Rent Seeking, Market Structure and Growth*

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Abstract

We study the role of productive and unproductive entrepreneurship in economic growth in a setting where firms compete in both economic and political markets. Specifically, firms compete for market share through cost reducing technological innovation and vie for influence over government transfer policy through rent seeking activities. We find that rent seeking affects growth in two ways: it allows firms to ignore economic competition, leading to less innovation, and alters the number of firms that are supported in equilibrium. The former effect is negative while the latter is ambiguous. We show how these effects depend on various characteristics of economic and political markets.
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I 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. 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 "unproductive entrepreneurship" can take many forms including lobbying, tax evasion, litigation, or theft and can achieve a variety of goals which are profitable for the firm, but wasteful from the point of view of society. This type of activity, which is generally referred to as rent seeking, will have important effects on the rate of innovation, the structure of the market and, consequently, on the rate of growth of the economy.

There is no clear agreement in the literature about the empirical relationship between rent seeking and growth. Rent seeking is inherently difficult to measure but Mauro (1995), using subjective indices of perceived corruption, finds a negative relationship with economic growth. Bardhan (1997), on the other hand, identifies many instances where rent seeking activities have contributed to growth. Whether rent seeking facilitates or hinders growth seems to depend on the political and economic environment.

An important consideration is the channel through which rent seeking affects growth and welfare. The literature on rent seeking and economic performance has focused on two main channels. The private advantage from an 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 is not diminished by newer technologies. Parente and Prescott (1994) argue that, when monopoly rights are very strong, firms do not need to innovate in order to maintain market share. If firms find it more profitable to devote resources to the protection of existing monopolies than to R&D, overall effort in innovation will fall as a result of rent seeking.[1] A second way of ensuring monopoly rights is to prevent the adoption of new technologies. When innovation occurs through a process of Schumpeterian "creative destruction," the owners of pre-existing technologies have an interest in limiting this process. Mokyr (1998) provides ample historical evidence of this resistance to innovation and Bellettini and Ottaviano (2005) model this tension as a dynamic common agency problem between overlapping generations and policy makers. Aghion et. al. (2008) explicitly model rent seeking activity devoted to obtaining government protection from the entry of competitors.

Inherent in these arguments is the assumption that the government can grant perfectly enforceable monopoly rights that restrict the market and create a local monopoly. But it is also the case that firms influence government policies that supplement their profits rather than directly block entry.[2] A variety of government activities have this effect, including direct subsidies, tax breaks, loan guarantees, below-market-rate loans, and the provision of subsidized inputs or above market prices through state-owned enterprises. The OECD (2010) documents that these practices represent "a significant amount of public funds."[3] In effect, firms use the political process to help them survive against competitors - as witnessed in the recent financial crisis. This suggests an alternate channel for rent seeking to affect growth and welfare: it can alter market structure in ways that the industrial organization

[1] Classic works along these lines include Krueger (1974), Murphy, Shleifer and Vishny (1991) and Krusell and Rios-Rull (1996).

[2] Campos et. al. (2010) provide evidence that unproductive activities alter the expected cash flows of potential entrants and have an impact on the level of competition in economic markets.

[3] For example in the European Union, where controls on "state aids" are strictest, they represented 1% of EU GDP in 2008. If crisis related measures are included, the number triples.

literature argues play an important role in the rate of innovation, including the number and size of firms.[4] 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.[5]

We address these issues by introducing rent seeking in a growth model where innovation and market structure are determined endogenously. We define market structure as the number and composition of firms participating in the market, recognizing that this is endogenously determined and depends on the demand and technological characteristics of markets. Following Peretto (1996 and 1998) we consider oligopolistic markets where each firm carries out two different activities (in addition to rent seeking): producing a differentiated good and carrying out R&D. The latter 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. Firms can also participate in rent seeking by dedicating resources to influence the government for direct transfers which are financed through taxation. The model captures two important ideas. First, profits from rent seeking supplement economic profits for firms and represent a (direct or opportunity) cost to taxpayers.[6] Second, modern corporations

[4] For a survey of this literature, see Baldwin and Scott (1987). Later work on this topic includes Nickell (1996), Aghion et. al. (2004) and Aghion et. al. (2005). The literature linking growth theory to industrial organization is discussed in Aghion and Howitt (2005).

[5] The role of market structure has been largely ignored, with two exceptions. Bliss and Di Tella (1997) study the effect of corruption on the equilibrium number of firms, but do not address the effects on economic growth. In a related paper, Brou and Ruta (2011), we employ a model of endogenous market structure and rent seeking to investigate the relationship between economic integration and political integration in the growth process.

