quality-ladder model of product innovation, where quality is a continuous variable (and the number of available goods is endogenous).

<sup>7</sup>That firms are willing to both lobby the government and participate in production can also be explained with a small modification to the specification of the model. If the fixed cost of production,  $\phi$ , is interpreted as a fixed and sunk cost of running a firm (so that a firm wishing to just lobby the government would also have to pay it), then economies of scope imply that a firm can lower costs by participating in both markets.

fact that modern corporations engage in both R&D and lobbying activities.

The government must satisfy its budget constraint at every instant

$$B \equiv LT = \sum_{i=1}^n Q_i,$$

where  $Q_i$  represents the rents transferred to firm  $i$ ,  $T$  is the per capita tax on consumers and  $B$  is the overall budget, that can either be fixed ex ante or endogenously determined. We define a rent seeking “technology” as a function,

$$Q_i = f(L_{Q_i}, \Theta), \tag{9}$$

which translates the firm’s efforts in rent seeking,  $L_{Q_i}$ , into rents. This general representation will allow us to capture a variety of plausible relationships between rent seekers and the government. The vector  $\Theta$  is made up of variables that describe the way that rent seeking effort is converted into transfers and may include measures of government bargaining power, level of government malfeasance, the political cost of raising taxes, etc. As is widely discussed in the literature (see for instance Ades and Di Tella, 1999), among these variables the level of market concentration,  $n$ , is of particular relevance. At this stage, the only restriction we place on the function  $f$  is that it be increasing and concave in  $L_{Q_i}$ .

It is useful to discuss the differences between the market for consumption goods (the *economic* market) and the market for rents (the *political* market). Firms compete for favours from the government in a way that is fundamentally different from the way in which they compete for market share. In the economic market, firms are oligopolists, offering differentiated goods and engaging in Bertrand competition. Competition takes place over prices and firms can capture market share away from their competitors by investing in cost-reducing R&D. In the political market, firms compete with each other by lobbying the government in order to receive the same good: government granted rents. This is, in effect, a game of distribution where the government need not have an inherent preference for one firm over the other. The economic and political markets are linked, however, by the fact that the total rents paid out by the government must be raised through taxation. This has a negative income effect on consumers, who reduce their demand for all goods. The next section provides a formal treatment of these ideas and studies the effects of rent seeking on market structure and economic growth.

### 3 Market structure, rent seeking and growth

Market structure plays an important role in the general equilibrium of this economy. In order to establish equilibrium market structure, we first consider the behavior of firms who take the number of competitors and the price of labor as given. Firms maximize their stock market value

through the choice of pricing strategy, R&D expenditure, and rent seeking expenditure. Entry/exit decisions then determine the number of active firms. Once the behavior of firms is established, market clearing conditions determine the general equilibrium of the economy. In order to keep the analysis clear, we focus on a symmetric equilibrium. This allows us to isolate the importance of market structure.

Intuitively, the Nash Equilibrium (NE) with free entry/exit requires that firms choose time paths of price, R&D investment and rent seeking expenditure in order to maximize the present value of net cash flow ( $V_i$ ). This value is driven to zero by costless entry/exit. More formally, consider the strategy vector for firm  $i$ ,  $a_i = [p_i(\tau), L_{z_i}(\tau), L_{Q_i}(\tau)]$  for  $\tau \geq t$ . With costless entry/exit, the number of firms is free to jump to the equilibrium level. A strategy vector and number of firms  $[\mathbf{a}, n]$  is an instantaneous equilibrium with free entry if for all  $i$

$$V_i(a_i, \mathbf{a}_{-i}, n) \geq V_i(a'_i, \mathbf{a}_{-i}, n)$$

and

$$V_i(a_i, \mathbf{a}_{-i}, n) \geq 0,$$

and for all  $n > 1$

$$V_i(a_i, \mathbf{a}_{-i}, a_{n+1}, n+1) \leq 0.$$

The first condition states that each firm is maximizing  $V_i$  given the number of competitors and their strategies. The second and third conditions are the free exit and free entry conditions, respectively.<sup>8</sup>

### 3.1 The firm's problem

For firm  $i$ , the present discounted value of net cash flows is

$$V_i(t) = \int_t^\infty e^{-\int_t^\tau r(s)ds} \pi_i(\tau) d\tau,$$

where instantaneous profits are given by

$$\pi_i = p_i x_i + Q_i - L_{x_i} - L_{z_i} - L_{Q_i}. \quad (10)$$

The firm will maximize  $V_i$  subject to technological and institutional constraints (7) and (9), total demand (5), and taking as given the number of active firms and competitors' pricing, innovation and rent seeking strategies. We assume that the initial knowledge is given and equal for all firms.

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<sup>8</sup>For a complete definition and discussion of the equilibrium concept, see Peretto (1996).

### 3.1.1 Optimal price, rent seeking and R&D strategy

The optimal Bertrand-Nash price strategy is

$$p_i = \frac{\xi_i}{\xi_i - 1} z_i^{-\theta}, \quad (11)$$

where  $\xi_i$  is the price elasticity of demand faced by the firm (6).

Firm  $i$  invests in innovation up to the point where the value of innovations  $q_i$  equals its cost

$$q_i = \frac{1}{Z_i}. \quad (12)$$

Returns to innovations must satisfy the arbitrage condition,

$$r = \frac{\partial \pi_i}{\partial z_i} \frac{1}{q_i} + \frac{\dot{q}_i}{q_i}. \quad (13)$$

The transversality condition,

$$\lim_{\tau \rightarrow \infty} e^{-\int_t^\tau r(s) ds} q_i(\tau) Z_i(\tau) = 0,$$

states that the firm's knowledge has no value at the end of the planning period.

Substituting (7) and (5) into the profit function (10), taking derivatives with respect to  $z_i$ , using the optimal Bertrand-Nash price strategy and rearranging terms, the return on innovation (13) can be rewritten as

$$r = \frac{LES_i \theta (\xi_i - 1)}{\xi_i} \frac{Z_i}{z_i} - \frac{\dot{Z}_i}{Z_i}. \quad (14)$$

When choosing the optimal amount of resources to devote to rent seeking activity, firm  $i$  equates the marginal benefit of one additional unit of labor used in rent seeking with its marginal cost.<sup>9</sup> The optimal amount of resources employed in rent seeking can be written as

$$L_{Q_i} = L_{Q_i}(\Theta). \quad (15)$$

Substituting the optimal lobbying strategy into  $Q_i$ , we obtain the equilibrium amount of rents that firm  $i$  can extract by lobbying the government:

$$Q_i = Q_i(\Theta). \quad (16)$$

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<sup>9</sup>Notice that the firm does not consider the effect of its rent seeking activity on total expenditures. This need not be viewed as an assumption, but rather a result of the fact that firms are price takers in the labor market and take the number of firms as given. Any profits made by firms from the rent seeking process will be paid to consumers as dividends and any cost of R&D will be paid to consumers as wages. From the point of view of the firm, the net effect of rent seeking on expenditures would be zero.

Equilibrium cash flow generated by rent seeking activities can be expressed as

$$\Omega_i(\Theta) = Q_i(\Theta) - L_{Q_i}(\Theta)$$

The previous conditions give a NE of the firms' interaction for a given market size,  $LE$ , and number of firms,  $n$ . If we assume that all firms start out with the same stock of knowledge, the firms will accumulate knowledge at the same rate and symmetry will be preserved at all times.