[6] These transfers are likely to be unpopular and, therefore, difficult to sustain politically. Though we do not model it explicitly, we have in mind that they are the result of an agency game between the electorate and the government - as in Persson and Tabellini (2003) - where the characteristics of the political environment allow for some rents. In the rest of the paper, we do not focus on the basic question of why these inefficiencies in the political system exist and focus, instead, on their consequences.

conduct productive and unproductive activities concurrently.[7] In this context, the choice between R&D and rent seeking is, therefore, internal to the firm. The model allows us to study how this choice depends on characteristics of the economic and political markets as well as how 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 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 three reasons. Firstly, transfers to firms are financed by taxing consumers. Because firms are owned by households, we might expect that 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 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 size reduces them. The net effect on profits will determine whether rent seeking induces entry or exit, with further repercussions for growth. Thirdly, profits from the political market ensure that firms are less dependent on profits from the economic market to remain

[7] Laband and Sophocleus (1992) document the vast expenditures on transfer activities by firms (including those aimed at governments) in the US. Publicly available data on lobby expenditures corroborates their findings. 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). Official data are likely to represent only a fraction of total spending for rent seeking.

competitive. This *slack* reduces a firm's incentive to invest in R&D.[8]

As in the previous literature, rent seeking has a negative impact on growth through the effect of a shrinking market and the slack provided by political profits. Differently from previous work in this area, this effect can either be reinforced by the exit of firms or counteracted by entry. A natural question arises: which of these effects is stronger? The answer depends on the characteristics of both the political and economic markets. In the formal literature, 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. To address this issues, we first consider a general market for rents and describe the characteristics that will determine the net effect of rent seeking on growth. We then study a specific example based on the classic rent seeking model by Tullock (1980). By considering three special cases of this model, we are able to highlight the channels through which rent seeking affects economic growth.

The paper is organized as follows. Section II presents the formal model and section III solves it. In section IV, we establish general results on the effects of rent seeking on market structure, growth and welfare. Section V provides a specific example of a rent seeking game. Concluding remarks follow.

II The Model

Consider an economy composed of a population of L identical consumers with symmetric preferences over differentiated goods supplied by oligopolistic producers. Consumers are

[8] Our choice of oligopolistic markets matters. Models with localized monopolies, such as the expanding varieties and quality ladder models of Grossman and Helpman (1991), would not capture all three effects outlined above.

endowed with one unit of labor each, which they supply inelastically. The number of firms is determined endogenously and firms compete in two markets. In the economic market, firms engage in two activities. Each firm produces a good which it sells to consumers. At the same time, each firm undertakes cost reducing R&D. In the political market, firms vie for a share of the government's fiscal transfer budget. All three activities undertaken by the firm require the use of labor as an input. The economic market is modeled following Peretto (1996).[9]

Consumer Behavior

Demand for each good is derived from the behavior of consumers. We assume that consumers have identical, symmetric preferences over the available varieties of goods. The typical consumer maximizes lifetime utility,

$$U(t) = \int_t^{\infty} e^{-\rho(\tau - t)} \log \left[\sum_{i=1}^{n} c_i(\tau)^{\frac{\epsilon-1}{\epsilon}} \right]^{\frac{\epsilon}{\epsilon-1}} d\tau, \tag{1}$$

subject to the intertemporal budget constraint $\dot{A} = W + D + rA - E - T$. The individual's discount rate is $\rho > 0$ and $\epsilon > 1$ is the elasticity of product substitution. Per capita expenditure is given by $E = \sum_{i=1}^{n} p_i c_i$, where p_i is the price of good i, c_i is consumption of good i and n is the number of goods available. T represents per capita taxes and W is the wage rate that we take as the numeraire and assume equal to unity. Finally, A is per capita asset holding and D represents dividends.[10]

Households obtain the optimal expenditure plan by setting the time path for expen-

[9] Readers interested in a deeper discussion of the derivation of the model's equilibrium will find it in this reference.

[10] In free entry/exit equilibrium, profits will always be zero so that this last term can be omitted without loss of generality.

ditures according to $\dot{E}/E = r - \rho$ and maximizing instantaneous utility subject to per capita expenditure. The resulting demand schedules are given by $x_i = S_i LE/p_i$, where $S_i \equiv p_i^{1-\epsilon}/P^{1-\epsilon}$ is the the share of the market captured by firm i and $P \equiv \left[\sum_{i=1}^{n} p_i^{1-\epsilon}\right]^{\frac{1}{1-\epsilon}}$ is a price index. It will be useful to characterize demand by the price elasticity of demand, $\xi_i = \epsilon - (\epsilon - 1)S_i$,

Production Technology

Each firm produces output with the following technology:

$$x_i = z_i^{\theta}(L_{x_i} - \phi), \tag{2}$$

where x_i is the output of firm i, L_{x_i} is labor used in production, and $\phi > 0$ is a fixed and sunk cost of production. The firm's knowledge (or patent) stock is given by z_i and $\theta \in (0, 1)$ is the elasticity of cost reduction. The term z_i^{θ} captures the idea that the marginal cost of production is decreasing in a 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. Technological innovations evolve according to the following condition

$$\dot{z}_i = L_{z_i}\left[z_i + \sum_{j \neq i}^{n} \frac{\gamma}{1 + \delta(n-1)} z_j\right] \equiv L_{z_i} Z_i, \tag{3}$$

where Z_i is the stock of knowledge available to firm i in the innovation process. Taken together, equations (2) and (3) imply that firms can only use the knowledge they have produced, z_i, in final good production, but knowledge produced by other firms helps in the production of new firm-specific knowledge. The parameter $\gamma \in (0, 1)$ determines the share of

privately developed R&D that becomes publicly available. The parameter δ determines how quickly congestion sets in. 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 overall increasing returns to scale and constant returns to scale in knowledge.[11] Profits from the economic market are defined as $\pi_i^e \equiv p_i x_i - L_{x_i} - L_{z_i}$.

The Political Market

We model a polity where the government collects lump sum taxes from consumers and uses this common pool of tax revenue to provide transfers to firms. The key assumption is that the government allocates the revenues to firms in response to their rent seeking efforts.[12] 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 influence the government.[13] This is meant to capture the fact that modern corporations engage in both R&D and influence activities.

The government must satisfy the following budget constraint in each period,

$$B \equiv LT = \sum_{i=1}^{n} Q_i, \tag{4}$$

where Q_i represents the transfer to firm i, T is the per capita tax on consumers and B is

[11] The model can be reinterpreted as having quality-improving innovation, where quality is a continuous variable.

[12] As discussed in the introduction, we wish to introduce a general rent seeking structure. This representation will allow us to consider the effect of various different rent seeking games. In section V we will provide a specific example.

[13] 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, ϕ, 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.

the overall budget, that can either be fixed ex ante or endogenously determined. We define a rent seeking "technology" as a function,

$$Q_i = f\left(L_{Q_i}, \Theta\right), \tag{5}$$

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 Θ contains variables that describe the way that rent seeking effort is converted into transfers. This may include exogenous measures of political competition such as the level of government bargaining power, the level of government malfeasance or the political cost of raising taxes. The vector may also include endogenous measures of political competition such as the rent seeking behavior of other firms ($L_{Q_{-i}}$) or the number of firms in the market (n), as is widely discussed in the literature (see for instance Ades and Di Tella (1999)). At this stage, the only restriction we place on the function f is that it is increasing and concave in L_{Q_i}. Profits from the political market can be defined as $\pi_i^p \equiv Q_i - L_{Q_i}$.

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 from their competitors by investing in cost-reducing R&D. In the political market, firms compete with each other by trying to obtain 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. Section III provides a formal treatment of these ideas and studies the effects of rent seeking on market structure and economic growth.

Firm Behavior

For firm i, the present discounted value of net profits is

$$V_i(t) = \int_t^{\infty} e^{-\int_t^{\tau} r(s)ds} \left[\pi_i^e(\tau) + \pi_i^p(\tau)\right] d\tau. \tag{6}$$

The firm will maximize V_i subject to technological and institutional constraints (2), (3) and (5), total demand, and taking as given the number of active firms and competitors' pricing, innovation and rent seeking strategies. The initial knowledge is assumed to be equal for all firms.

In symmetric equilibrium, firm-specific subscripts can be dropped. The elasticity of substitution is $\xi = \epsilon - (\epsilon - 1)/n$ and the stock of knowledge available to each firm when innovating is given by $Z = \left[1 + \gamma(n-1)/\left(1 + \delta(n-1)\right)\right] z \equiv \alpha(n)z$, where $\alpha(n)$ represents the productivity of labour in R&D. Each firm's optimizing behavior is characterized by the Bertrand-Nash price strategy, $p = \left[\xi/(\xi - 1)\right] z^{-\theta}$, and the optimal level of R&D activity,

$$L_z = \frac{LE\theta(\xi - 1)}{n\xi} - \frac{r}{\alpha}. \tag{7}$$

Equation (7) captures some important characteristics of R&D in partial equilibrium. The term $LE/n\xi$ represents the *gross-profit effect* that depends on total sales per firm and the oligopoly mark-up. The term $\theta(\xi - 1)$ is the *business-stealing effect* - by investing in cost reducing innovations, firms lower prices and expand their market share. Spillovers

(represented by the term α) have two distinct effects, one negative and one positive. R&D makes their competitors more productive, but they also benefit from the R&D undertaken by other firms.

When choosing the optimal amount of resources to devote to rent seeking activity, each firm equates the marginal benefit of one additional unit of labor used in rent seeking with its marginal cost.[14] The optimal amount of resources employed in rent seeking can be written as $L_{Q_i} = L_{Q_i}(\Theta)$. Substituting the optimal rent seeking strategy into Q_i, we obtain the equilibrium amount of rents that firm i can extract from the government. In symmetric equilibrium instantaneous profits are given by

$$\pi^e + \pi^p = \frac{LE\left[1 - \theta(\xi - 1)\right]}{n\xi} + \frac{r}{\alpha} + Q - L_Q - \phi. \tag{8}$$

The above discussion describes the Nash equilibrium for a given market size, LE, and number of firms, n. Since we assume that all firms start out with the same stock of knowledge, firms will accumulate knowledge at the same rate and symmetry will be preserved at all times.

III Market Structure and Growth

In order to establish equilibrium market structure, we first consider the behavior of firms taking 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. The entry/exit decision then determines the number of active firms. Once the behavior of firms is established, market clearing conditions determine the general equilibrium

[14] 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.

of the economy.

Free Entry and General Equilibrium

Consider the entry/exit decisions of firms.[15] In the absence of entry/exit costs, the number of firms is a jumping variable and $V = 0$ at all times. Moreover, stock prices must satisfy the arbitrage condition, $rV = \pi^e + \pi^p + \dot{V}$. These conditions imply that profits must equal zero at all time. Together with condition (7), the zero profit condition defines the Nash equilibrium with free entry, given the interest rate, r, and the size of the market, LE.