### 3.1.2 Free entry and exit

Consider next the entry/exit decisions of firms.<sup>10</sup> We assume that the cost of entry is zero. In an equilibrium with free entry, whenever  $V_i > 0$  there is entry and for  $V_i < 0$  there is exit. In the absence of entry/exit costs, the number of firms is a jumping variable and  $V_i = 0$  at all times. Moreover, stock prices must satisfy the arbitrage condition

$$r = \frac{\pi_i}{V_i} + \frac{\dot{V}_i}{V_i}.$$

Together with the fact that  $V_i = 0$ , this condition implies that profits,  $\pi_i$ , must equal zero at all time.

From the production function (7), note that  $L_{x_i} = x_i z_i^{-\theta} + \phi$ . Substituting this into the profit function (10), we get  $\pi_i = (p_i - z_i^{-\theta})x_i + Q_i - \phi - L_{z_i} - L_{Q_i}$ . Using the demand function, (5), the profit function becomes

$$\pi_i = (p_i - z_i^{-\theta}) \frac{LES_i}{p_i} + Q_i - \phi - L_{z_i} - L_{Q_i}.$$

We can use the price strategy (11) to substitute for  $z_i^{-\theta}$  in the profit function. Rearranging terms, the zero profit condition can be written as

$$\frac{S_i LE}{\xi_i} + Q_i = \phi + L_{z_i} + L_{Q_i}, \quad (17)$$

which states that firm's cash flows from operations in both the economic and political markets just cover their fixed, R&D and lobbying costs.

### 3.1.3 The symmetric equilibrium

We focus now on the symmetric equilibrium and denote variables without subscripts as industry averages. Symmetry across firms implies that  $Z = z [1 + \gamma(n - 1)] \Rightarrow \frac{Z}{z} = [1 + \gamma(n - 1)] \equiv \alpha(n)$ . The term  $\alpha$  represents the productivity of R&D and is an increasing function of the number of firms in the market. The productivity of labor in R&D then grows at a rate  $\frac{\dot{Z}}{Z} = \frac{\dot{z}}{z} + \frac{\dot{\alpha}}{\alpha}$ . With entry

<sup>10</sup>For analytical convenience, in the rest of the analysis we treat the number of firms as a continuous variable.

costs equal to zero, the number of firms is a jumping variable and is constant along the balanced growth path. This implies that  $\frac{\dot{\alpha}}{\alpha} = 0$ . Similarly, it can be shown that  $\frac{\dot{z}}{z} = \alpha L_z$ .

The price elasticity of demand (equation 6) in a symmetric equilibrium simplifies to

$$\xi = \epsilon - (\epsilon - 1)\frac{1}{n}. \quad (18)$$

The number of firms in the economic market - the term  $n$  in condition (18) - affects economic competition between firms. As this number increases, consumers have access to more varieties of consumption goods to choose from and the price elasticity of demand faced by each firm increases. The limit as  $n$  becomes very large is monopolistic competition.

From the rate of return to innovation (14), we obtain

$$r = \frac{LE\alpha\theta(\xi - 1)}{n\xi} - \alpha L_z. \quad (19)$$

The rate of return to innovation captures some important characteristics of R&D. The term  $\frac{LE}{n\xi}$  represents the *gross-profit effect* that depends on total sales per firm  $\frac{LE}{n}$  and the oligopoly mark-up  $\frac{1}{\xi}$ . The term  $\theta(\xi - 1)$  is the *business-stealing effect* - by investing in cost reducing innovations, firms lower prices and expand their market share.<sup>11</sup> Spillovers (represented by the term  $\alpha$ ) have two distinct effects, one negative and one positive. Firms realize that their own R&D will make their competitors more productive, but they also benefit from the R&D undertaken by other firms. Note that there is no direct effect of rent seeking activity on the return to innovation. However, as we will show later, rent seeking reduces consumers' expenditure on consumption goods ( $E$ ) through taxation. Rent seeking effectively reduces the size of the market, thus having an indirect effect on the rate of return to innovations. Firms, however, do not internalize this when deciding rent seeking expenditures.

It will be useful, throughout the analysis, to highlight the effect of two variables in particular because it will be through these channels that rent seeking has an effect on growth. The size of the market,  $LE$ , has a positive effect on the returns to innovation. The number of firms,  $n$ , represents an increase in competition which has various effects: it decreases the gross profit effect as a given market size must be divided among more firms; it increases the business stealing effect as the share of the market controlled by competitors increases, and it reinforces both the negative and positive spillover effects.

In symmetric equilibrium, the zero profit condition (17) simplifies to

$$\frac{LE}{n\xi} + Q = \phi + L_z + L_Q. \quad (20)$$

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<sup>11</sup>This terminology is due to Peretto (1996).

The left-hand side consists of cash flows from the economic market ( $\frac{LE}{n\xi}$ ) and the political market ( $Q$ ). The right-hand side is made up of the exogenous fixed cost of production, the dynamic, endogenous fixed costs of keeping up with the level of innovation in the economic market and the cost of keeping up with competition in the political market.

Conditions (19) and (20) define the Nash equilibrium with free entry, given the interest rate,  $r$ , and the size of the market,  $LE$ . The analysis of these conditions allows us to discuss the effects of the number of firms, total expenditures and rent seeking on equilibrium innovation. From equation (19), we find R&D investment as a function of  $n$  and  $LE$ :

$$L_z = \frac{LE\theta(\xi - 1)}{n\xi} - \frac{r}{\alpha}. \quad (21)$$

An increase in the number of firms increases R&D investment through the business stealing effect and the spillover effect, but decreases it through the gross profit effect. In the Nash equilibrium, the relationship between  $L_z$  and  $n$  is hump-shaped because the gross profit effect dominates only for a large number of firms.<sup>12</sup> R&D investment is strictly increasing in the size of the market.

From the zero-profit condition (20), we obtain  $n$  as a function of  $L_z$  and  $L_Q$ . This shows the trade-off between the number of active firms and the lobbying and R&D costs. Firms in this model have perfect foresight and correctly perceive that, once active, they will have to pay these costs at each point in time (in addition to the exogenous cost  $\phi$ ) to keep up with the rate of innovation and the lobbying effort of their rivals. The partial equilibrium of this economy, the intersection of the two schedule (condition 20 and 21), is depicted in Figure 1.

### 3.2 Equilibrium market structure

The final step in order to derive the equilibrium number of firms in this economy is to obtain an expression for equilibrium expenditures. From condition (10), the zero profit condition can be rewritten as

$$p_i x_i + Q_i = L_{x_i} + L_{z_i} + L_{Q_i}.$$

Summing across firms and imposing the labor market clearing condition,  $L = \sum_{i=1}^n (L_{x_i} + L_{z_i} + L_{Q_i})$ , the zero profit condition becomes

$$L = \sum_{i=1}^n (p_i x_i + Q_i).$$

Imposing symmetry and using condition (5), we have per capita expenditures

$$E = 1 - \frac{nQ}{L}. \quad (22)$$

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<sup>12</sup>This is not necessarily the case in the general equilibrium.

Notice that rent seeking activities represent a waste of resources and reduce per capita equilibrium expenditures.<sup>13</sup> Since  $n$  is constant along the balanced growth path,  $E$  is constant over time, jointly with condition (4) this implies that  $r = \rho$ .