By summing the zero profit condition across firms and imposing labor market clearing, per capita expenditures are shown to be $E = 1 - nQ/L$. Notice that rent seeking activities represent a waste of resources and reduce per capita equilibrium expenditures. Since n and E are constant along the balanced growth path it must be the case that $r = \rho$. The optimal investment strategy (7) can now be written as a function of exogenous parameters and the number of firms. Substituting this into condition (8) and setting it equal to zero yields the zero profit condition,

$$\frac{L\left[1-\theta(\xi(n)-1)\right]}{n\xi(n)}\left[1-\frac{nQ(\Theta)}{L}\right]+\pi^p(\Theta)+\frac{\rho}{\alpha(n)}=\phi. \tag{9}$$

This condition implicitly determines the equilibrium number of active firms.[16] 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 (π^p), but also reduce sales because of the effect of higher taxes on equilibrium

[15] For analytical convenience, in the rest of the analysis we treat the number of firms as a continuous variable.

[16] If the vector Θ does not contain n, total profits - the left hand side of (9) - are strictly decreasing in n and there is a unique equilibrium. There are also a large class of rent-seeking games for which the left-hand side is decreasing in n so that the equilibrium number of firms is also uniquely determined. We consider an example in section V.

expenditures.[17] Condition (9) is depicted in the top panel of Figure 1.

[Figure 1 about here]

Equilibrium Growth and Welfare

Firms take the number of competitors as given and choose the optimal level of R&D according to condition (7). The equilibrium number of firms, in turn, is endogenous and determined by the zero profit condition (9). The number of firms is a jumping variable and is constant along the balanced growth path. This implies that the total stock of knowledge available to each firm grows at the rate $\dot{Z}/Z = \alpha L_z$. Along the balanced growth path, both consumer expenditures and the number of firms are constant. The rate of cost reduction then determines the growth of output and consumption. Using the zero profit condition (9) and the definition of growth yields the equilibrium growth rate of the economy

$$g \equiv \dot{C}/C = \theta \dot{Z}/Z = \theta \frac{\theta \alpha(n) \left[\xi(n) - 1\right] \left[\phi - \pi^p(\Theta)\right] - \rho}{1 - \theta \left[\xi(n) - 1\right]}. \tag{10}$$

This condition is a modified version of the firm's R&D decision, where firms have perfect foresight, correctly perceive the effect of parameter changes on their profits and, based on this, choose whether to be active or not. It therefore shows, for any given number of firms, the incentive to pursue the innovation that drives economic growth. Together with the equilibrium number of firms determined by condition (9), this determines the economy's equilibrium growth rate as depicted in the lower panel of Figure 1.

Welfare in this economy is closely related to economic growth. Integrating the con-

[17] These results would be slightly different if it were firms rather than consumers who paid the tax. The market size effect would not arise. Furthermore, in symmetric equilibrium, the amount of taxes paid by each firm would exactly equal the transfers received and $\pi^p = -L_Q$. All other results and comparative statics would be the same. We prefer the assumption that taxes are paid by consumers because firms extract some benefit from rent seeking.

sumer's lifetime utility function yields

$$U = \frac{1}{\rho}\left[\frac{1}{\epsilon - 1}\log n + \log\frac{\xi - 1}{\xi} + \frac{g}{\rho} + \log E\right]. \tag{11}$$

Welfare is increasing in the number of goods available, in the rate of growth of consumption (which is equal to the rate of cost reduction, g) and in total expenditures.

IV The Effects of Rent Seeking

Rent seeking, like market structure and growth, is an endogenously determined feature of this model. In order to analyze the implications of rent seeking on the economic outcomes of interest we will compare the outcomes derived in the previous section to those that would arise if the possibility of rent seeking were eliminated from the model.

Market Structure

In the absence of rent seeking, the equilibrium number of firms is determined by condition (9) with $L_Q = Q = 0$. The change in the left-hand side of (9) when rent seeking is eliminated is

$$\Phi \equiv \pi^p(\Theta) - \frac{[1 - \theta(\xi(n) - 1)]}{\xi(n)}Q(\Theta). \tag{12}$$

This term represents, for a given number of firms, the total contribution of rent seeking activity to the firm's profits. In other words, it represents the shift in the $\pi^e + \pi^p - \phi$ schedule in the top panel of Figure 1. We see that rent seeking has two effects on the equilibrium number of firms, which work in opposite directions. The first term represents the increase in profits from rent seeking activity, the second represents the loss of profits from a reduction in consumers' 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 profitability of rent seeking, π^p, relative to the size of rents, Q, provides an incentive for entry. Economic market conditions shape this comparison. The term $[1-\theta(\xi-1)]/\xi$ captures the fraction of revenues from the economic market that the firm keeps as profits. The higher this term, the more costly is the loss of market size due to rent seeking. More precisely, notice that this term is higher for lower values of ϵ (the elasticity of product substitution) and θ (the elasticity of cost reduction). Using the terminology of Bliss and Di Tella (1997), we can refer to ϵ and θ as "deep" competition parameters, because they are demand and technology parameters, respectively, that determine the structure of economic market in the absence of rent seeking. The negative impact of rent seeking on firms' profits is larger for those industries that are inherently less competitive (i.e. with low ϵ and θ). This shows the following:

Proposition 1. *Rent seeking can either increase or decrease market entry. For any given political structure, the negative impact of rent seeking on the equilibrium number of firms will be larger for an industry characterized by low elasticity of product substitution (ϵ) and low elasticity of cost reduction (θ).*

Equilibrium transfers, Q, and profits from rent seeking, π^p, 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 so that political profits are small, then rent seeking will have a negative effect on profits and firms will exit from the market.