Now substitute condition (22) into (19). This provides the optimal investment strategy  $L_z$  as a function of the number of firms. Then substitute this into the zero profit condition to obtain

$$\frac{L [1 - \theta(\xi(n) - 1)]}{n\xi(n)} \left[ 1 - \frac{nQ(\Theta)}{L} \right] + \Omega(\Theta) + \frac{\rho}{\alpha(n)} = \phi, \quad (23)$$

where the price elasticity of demand  $\xi(n)$ , equilibrium rents  $Q(\Theta)$  and lobbying  $L_Q(\Theta)$  are given by equations (18), (16) and (15), respectively. This condition implicitly determines the equilibrium number of active firms with rent seeking.<sup>14</sup> Notice that the market structure of this economy depends on the interaction of firms in the economic and political markets. In particular, rent seeking activities provide an extra source of income to firms ( $\Omega$ ), but also reduce sales because of the effect of higher taxes on equilibrium expenditures. We depict condition (23) in Figure 2 for the special case in which firm's net cash flows are everywhere decreasing in the number of competitors.

We now consider the implications of lobbying activities for the structure of the market. In order to highlight the role of rent seeking, we compare the above conditions with those that would obtain in an identical economy with no rent seeking. In the absence of rent seeking (where  $L_Q = Q = 0$  and  $E = 1$ ), the equilibrium number of firms is determined by

$$\frac{L [1 - \theta(\xi(n) - 1)]}{n\xi(n)} + \frac{\rho}{\alpha(n)} = \phi. \quad (24)$$

As shown by Peretto (1996), condition (24) defines a unique market structure because the expression on the left-hand side is strictly decreasing in  $n$ . Comparing conditions (23) and (24), we see that rent seeking has two effects on the equilibrium number of firms. The two effects work in opposite directions. We can define the difference between conditions (24) and (23) as the term  $\Phi \equiv \Omega(\Theta) - \frac{[1 - \theta(\xi(n) - 1)]}{\xi(n)} Q(\Theta)$ . This term represents, for a given level of market concentration, the total contribution of rent seeking activity to the firm's profits. The first term represents the increase in profits from rent seeking activity, the second represents the loss of profits from a reduction in equilibrium expenditure brought about by higher taxes.

We can see that the effect of rent seeking on market structure depends on characteristics of both the economic and political markets. The term  $\frac{1 - \theta(\xi - 1)}{\xi}$  captures the fraction of revenues from the economic market that the firm keeps as profits. The higher this term, the more costly is the

<sup>13</sup>Recall the discussion in footnote 10. In free entry equilibrium, all profits are zero and taxes transferred to firms are not paid back to consumers as dividends.

<sup>14</sup>Depending on the lobbying structure, multiple equilibria are possible (as well as no equilibria at all), depending on how, and if, the equilibrium levels of  $Q$  and  $L_Q$  depend on the number of competitors in the political market. We ignore the issues of existence and multiplicity at this stage and shall be more precise in the last section, where we focus on specific rent seeking games.

loss of market size due to rent seeking. More precisely, notice that this term is higher for lower values of  $\epsilon$  (the elasticity of product substitution) and  $\theta$  (the elasticity of cost reduction). Firms can charge higher prices when consumption is less elastic and when firm-specific innovation result in less cost reduction.<sup>15</sup> Equilibrium per firm transfers,  $Q$ , and per firm cash flows from rent seeking,  $\Omega$ , depend on characteristics of the political market and on the effects of competition. In general, if rents are large, but the cost of obtaining them is also large, then rent seeking will have a negative effect on profits and firms will exit from the market.

### 3.3 Equilibrium growth

Along the balanced growth path, both consumers' expenditures and the number of firms are constant. The rate of cost reduction then determines the growth of output and consumption. We can define this as

$$g \equiv \theta \frac{\dot{z}}{z} = \theta \alpha L_z. \quad (25)$$

From condition (19), we have the firm's R&D strategy as a function of total expenditures. Firms take the number of competitors as given and choose the optimal level of R&D according to condition (21). The equilibrium number of firms, in turn, is endogenous and determined by the zero profit condition. Substituting the zero profit condition (20) into the investment in innovation and using the definition of growth yields the equilibrium growth rate of the economy

$$g = \theta \frac{\theta \alpha(n) [\xi(n) - 1] [\phi - \Omega(\Theta)] - \rho}{1 - \theta [\xi(n) - 1]}. \quad (26)$$

This condition is a modified version of the firm's R&D decision which takes into account that firms have perfect foresight and correctly perceive the effect of parameter changes on their profits and, based on this, choose whether to be active or not. The equilibrium number of active firms determines the level of competition in the economic and political markets, R&D, pricing and rent seeking strategies and, ultimately, long run growth.

According to condition (26), rent seeking has two separate effects on the equilibrium growth rate. First, the existence of rent seeking has a direct negative effect on growth. To see this, define the growth rate when there is no rent seeking (where  $L_Q = Q = 0$  and  $E = 1$ ) as:

$$g^{nrs} = \theta \frac{\theta \alpha(n) [\xi(n) - 1] \phi - \rho}{1 - \theta [\xi(n) - 1]}.^{16}$$

<sup>15</sup>Using the terminology of Bliss and Di Tella (1997), we can refer to these parameters as "deep competition" parameters, because they determine the structure of economic market in the absence of rent seeking. To put it differently, for any given political structure, the negative impact of rent seeking on firms' cashflows is larger for those industries with low  $\epsilon$  and  $\theta$ . In this case, rent seeking activity is more costly.

<sup>16</sup>Assuming  $1 > \theta(\epsilon - 1)$  is sufficient to prove the symmetry of the Nash equilibrium (see Peretto, 1998, proposition

Note that the growth rate in condition 26 can also be written as

$$g = g^{nrs} - \frac{\theta \alpha(n) [\xi(n) - 1] \Omega(\Theta)}{1 - \theta [\xi(n) - 1]},$$

where the second term represents the direct (negative) effect of rent seeking on growth. When cash flows generated by rent seeking are high, production plays a lesser role in the firms' equilibrium cash flows. As a result, there is less of an incentive to invest in R&D so that growth is lower. As long as cash flows from rent seeking are positive, the growth schedule of the economy will be lower because rent seeking reduces the incentive to innovate for any given number of firms. This result is similar to the argument that rent seeking diverts resources away from productive uses, as emphasized by the literature discussed in the introduction.

Notice that if the political market were to yield no additional cash flows for a firm, the growth schedule would not be affected. This does not, however, mean that rent seeking would not have any effect on economic growth. Since rent seeking alters that cash flows generated by each firm, it affects the incentives to enter or exit the market. As condition (26) shows, the number of firms also plays an important role in determining the incentive to innovate and the growth rate of the economy. When the profits from rent seeking are larger than the cost (in terms of a smaller market), rent seeking will induce entry. The increase in competition for consumer spending implies an increase of knowledge spillovers, a positive business stealing effect and a negative gross profit effect. The first two effects always dominate the second and will result in higher R&D spending. The negative effect on growth discussed above will be mitigated, though the total effect on growth is ambiguous. This possibility is depicted in Figure 3. Alternately, when the cost of rent seeking more than offsets any benefits, rent seeking will induce exit and growth will be further reduced. This case is depicted in Figure 4.

The effect of rent seeking is to shift down the growth schedule for any value of  $n$  (direct effect) and to alter the equilibrium structure of the market (indirect effect). The interaction of these two effects -i.e. the intersection of the two schedules in Figures 3 and 4- determines the long run rate of growth of the economy. The overall effect of rent seeking on growth will depend on the specific characteristics of the political market. We turn our attention to this in section 4.