Growth and Welfare

To see the impact of rent seeking on growth, first define the growth rate (10) when there is no rent seeking (i.e. when $L_Q = Q = 0$) as g^{nrs}.[18] The change in the growth schedule can be expressed as:

$$g - g^{nrs} = -\frac{\theta\alpha\left[\xi - 1\right]}{1 - \theta\left[\xi - 1\right]}\pi^p. \tag{13}$$

For any given market structure, this term represents the direct effect of rent seeking on growth, which is always negative. In terms of Figure 1, it represents the shift in the $g(n)$ schedule in the second panel. When profits generated by rent seeking are high, production plays a lesser role in the firms' equilibrium profits. As a result, there is less of an incentive to invest in R&D and growth is lower for any given number of firms: the growth schedule shifts down. In other words, political profits provide firms with *slack* in the economic market. The greater are political profits, the less pressure firms feel to cover their fixed costs through economic competition. As long as profits 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.

[Figure 2 about here]

Notice that if the political market were to generate no direct profits 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. As shown in the previous subsection, rent seeking affects the incentives to enter or exit the market. The number of firms 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 reduced market

[18] Assuming $1 > \theta\left(\epsilon - 1\right)$ is sufficient to prove the symmetry of the Nash equilibrium (see Peretto, 1998, proposition 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.

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 third 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 2. 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 3.

[Figure 3 about here]

The effect of rent seeking on welfare is closely linked to growth. If we again define consumers' lifetime utility (11) in the absence of rent seeking as U^{nrs}, then the difference

$$U - U^{nrs} = \frac{1}{\rho}\left[\frac{g - g^{nrs}}{\rho} + \log(1 - \frac{nQ}{L})\right] \tag{14}$$

shows that the impact on welfare, for a given number of firms, depends on the impact on growth together with an (always negative) income effect.

The above results are summarized in

Proposition 2. *Rent seeking has two effects on long-run growth. First, rents reduce incentives to invest in R&D for a given number of active firms by creating slack in the economic market (direct effect). Second, rent seeking alters the equilibrium number of active firms, further changing the incentives to innovate (indirect effect). There is an additional negative effect on welfare through the decrease in expenditures.*

Graphically, the direct effect of rent seeking is to shift the growth schedule down for any value of n. Rent seeking also alters the equilibrium structure of the market, n (the indirect effect). The interaction of these two effects - i.e. the intersection of the two schedules in Figures 2 and 3 - determines the long run rate of growth of the economy. It is important

to note that market structure and the growth rate depend importantly on what happens in both the economic market and the political market. The inherent level of competition (in the sense of the 'deep' parameters) in each market affects the number of firms that can be supported in equilibrium. Furthermore, political factors directly influence the incentives of firms to engage in R&D. The overall effect of rent seeking on growth will depend on the specific characteristics of the economic *and* political markets. We turn our attention to this in section V.

V A Model of Rent Seeking

Until now we have focused on a very general structure for the market for rents. This section introduces a specific model of rent seeking developed by Tullock (1980). The rent a firm obtains is assumed to be an increasing function of that firm's share of total rent seeking activity. The general form of this model can be expressed as:

$$Q_i = \frac{L_{Q_i}^{\lambda}}{\sum_j L_{Q_j}^{\lambda}} \overline{B}. \tag{15}$$

In terms of the general rent seeking function described in section III, the vector of political market characteristics is now $\Theta = \left[L_{Q_{-i}}, \overline{B}, \lambda\right]$, where $L_{Q_{-i}}$ is the vector of rent seeking effort of firm i's $n-1$ competitors, $\overline{B}$ is the exogenous government budget, and $\lambda > 0$ is a parameter measuring the responsiveness of government to rent seeking effort. In each period there is a fixed budget ($\overline{B} > 0$) 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 $\overline{B} = LT = \sum_i Q_i$.

This model is 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 the directly unproductive profit-seeking of Bhagwati (1982)). Secondly, competition between different special interests reduces the returns to rent seeking (along the lines of Becker (1983)).[19] This choice further simplifies the analysis by imposing that the amount available for distribution by the government is fixed: firms cannot influence the level of taxation, only their share of the pie. More generally, this specification can be thought of as the reduced form of political model as in Persson and Tabellini (2003) where the parameters are the outcome of an agency model of political accountability. In particular, λ measures how responsive the government needs to be to certain special interests. The Tullock model also has the benefit of sharing important characteristics with other interesting rent seeking games. Baye and Hoppe (2003) show that under certain conditions, a Tullock game is equivalent to models of innovation tournaments and race patents.

The game has a symmetric pure strategy Nash equilibrium if and only if $\lambda \leq n/(n-1)$, so we restrict our attention to this case.[20] The rent seeking literature is concerned with the total rent seeking outlays relative to the value of the contested rent - i.e. the level of *rent dissipation*. The model specified in (15) allows us to consider two possibilities: full and partial rent dissipation.[21] It is important to note that even though the case of over-dissipation is ruled out in this game, it does not rule out the possibility that in general equilibrium rent seeking will have a negative effect on growth and welfare greater than just the reduction in income. As we show, rent seeking draws valuable resources away from more productive uses.

[19] 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.