### 3.4 Welfare

Welfare in this economy is closely related to economic growth. In symmetric equilibrium, the consumption index, equation (2), becomes

$$C = \left[ nc^{\frac{\epsilon-1}{\epsilon}} \right]^{\frac{\epsilon}{\epsilon-1}}.$$

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1). Under this assumption, one can show that the growth rate of the economy without rent seeking ( $g^{nrs}$ ) is positive only for a sufficiently large number of firms and always increasing in  $n$ .

Substituting the equilibrium values for consumption, we obtain the following expression for the instantaneous utility function.

$$\log C(\tau) = \frac{\epsilon}{\epsilon - 1} \log(n) + \log \frac{1}{n} \frac{\xi - 1}{\xi} + \theta \log z(\tau) + \log E(\tau).$$

Substituting this expression into the consumer's lifetime utility function and integrating yields

$$U = \frac{1}{\rho} \left[ \frac{1}{\epsilon - 1} \log(n) + \log \frac{\xi - 1}{\xi} + \frac{g}{\rho} + \log E \right].$$

In this model welfare is increasing in the number and quantity of goods available, in the rate of growth of consumption (which is equal to the rate of cost reduction,  $g$ ), in total expenditures and knowledge. As the previous subsection shows, rent seeking reduces the amount of per capita expenditures and -for a given number of firms- the growth rate of the economy, thus having a direct negative effect on welfare. Rent seeking also has an indirect welfare effect by changing the equilibrium structure of the market. This second effect depends on the specific structure of the rent seeking game. If the general equilibrium effect of rent seeking on firms' cash flows is negative, then rent seeking leads to exit and has an unambiguous negative effect on welfare through the reduction of available varieties and of the growth rate of consumption, in addition to the fall in per capita expenditures.

## 4 Three models of rent seeking

Until now we have focused on a very general structure for the market for rents, what we call the political market. This section studies three models of rent seeking that provide different examples of the main effects at work in this paper. In order to highlight the novel effect of rent seeking on market structure and growth, we focus on particular rent seeking technologies that are consistent with two aspects of rent seeking that are commonly described in the literature. First, rent seeking is a directly unproductive activity in that firms dedicate real resources to obtain a profit without producing any good or service (along the lines of Baghwati, 1982). Secondly, competition between different special interests reduces the returns to rent seeking (along the lines of Becker, 1983).<sup>17</sup>

The first two models simplify the analysis by considering a rent seeking game where the amount available for distribution by the government is fixed. The firms cannot influence the level of taxation, only their share of the pie. The first model is based on the common agency approach by Bernheim and Whinston (1986) and Grossman and Helpman (1994), while the second model builds on the classic work on rent seeking by Tullock (1980). In the final model, we consider a

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<sup>17</sup>Theoretically the effect of competition on rent seeking is ambiguous. However, Ades and Di Tella (1999) find that corruption is higher in economies with fewer number of firms, thus supporting the idea that competition reduces rent seeking.

specific functional form of the rent seeking technology and allow it to determine the amount of resources collected by the government.

#### 4.1 Grossman-Helpman (1994) lobbying model

In this and the following subsection we provide some additional structure to the relationship between the government and the rent seeking firms. We disregard the endogenous determination of total rents and assume, instead, that in each period there is a fixed budget ( $\bar{B} > 0$ ) financed by lump sum taxation which the government allocates to firms in response to their rent seeking effort. We therefore have that in each period  $\bar{B} = LT = \sum_i Q_i$ .

Suppose that a government lives only for a single period and allocates the fixed budget, taking the number of firms as given. We follow Grossman and Helpman (1994) in formalizing the relationship between firms and the government as a menu auction. The political game has two stages. At the first stage, each firm offers a contract  $L_{Q_i}$  (for similarity with the literature, we refer to these contracts as contributions) to politicians contingent on the allocation of rents by the government.<sup>18</sup> The government observes the contracts and chooses how to allocate rents in order to maximize its objective function  $G = \sum_i L_{Q_i}$ , where we assume that politicians are purely self-interested and only care about the amount of resources allocated to them by firms.

In this framework, contribution schedules are assumed to be “truthful”, that is  $L_{Q_i} = \max[0, Q_i - k_i]$ , where  $k_i$  is a constant optimally chosen by firm  $i$ . As in Dixit et. al. (1997), for  $n > 1$  political competition leads firms to offer the government exactly  $L_{Q_i} = Q_i$  (i.e. firms optimally set  $k_i = 0$ ) and the government captures the entire value of the budget. Since the government can costlessly transfer funds between the firms, it is able to play them off against each other to its own benefit. Each firm will increase its “bid” for a transfer in the hopes of beating out its competitors up to the point where there is no benefit from bidding. This implies that in a symmetric equilibrium  $L_Q = Q = \frac{\bar{B}}{n}$  and  $G = nL_Q = \bar{B}$ .<sup>19</sup>

What are the implications of this lobbying model for the equilibrium structure of the market? If the budget is positive,  $\bar{B} > 0$ , the equilibrium number of firms is determined by

$$\frac{L [1 - \theta(\xi(n) - 1)]}{n\xi(n)} \left[ 1 - \frac{\bar{B}}{L} \right] + \frac{\rho}{\alpha(n)} = \phi,$$

because  $\Omega = 0$  for any  $n > 1$ . Since the left-hand side of this condition is strictly decreasing in  $n$ , the equilibrium market structure is unique. Instead, in a rent seeking free society with  $L_Q = Q = 0$  and  $E = 1$ , the equilibrium market structure is determined by

<sup>18</sup>Since in our model the wage rate is the numeraire, contributions in terms of labor can be interpreted as monetary transfers, as in Grossman and Helpman (1994).

<sup>19</sup>Because of symmetry, we have dropped the firm index. Note that the assumption of symmetry does not play an important role since firms are indifferent between dedicating resources to rent seeking and not doing so. Furthermore, cash flows will not be affected, nor will the total amount of taxes collected.

$$\frac{L [1 - \theta(\xi(n) - 1)]}{n\xi(n)} + \frac{\rho}{\alpha(n)} = \phi.$$

The difference between the last two equations is given by

$$\Phi \equiv \Omega - \frac{[1 - \theta(\xi(n) - 1)]}{\xi(n)} Q(n) = -\frac{\bar{B} [1 - \theta(\xi(n) - 1)]}{n\xi(n)} < 0.$$

Since cash flows, for any given  $n$ , are lower when rent seeking is allowed, the number of firms will be lower in a rent-seeking society. The intuition is that rents reduce the size of the economic market (as in the general case). Moreover, political competition between rent seeking firms fully dissipates the value of rents allowing the selfish government to capture the entire budget. This model allows us to isolate the market size effect of rent seeking since, in equilibrium, rent seeking generates only costs from the point of view of the firm. Naturally, the question arises as to why firms bother to seek political rents in the first place. The answer is that not rent seeking cannot be an equilibrium strategy in this class of lobbying models. With no firm participating in the political market, the incentive for any one firm to influence the government in its favour is high because having no competition guarantees high returns from rent seeking. In fact, the first firm could appropriate the entire budget by making a take-it-or-leave-it offer to the government. All firms realize this and the result is positive rent seeking expenditures in every period with lower cash flows generated by every firm.<sup>20</sup>

To see the effect on economic growth recall that

$$g = \theta \frac{\theta\alpha(n) [\xi(n) - 1] [\phi - \Omega(\Theta)] - \rho}{1 - \theta [\xi(n) - 1]} = \theta \frac{\theta\alpha(n) [\xi(n) - 1] \phi - \rho}{1 - \theta [\xi(n) - 1]} = g^{nrs},$$

where the second equality comes from the fact that  $\Omega = 0$ . Notice that growth is increasing in the number of firms. As more firms compete for consumer spending, there is a greater incentive to invest in innovation. The growth schedule has not been affected by rent seeking because rent seeking does not generate additional cash flows for the firm. If the market could support the same number of firms as without rent seeking, the same level of growth would be achieved. However, with the smaller market size caused by the additional taxation required to finance government transfers, less firms will find it possible to enter the market. Faced with less competition, each active firm will have less of an incentive to engage in R&D. The result is an unambiguous reduction in growth, as depicted in Figure 5.

This model is of particular interest as a starting point because it isolates the market size effect. The “traditional” (i.e. direct) effect shifting down the growth schedule disappears. Rent seeking leads to lower growth in equilibrium only through its indirect (market structure) effect. With firms

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<sup>20</sup>This feature is not only specific to the Grossman and Helpman (1994) lobbying model, but extends to the other two examples.

receiving no benefit from rent seeking and consumers spending less on the goods being sold by firms, cash flows are lower and the market can sustain a lower number of firms. This has important implications for the welfare of consumers. The combination of a lesser variety of goods to consume, higher prices and lower expenditures leaves them unambiguously worse off.

Another important consideration is the differences and similarities between the economic and political markets. In both markets oligopolistic firms compete a la Bertrand, choosing the price  $p_i$  in the economic market and the constant  $k_i$ , which captures the net lobbying revenue, in the political market. For a given number of competitors, imperfect substitutability of goods allows firms to make positive profits from economic competition. In the political market instead, firms offer contributions to a government that has no intrinsic preference over lobbying by one firm over the other. This explains why economic and political competition have such different implications for the profitability of firms.

## 4.2 Tullock (1980) rent seeking model

The stark results presented in the previous sub-section are important, but they were achieved by shutting down some important channels through which rent seeking may affect growth. Effectively, the competition for transfers from the government was so tough that firms could not generate positive profits from rent seeking. But if rent seeking is actually profitable for firms, it may be the case that it induces entry into the market and possibly offsets the market size effect described above. In this section we construct a political game where it is possible to begin to consider the conditions under which rent seeking has a positive effect on growth.

More precisely, following the classic work of Tullock (1980), the rent a firm gets is assumed to be an increasing function of that firm's share of total rent seeking activity.<sup>21</sup> The payoff from rent seeking activity depends on the (gross) rent and the cost of lobbying, where the rent depends on a firm's share of total rent seeking expenditures in the political market. Formally, we have

$$Q_i = \frac{L_{Q_i}}{\sum_j L_{Q_j}} \bar{B},$$

We look for the Nash equilibrium of the lobbying game. Each firm chooses  $L_{Q_i}$  to maximize  $Q_i$  for given  $L_{Q_{-i}}$ . In a symmetric equilibrium, each firm devotes an amount of resources to rent seeking equal to

$$L_Q = \frac{n-1}{n^2} \bar{B}.$$

Using this last condition, we can obtain the equilibrium per firm rent and payoff from rent seeking respectively given by

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<sup>21</sup>For a recent discussion of this type of lobbying games see Hindriks and Myles (2006), chapter 5.

$$Q = \frac{\bar{B}}{n} \quad \text{and} \quad \Omega = \frac{\bar{B}}{n^2}.$$

As concentration in the political market decreases, the value of the rent ( $Q$ ) and payoff from rent seeking ( $\Omega$ ) decrease in equilibrium. Cash flows from rent seeking decrease as the number of firms in the political market increases because the reduction in rents dominates the fall in lobbying effort.

It is immediate to show that this rent seeking model implies a unique equilibrium market structure. In fact, condition (23) simplifies to

$$\frac{L [1 - \theta(\xi(n) - 1)]}{n\xi(n)} \left[ 1 - \frac{\bar{B}}{L} \right] + \frac{\bar{B}}{n^2} + \frac{\rho}{\alpha(n)} = \phi,$$

which is everywhere decreasing in  $n$ . Comparing this with the case of no rent seeking (condition 24), the difference is given by the term

$$\Phi \equiv \Omega(n) - \frac{[1 - \theta(\xi(n) - 1)]}{\xi(n)} Q(n) = \frac{\bar{B}}{n} \left[ \frac{1}{n} - \frac{1 - \theta(\xi(n) - 1)}{\xi(n)} \right].$$

The above condition has a very simple economic intuition. The term  $\Omega(n)$  captures the payoff from rent seeking, while the term  $\frac{[1 - \theta(\xi(n) - 1)]}{\xi(n)} Q(n)$  is the loss in profits from the economic market due to the reduction of consumers' expenditures. The difference of these terms can either be negative or positive depending on parameter values. In particular, when the elasticity of product substitution is sufficiently low ( $\epsilon < \frac{2+\theta}{1+\theta}$ ) firms' cash flows will be lower for any given  $n$  when there is rent seeking (i.e.  $\Phi < 0$ ). Whenever  $\epsilon > \frac{2+\theta}{1+\theta}$ , then whether rent seeking increases firms' equilibrium cash flows depends on the number of firms that would exist in the absence of rent seeking (call it  $n^{nrs}$ ). If this number is below a threshold given by  $\tilde{n} \equiv \frac{\epsilon-1}{1-\theta(\epsilon-1)}$ , then cash flows will increase as a result of rent seeking, otherwise cash flows will decrease.

We can summarize the implications of this analysis in the following way: Rent seeking will have a positive effect on firms' cash flows (and therefore induce entry into the market) only when  $\epsilon$  is high *and* the number of firms supported by the market in the absence of rent seeking is small. Otherwise, rent seeking will decrease cash flows and result in exit. Intuitively, when  $\epsilon$  is high, consumers are willing to substitute between consumption goods and each firm has little market power. This implies that margins from participating in the economic market are small and firms suffer less from reductions in the market size. If the number of competitors is initially low, then rent seeking can generate large enough cash flows to make entry worthwhile. When  $\epsilon$  is low and firms have market power over consumers, the cost of losing market size will always outweigh the benefits from rent seeking and firms will exit.

To see the effect on economic growth recall that

$$g = \theta \frac{\theta \alpha(n) [\xi(n) - 1] [\phi - \Omega(\Theta)] - \rho}{1 - \theta [\xi(n) - 1]} = g^{nrs} - \frac{\theta \alpha(n) [\xi(n) - 1] \Omega(\Theta)}{1 - \theta [\xi(n) - 1]}.$$

Notice again that growth is increasing in the number of firms. As the number of firms increases the profits from rent seeking fall and there are more firms competing for consumer spending. Both of these effects increase each firm's incentive to innovate. At the same time, since cash flows from rent seeking are now positive, rent seeking reduces the growth rate for any given number of firms.

The overall effect on growth is a combination of this negative direct effect and the market structure effect described above. If rent seeking results in exit, there will be an unambiguous reduction in the economic growth rate. If rent seeking results in entry then the negative direct effect will be mitigated by new firms which spur the need for each firm to invest in R&D.