[20] Whenever $\lambda > n/(n-1)$, there is a continuum of Nash Equilibria in mixed strategies, but no pure strategy equilibrium. A general characterization of the equilibria is not available in the literature except for the limit case of $\lambda \to \infty$.

[21] That *over*-dissipation is not possible is not a result of our restriction on λ. Baye, Kovenock and de Vries (1994) show that the equilibrium mixed strategies when $\lambda > n/(n-1)$ cannot allow for over-dissipation in expectation because this would imply that firms would have a negative expected payoff and would be better off not participating in rent seeking activity at all.

In this sense, our results are similar to those in the 'resource curse' literature. Typically, the decrease in income, growth or welfare that results from an increase in natural resources is not (fully) explained by the assumption of a political contest with over-dissipation, but rather by a re-allocation of productive resources (e.g. Tornell and Lane (1999), Sachs and Warner (1995)). Torvik (2002) uses a related rent seeking function to show that a shift in entrepreneurial effort toward rent seeking can explain the resource curse.

Full Rent Dissipation

Full rent dissipation occurs when $\lambda = n/(n-1)$.[22] Formally this implies that in a symmetric equilibrium $L_Q = Q = \overline{B}/n$ and $\pi^p = 0$. Condition (12) then becomes

$$\Phi = -\frac{\overline{B}\left[1-\theta(\xi(n)-1)\right]}{n\xi(n)} < 0. \tag{16}$$

Since profits, 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 their value to firms. This model allows us to isolate the market size effect of rent seeking since, in equilibrium, rent seeking generates only this cost. Firms find themselves in a prisoner's dilemma. They would all be better off if none of the firms participated in rent seeking, but if this were the case, the incentive for any one firm to influence the government

[22] The analysis is the same for the case where $\lambda \to \infty$. This is referred to as the all-pay auction because the firm putting forth the greatest rent seeking effort is certain to receive the entire budget and all firms pay the cost of rent seeking whether they win the contest or not. Baye, Kovenock and de Vries (1999) show that there is a symmetric equilibrium where the expected payoff for each firm is zero. There is also a continuum of asymmetric equilibria, but all of these equilibria are payoff equivalent so little is lost from focusing on the symmetric equilibrium.

A similar result would obtain if we assume a lobbying a la Dixit, Grossman and Helpman (1997). Since transfers are lump-sum, the government can costlessly transfer funds between the firms. This allows it to be able to play them off against each other and extract the entire surplus. 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.

is high because having no competition guarantees high returns from rent seeking. All firms realize this and the result is positive rent seeking expenditures in every period with lower total profits for every firm.

To see the effect on economic growth notice that condition (13) is equal to zero, since $\pi^p = 0$. There is no direct effect on economic growth because rent seeking does not generate additional profits for the firm - does not provide any slack - and therefore does not alter the incentive to engage in R&D for a given market structure (i.e. number of firms). 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 resulting from the taxation required to finance government transfers, a smaller number of firms will find it profitable 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 4. This has important implications for the welfare of consumers. Lower expenditures due to taxation shift the equilibrium utility curve (10) down while a lesser variety of goods to consume results in higher prices and reduced growth, leaving consumers unambiguously worse off.

Proposition 3. *In a Tullock economy with full rent dissipation, rent seeking lowers long-run growth through its negative indirect (market structure) effect. As political profits are zero, no direct effect on growth is present. Welfare is reduced.*

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. Since firms compete away all benefits from rent seeking and spending on their goods is reduced, profits are lower and the market sustains a smaller number of firms.

[Figure 4 about here]

Partial Rent Dissipation

The stark result presented in the previous sub-section is important, but it was achieved by shutting down some important channels through which rent seeking may affect growth. Effectively, competition for transfers was so tough that firms could not generate positive profits from rent seeking. But if we allow for firms to gain some advantage through rent seeking, it may induce entry into the market and possibly offset the market size effect described above.[23]

Consider the case where $\lambda \leq n/(n-1)$. We will establish that the impact of rent seeking on the economy depends on the interaction between economic and political market parameters. Notice that the larger is λ, the more the government is responsive to rent seeking. This parameter can depend on institutional variables such as transparency, accountability of bureaucrats and politicians and, more generally, on the checks and balances on government activity. We can think of λ as a 'deep' parameter of competition in the political market.

The symmetric equilibrium rent and profit from rent seeking are given, respectively, by $Q = \overline{B}/n$ and $\pi^p = \left(\overline{B}/n\right)[1 - \lambda(n-1)/n]$. It is important to highlight the role that checks and balances on the government play in this model. As λ increases, devoting resources to rent seeking 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 it induces more rent seeking by all firms. In equilibrium, this reduces the ability of each firm to extract resources from the government.

The effect of rent seeking on entry/exit is captured by rewriting condition (12) to reflect

[23] It is has been argued, following Posner (1975), that free entry into the rent seeking game will ensure full rent dissipation - total expenditures on rent seeking equal to total rents. This result does not apply to the present model because rent seeking is not the only thing that firms do. Free entry will ensure that total profits are pushed to zero, but this does not necessarily imply that profits from rent seeking will be zero.

equilibrium values:

$$\Phi = \frac{\overline{B}}{n}\left[1 - \lambda\left(\frac{n-1}{n}\right) - \frac{1-\theta(\xi(n)-1)}{\xi(n)}\right]. \tag{17}$$

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

As established in Proposition 1, when consumers cannot substitute freely between goods, firms can charge a higher price and extract greater profits 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 λ. As the quality of institutions falls, rents increase but so does the cost of obtaining them. For this reason, rent seeking is more likely to have a negative (general equilibrium) effect on profits. In order for rent seeking to have a positive impact on entry it must be the case that λ is small relative to ϵ. Recalling that we referred to these as 'deep' parameters of competition in the the political and economic markets, respectively, this can be interpreted as saying that rent seeking promotes entry only when political markets are *relatively* less competitive than economic markets. Only when this is the case does the increase in profits from rent seeking activities more than offset the loss of market size.

To see the effect on economic growth notice that the shift in the growth schedule is

$$g - g^{nrs} = -\frac{\theta\alpha\left[\xi - 1\right]}{1 - \theta\left[\xi - 1\right]}\pi^{p}. \tag{18}$$

Again, since rent seeking generates positive profits 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 political profits, π^{p}, thus providing further incentive 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.

Proposition 4. *In a general Tullock economy, rent seeking increases the equilibrium number of firms if government's responsiveness to rent seeking activity is low ($\lambda < (\epsilon - 1)(1+\theta)/\epsilon$) and the number of firms supported by the market in the absence of rent seeking is small ($n^{nrs} \leq \widehat{n}$, where $\widehat{n}$ is implicitly determined by $\lambda = (\xi(\widehat{n}) - 1)(1+\theta)/\xi(\widehat{n})$), and decreases the number of firms otherwise. In the first case, rent seeking has an ambiguous effect on long-run growth as the indirect effect of rent seeking is positive while the direct effect is negative. In the second case, rent seeking unambiguously lowers long-run growth as both its direct and indirect effect are negative. There is an additional negative effect on welfare through the decrease in expenditures.*

Two important implications can be drawn from this analysis. First, it is the interaction between demand characteristics from both the economic and political markets that determine the impact on growth. Secondly, rent seeking will have a positive growth effect only if it induces enough entry into markets that the negative direct effect is canceled out. This would occur only when firms have little market power over consumers (ϵ high), *and* are able

to extract high rents from every dollar raised by the government (λ 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.

VI 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. We provide a formal analysis of how this type of unproductive activity can affect economic growth. Firstly, the profits generated by rent seeking provide the firm with relief from economic competition and dull the incentive to innovate. Secondly, the market structure sustained in equilibrium is altered, further distorting the incentives to innovate. The former effect is consistent with the finding that aggregate measures of rent seeking and corruption are negatively correlated with economic growth, as in Mauro (1995). The importance of the latter effect is corroborated by Campos et al (2010), who find that rent seeking activities affect the cash flow of firms both through the costs involved and the rents received. Furthermore, the change in cash flow affects the entry decision of potential competitors and the profitability of incumbent firms. Perhaps more importantly, the relative impact of rent seeking on firm entry is conditional on the quality of institutions, as we show in our discussion of the Tullock rent seeking example. The market structure effect we identify is also broadly consistent with the work of Aghion et al (2008), who find that the quality of institutions can have a different effect on entry and growth depending on characteristics of the economic market. Although their focus is on democracy as a measure of institutional quality and distance from the technological frontier

as the economic characteristic, this result is similar to our findings.

The model also provides additional insight into the role that government (fiscal) policy plays in economic growth. This role is not dependent on whether government expenditures are useful in production or subject to congestion, but rather based on how competitively firms vie for the allocation of the fiscal budget and the implications this has on the incentives to innovate. Moreover, the model has two clear testable implications. First, in countries where governments are more responsive to rent seeking (i.e. where checks and balances on government activity are weak), rent seeking works as an implicit barrier to entry for new firms, as rents are offset by the large cost of obtaining them. In this case, rent seeking is predicted to have a stronger negative effect on growth due to the resulting lack of competition. Second, for a given quality of political institutions, in sectors characterized by low elasticity of product substitution, that is where active firms benefit from market power, rent seeking lowers entry as the cost of losing market size dominates the benefit of receiving a net rent. In these sectors, rent seeking is predicted to have stronger negative effects on growth.

The set of policies which firms try to affect through rent seeking activity and the set of means they employ to do so are both very large. The first includes - but is not limited to - taxes, subsidies (to production, R&D, etc.), barriers to entry and regulation, while the former includes lobbying, bribery and informal influence. No general theoretical framework can capture all these important features and new insights will likely emerge from future work in this area. However, we believe that our model is a useful first step. It provides insights into how the competition for a widely used policy - direct transfers to firms - affects economic growth through several channels.