This raises an important question. Can rent seeking be good for economic growth? We can begin to answer this by considering the conditions that must be met in order for growth to increase as a result of rent seeking. It must be the case that rent seeking induces entry and that there is enough entry that it compensates for the negative direct effect. This will only happen when consumers find it easy to substitute between the few goods available ( $\epsilon$  low) *and* the market supports few firms ( $n^{nrs}$  low) so that there is little innovation taking place. Under these conditions, rent seeking is a way to provide an incentive for new firms to enter a low profit market.<sup>22</sup>

### 4.3 A specific rent seeking technology

The previous sub-section established the important role played by economic market power in determining the impacts of rent seeking on economic growth. We now turn to a different rent seeking "technology" which allows us to refine this idea a little further. Again, we highlight that rent seeking is a directly unproductive activity and that competition between different special interests reduces the returns to rent seeking. In addition we allow the government to determine the total amount of taxes it collects in response to firms' rent seeking efforts.

A simple function that captures these ideas takes the following form

$$Q_i = \left( \frac{LQ_i}{n} \right)^v, \tag{27}$$

where  $v \in (0, 1)$  is the elasticity of government provided rents (transfers) to lobbying pressures.<sup>23</sup> This parameter will depend on institutional variables such as transparency, accountability of bureaucrats and politicians and, more generally, on the checks and balances on government activity. The larger is  $v$ , the lower the quality of institutions (the more the government is responsive to

<sup>22</sup>This suggests that allowing rent seeking as a way to promote growth should be viewed as a poor alternative to other possible incentive schemes, like direct subsidies.

<sup>23</sup>A similar rent seeking function is used by Angeletos and Kollintzas (2000).

lobbying), the higher is the transfer that firm  $i$  receives from the government for a given amount of rent seeking effort ( $L_{Q_i}$ ) and competition in the political market ( $n$ ).

By setting the marginal benefit of rent seeking equal to the marginal cost, we can obtain the firm's rent seeking strategy

$$L_{Q_i} = (v)^{\frac{1}{1-v}} (n)^{-\frac{v}{1-v}}, \quad (28)$$

equilibrium transfers

$$Q_i = \Delta(n)^{-\frac{v}{1-v}}, \quad (29)$$

where  $\Delta \equiv (v)^{\frac{v}{1-v}}$ , and cash flows from rent seeking

$$\Omega_i = Q_i - L_{Q_i} = (1 - v)Q_i. \quad (30)$$

Notice that an exogenous increase in the number of firms in the political market -an increase in  $n$ - would reduce the returns to rent seeking ( $\Omega$ ). Implicit in this technology is the idea that oligopolistic political markets are analogous to economic markets. As the number of competing firms increases economic market power decreases. Each firm is less able to extract profits and economic outcomes (quantities and the price) move towards the first best (price equal marginal cost and profits equal zero). In the market for rents, increasing the number of competitors reduces power concentration and lowers firms' ability to appropriate rents. At the limit, for very large numbers of competitors, outcomes of the political market (rents and lobbying efforts) move towards the first best (where both variables are equal to zero).

It is important to highlight the role that checks and balances on government activity play in this model. The more the government is responsive to rent seeking (the higher  $v$ ), the tougher is effective competition in the political market and the lower the returns from rent seeking ( $\frac{\partial \Omega}{\partial v} = -\frac{(\frac{n}{v})^{\frac{v}{v-1}} \log(\frac{n}{v})}{1-v} < 0$ ). As  $v$  increases, devoting resources to lobbying is more profitable, because the government will provide larger rents for each additional worker employed in rent seeking. However, since this is true for all firms, lower checks and balances on government activity induce more lobbying by all firms. In equilibrium, this reduces the ability of each firm to extract resources through lobbying.

We can use this structure to study the effects of rent seeking on market structure and growth. First, plugging the above expressions into the zero profit condition, we have

$$\frac{L [1 - \theta(\xi(n) - 1)]}{n\xi(n)} \left[ 1 - \frac{\Delta(n)^{\frac{1-2v}{1-v}}}{L} \right] + (1 - v)\Delta(n)^{-\frac{v}{1-v}} + \frac{\rho}{\alpha(n)} = \phi.$$

It can be shown that the net cash flows of firms -the left-hand side of the previous condition- are everywhere decreasing in  $n$ . This is sufficient to prove the existence and uniqueness of the equilibrium.

Comparing this equilibrium market structure condition to the case with no rent seeking, the difference is

$$\Phi \equiv \Omega(n) - \frac{[1 - \theta(\xi(n) - 1)]}{\xi(n)} Q(n) = \left[ 1 - v - \frac{1 - \theta(\xi - 1)}{\xi} \right] Q(n).$$

The term in square brackets is negative when the government's responsiveness to rent seeking is high or when the elasticity of substitution between consumption goods is low.<sup>24</sup> When consumers cannot substitute freely between goods, firms can charge a higher price and extract greater cash flows from every unit of revenue. If this is the case, rent seeking is very costly because the reduction in market size has a more pronounced effect on profits. Exit is also more likely for high values of  $v$ . As the quality of institutions falls, rents increase but so do the cost of obtaining them. For this reason, rent seeking is more likely to have a negative (general equilibrium) effect on profits.

To see the effect on economic growth recall that

$$g = \theta \frac{\theta \alpha(n) [\xi(n) - 1] [\phi - \Omega(\Theta)] - \rho}{1 - \theta [\xi(n) - 1]} = g^{nrs} - \frac{\theta \alpha(n) [\xi(n) - 1] \Omega(\Theta)}{1 - \theta [\xi(n) - 1]}.$$

Again, since rent seeking generates positive cash flows for the firm, the growth rate of the economy is lower for any given  $n$ . It can be shown that the growth rate of this economy still is everywhere increasing in  $n$  (if positive). More competition in the political market reduces net rents  $\Omega$ , thus providing further incentives for firms to invest in innovation. The total effect of rent seeking on growth again depends on the negative direct effect and the indirect (market structure) effect. When rent seeking results in exit, growth will be unambiguously lower.

Two important implications can be drawn from this analysis. First, we must qualify the result from the previous section that economic market power (measured by the demand parameter,  $\epsilon$ ) plays an important role in determining the impact of rent seeking on market structure and growth. It is the interaction between demand characteristics from both the economic and political markets (the latter measured by  $v$ ) that determine the impact on growth. Secondly, rent seeking will have a positive growth effect only if it induces enough entry into markets so that the negative direct effect is canceled out. This would occur only when firms have little market power over consumers ( $\epsilon$  high), *and* are able to extract high rents from every dollar raised by the government ( $v$  low), *and* the market supports few firms. In other words, rent seeking is good for growth only if there are few firms engaging in low R&D and they cannot take advantage of consumers or impose too great of a cost on society by extracting rents.

<sup>24</sup>The argument is similar to the one presented in the discussion of the Tullock model. A sufficient condition for the term to be negative is  $v > \frac{(\epsilon-1)(1+\theta)}{\epsilon}$ . This condition will hold for higher values of  $v$  and lower values of  $\epsilon$ . When  $v < \frac{(\epsilon-1)(1+\theta)}{\epsilon}$ , the initial (no rent seeking) equilibrium number of firms matters. In particular, there is a cutoff level of  $n$  given by  $v = \frac{(\xi(\hat{n})-1)(1+\theta)}{\xi(\hat{n})}$  such that for any initial  $n^{nrs} < \hat{n}$  the term in the square brackets will be negative and rent seeking will result in exit. This cut off level  $\hat{n}$  is increasing in  $v$  and decreasing in  $\epsilon$  so that the condition is again more likely to hold for higher values of  $v$  and lower values of  $\epsilon$ .

An interesting implication of this specific model is that, when the quality of checks and balances on government activities are low rent seeking will be harmful to growth because it creates an implicit barrier to entry of new firms. This result is consistent with the evidence in Perotti and Volpin (2006), who find in a cross section of 38 countries that lower quality of institutions and accountability of the government -a higher  $v$  in our model- is associated with lower firm entry. Note, however, that our logic is different from theirs in that, rather than being directed at raising barriers to entry of new firms, rent seeking itself works as a barrier by raising operational costs for active firms and reducing revenues from the economic market.

## 5 Conclusions

A firm can choose from a variety of strategies in order to maximize profits. Economists have often focused on the way firms behave in economic markets. But a firm can also earn profits in the political market through rent seeking. Even though the goal of this type of activity is simple redistribution, it can have important effects on the long run performance of an economy. Not only does rent seeking draw valuable resources away from productive activities, it also affects, through its impact on profitability, the incentives of potential entrants. We have developed a model that helps to identify the characteristics of the economic and political markets that will determine the effect of rent seeking on market structure.

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Figure 1: **R&D investment (partial equilibrium)**

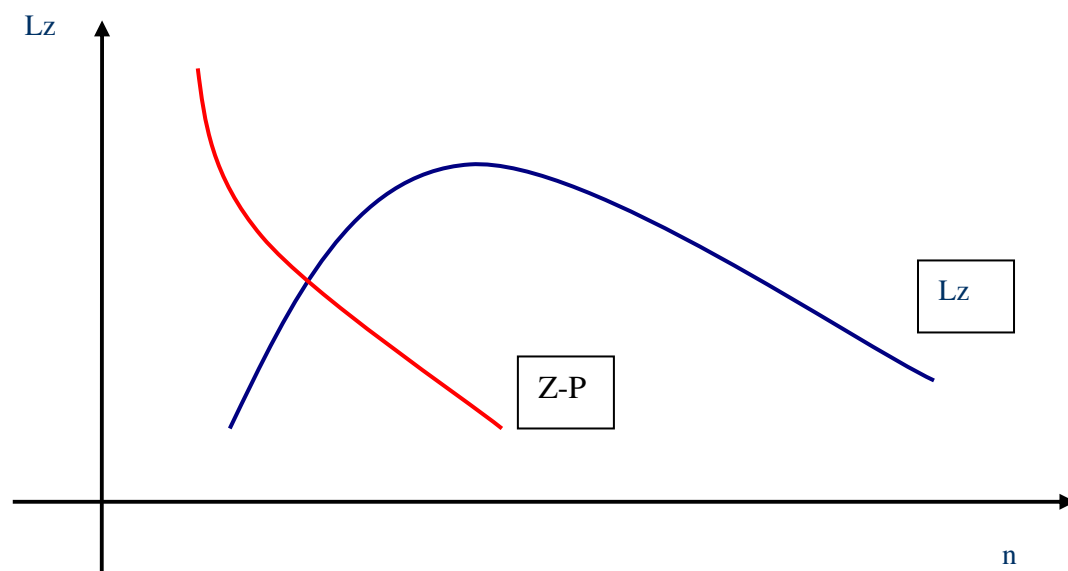


Figure 2: **Equilibrium market structure**

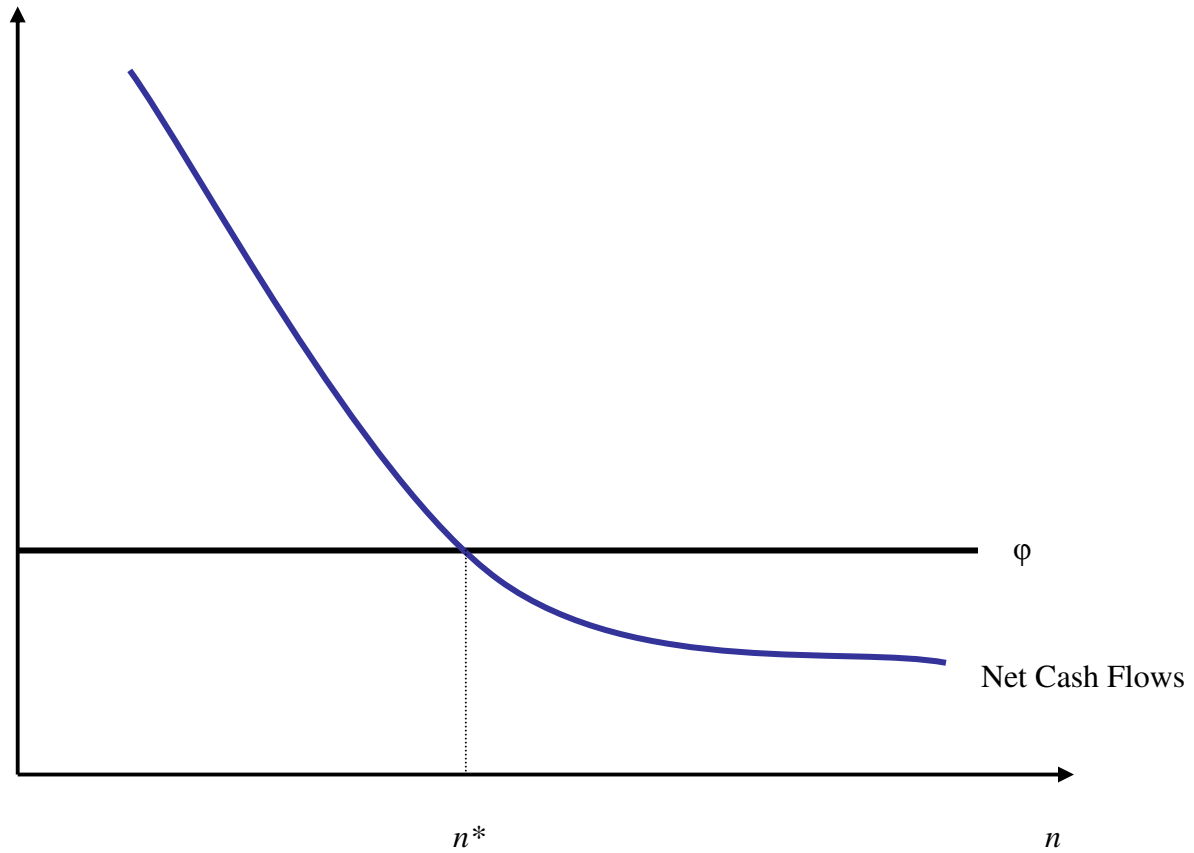


Figure 3: The effects of rent seeking on market structure and growth  
(when rent seeking induces exit)