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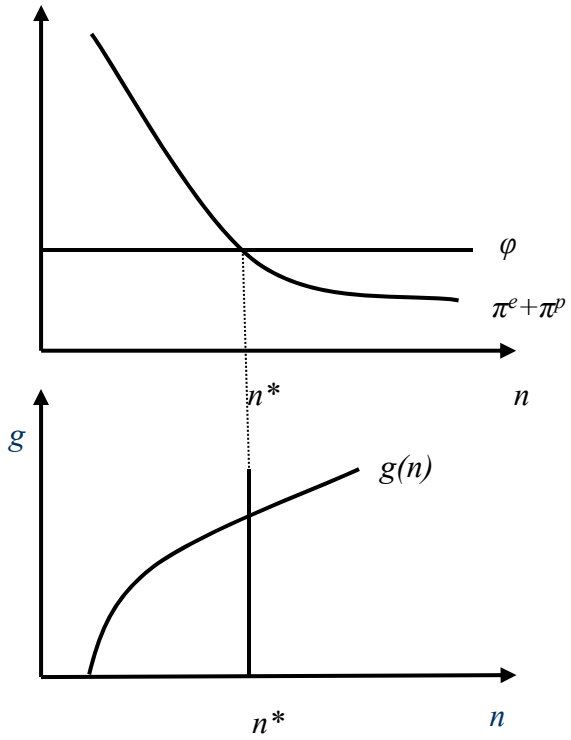

Figure 1: **Equilibrium market structure and growth**

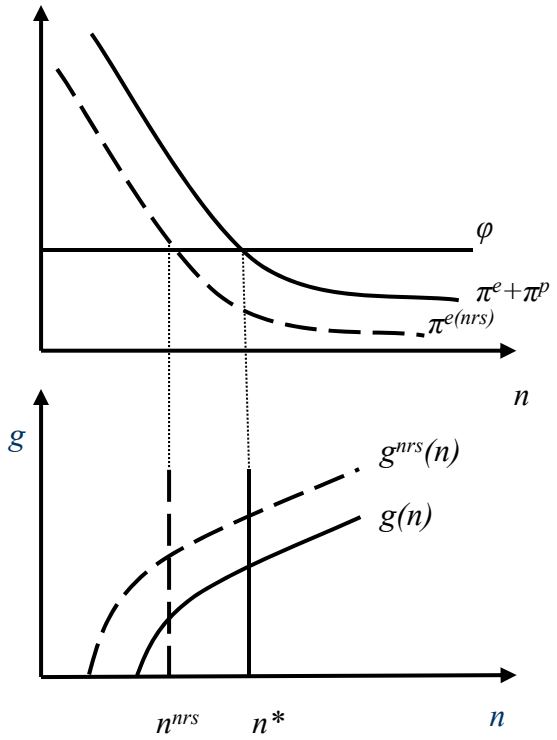

Figure 2: **The effects of rent seeking on market structure and growth (when rent seeking induces entry)**

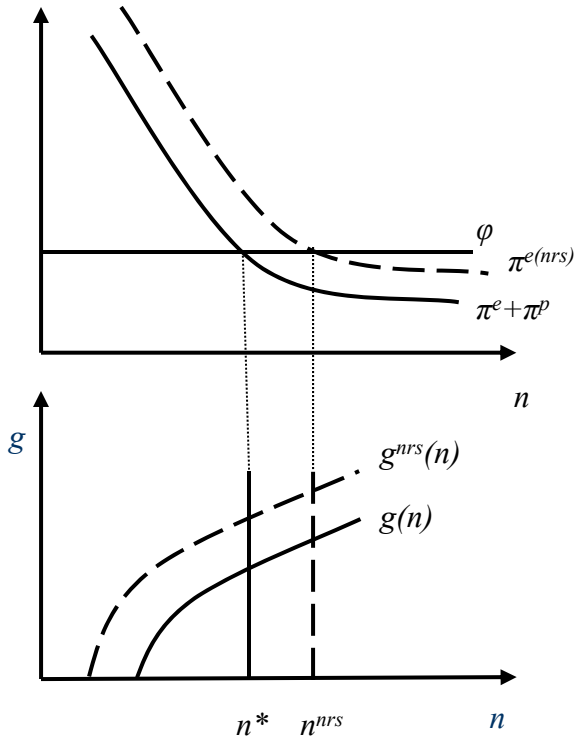

Figure 3: **The effects of rent seeking on market structure and growth (when rent seeking induces exit)**

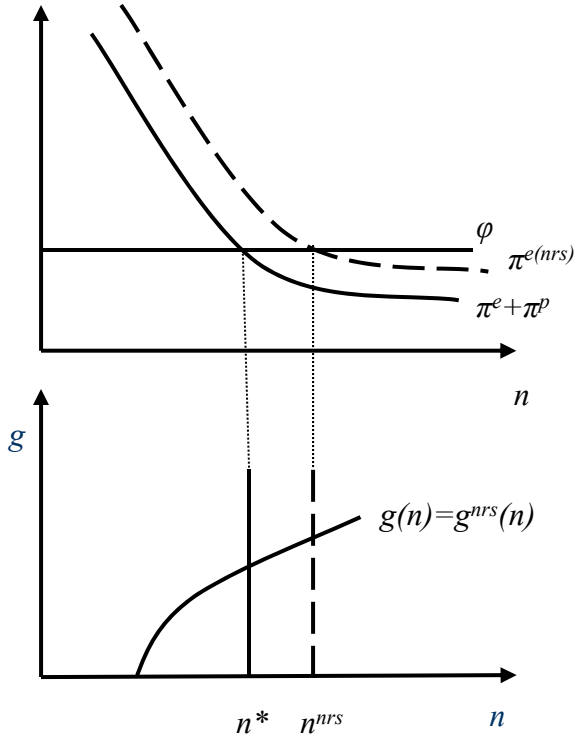

Figure 4: **The effects of rent seeking on market structure and growth (full rent dissipation)**