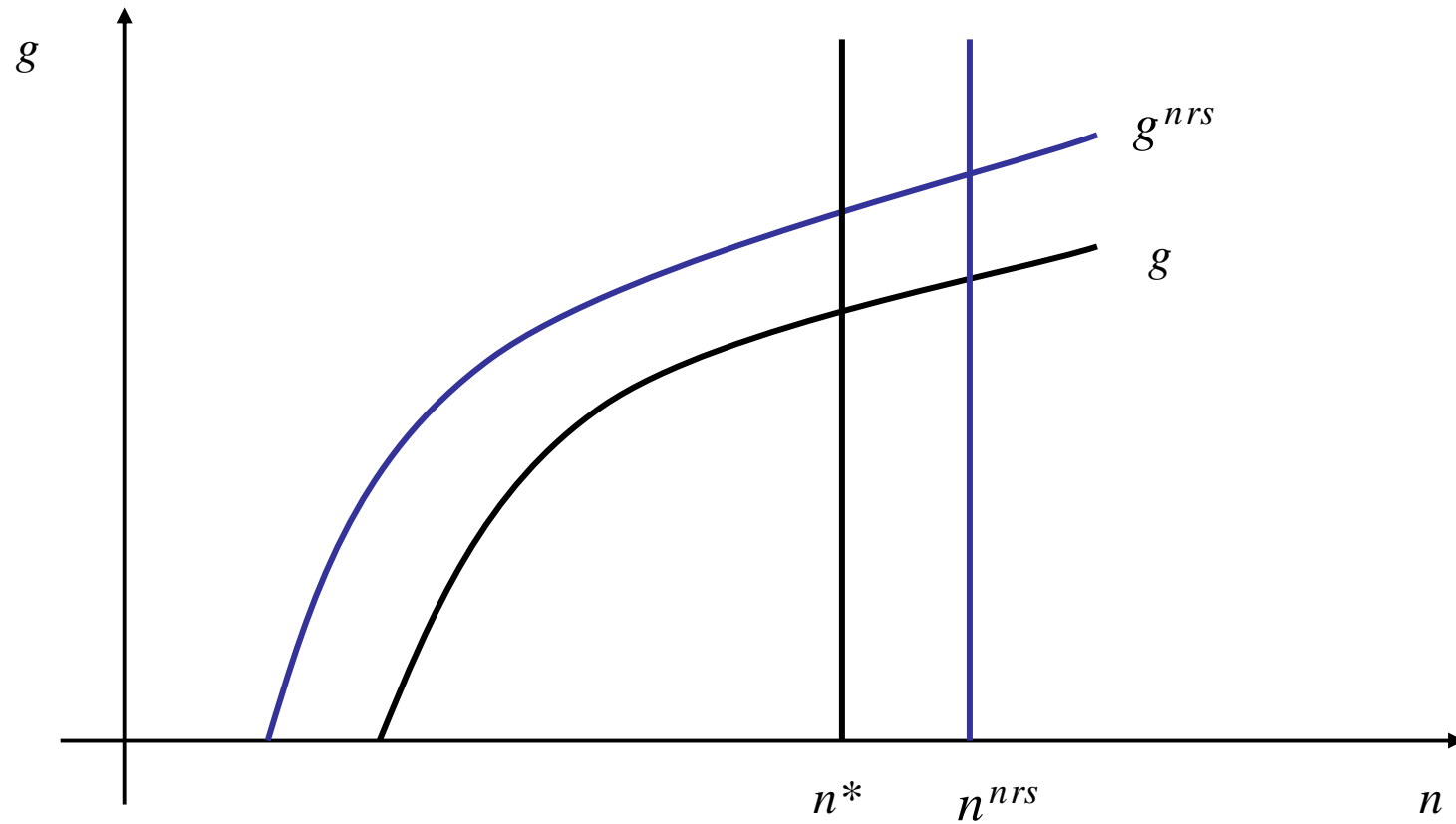


Figure 4: The effects of rent seeking on market structure and growth  
(when rent seeking induces entry)

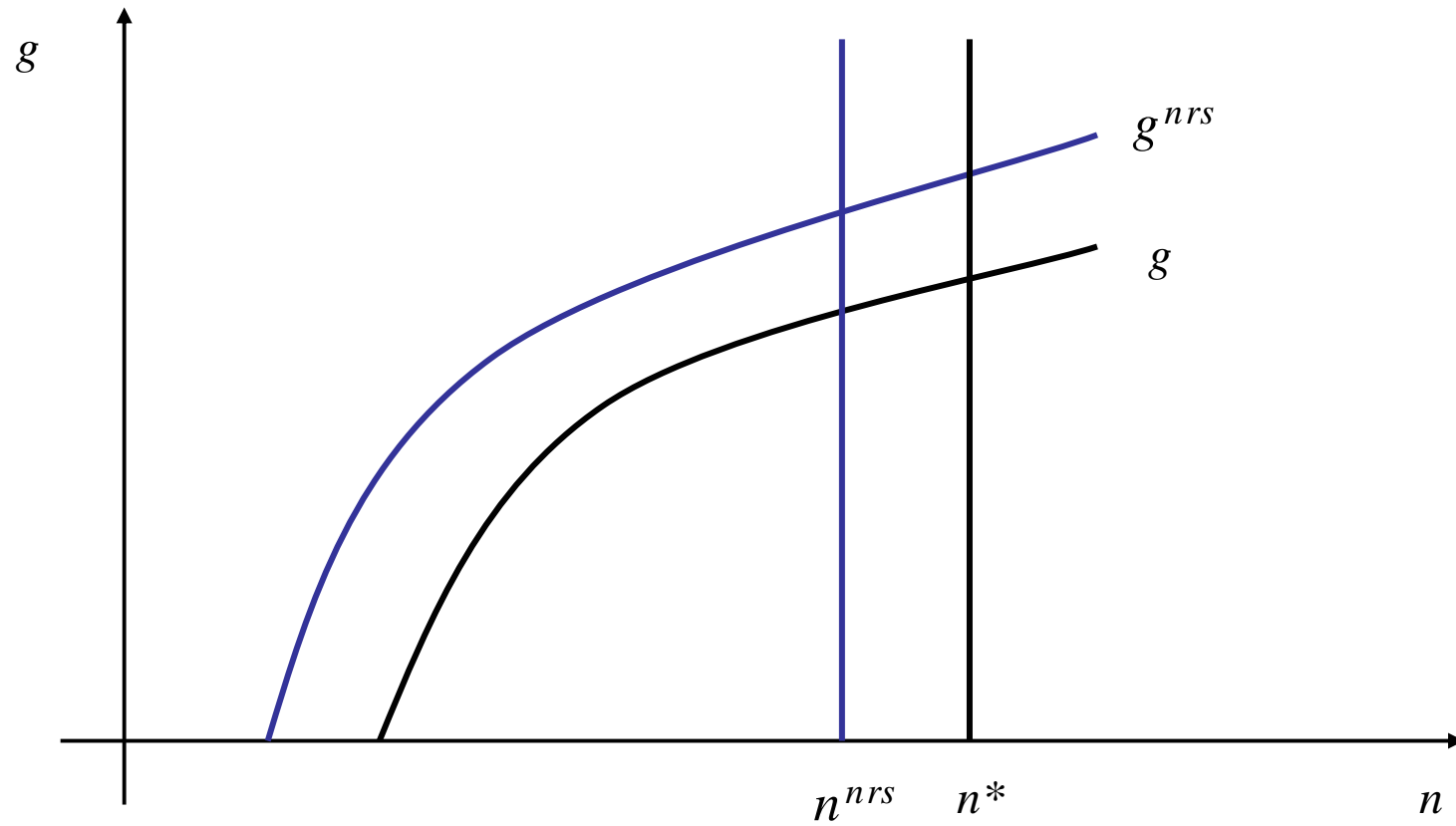


Figure 5: The effects of rent seeking on market structure and growth  
(Grossman and Helpman model)

