LOBBYING, VOTING AND THE POLITICAL ECONOMY OF PRICE REGULATION

by

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Abstract:

Is the cure of regulation always superior to the disease of market failure? This paper shows, in the context of a structural voting model, that voter-determined prices can lead to lower aggregate welfare than unregulated monopoly. Extending the voting model to incorporate lobbying, I examine the Becker (1983) hypothesis that lobbying can improve the efficiency of political outcomes by giving voice to economic interests under-represented in the political process. However, lobbying is costly (the Posner (1975) costly-rent-seeking hypothesis); the model suggests that competitive lobbying costs more than offset the increase in efficiency. The model is further extended to a "concentrated ownership" economy; if stockholders hold the market portfolio and actively control firms' lobbying expenditures, then costly rent-seeking is muted, greater efficiency obtains, but often at the cost of reversing the cross-subsidies preferred by voters to those preferred by stockholders.

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1. Introduction

Economists have long recognized that regulation is an imperfect solution to market failure. The term "regulatory failure" is often used to denote the inefficiencies inherent in government intervention in the marketplace. Policymakers are thus confronted with a practical problem of comparative institutions: do the inefficiencies of regulation outweigh the inefficiencies of the market failure that the regulation is designed to correct (say, monopoly)? In this paper, I develop a simple stylized model of a (potential) monopolist offering two services, one more widely demanded than the other. Aggregate surplus with unregulated monopoly is compared with aggregate surplus from a median voter model of price setting in a (perfectly) regulated monopoly, and it is shown that regulation can do substantially worse than unregulated monopoly.

However, this result is derived in a pure median voter model. Becker (1983), among others, has argued that lobbying may increase the efficiency of political outcomes. Broadly, the argument runs that lobbying permits agents to influence the political process commensurate with the strength of their preferences and not just their number. The model is extended to include lobbying by firms which do not vote but which have preferences and can influence electoral outcomes by expending lobbying resources. However, the Becker effect (increased efficiency of outcomes) must be balanced against the cost of lobbying,[1] which I refer to as the Posner effect (after (Posner (1975)). Lobbying is modeled as a one-stage game in which firms with competing interests choose lobbying expenditures which can affect voting patterns and thus the median voter outcome; the solution to the game is characterized by a modified Ramsey rule (similar to that in Grossman and Helpman (1994)). The complexity of the game precludes obtaining more general results, but extensive simulations suggest that competitive lobbying encourages rather substantial lobbying expenditures that largely offset one another, leading to very little gain in price-driven efficiency. The result is that lobbying leads to small increases in the welfare of (non-corporate) consumers, but decreases in total welfare.

The model is further extended to include the case in which voters own and control the firms, not only voting their investment interests, but determining lobbying expenses as well. When voter/stockholders hold the market portfolio, all lobbying costs are internalized and wasteful lobbying is eliminated. In this model, the Posner effect is muted, and not only are voter-preferred subsidies reduced, they can in fact be reversed, leading to inefficiencies that favor firms over consumers. Generally, this results in an increase in aggregate efficiency. This model is perhaps more applicable in economies with highly concentrated ownership, such as occurs in certain countries in the developing world.

In Section 2, the literature in reviewed; this section is longer than usual, in that several distinct schools of thought are pulled together, and the literature from another field is reviewed. The base model is laid out in Section 3, in which production, consumer/voters, and regulation are described. In Section 4, the efficiency of unregulated monopoly is compared to that of voter-determined prices for a regulated monopoly; there is no lobbying in this model. Lobbying is introduced in Section 5, in which the lobbying game is defined and I examine whether the costs of increased lobbying outweigh the gains of more efficient prices. Finally, in Section 6, voter control of lobbying is introduced and analyzed. Section 7 concludes the paper.

2. The Literature

The literature in regulatory economics is remarkably schizophrenic; there are three major schools of thought that have developed independently, with little interaction among them. This section is a necessarily cursory attempt to bring these disparate threads together.

One major school of thought on regulation was pioneered by Stigler in the early 1960s and carried on by Peltzman, Becker and many others, well-represented in the collection of articles in Stigler (1988). It is justly known as the Chicago School. The central problem addressed by this work is "demanders" of regulations (industries and other constituents) using political influence to enlist "suppliers" of regulations (regulators and legislators) in order to capture market rents. In this view, regulation is not about achieving efficient outcomes (in the sense above), but rather redistributing rents using the coercive power of government.

This powerful concept has no single, central organizing analytic model to fully realize it. Becker's (1983) formulation of a more general model of political influence has had little impact on the applications literature, which has instead focused on reduced form models, applicable only to the problem at hand (see, for example, Stigler, Peltzman, and Linneman in Stigler (1988)). Closest in spirit to this paper is Peltzman (1980) which uses a stylized majority-voting approach to model government tax and transfer policies.

The second school stems from the work of Baron and Myerson and others in the early 1980's, who applied the then-new principal-agent model to regulation. While many have contributed to this literature, Laffont and Tirole (e.g., 1993) are the names most closely associated with this approach, which Laffont (1996) has labeled the 'public interest asymmetric information' model; perhaps it is most appropriate to refer to this as the Toulouse School. The basic idea is that a principal (regulators, or legislators, or constitution-writers) are interested in promoting the public interest, generally defined (by economists) as maximizing some form of aggregate welfare, facing an agent who possesses superior information (on costs, demands, technology, etc.) who uses the information strategically for its own objectives. Regulation is thus modeled as a mechanism design question.

There is no question that the Toulouse School has developed an analytical paradigm of great power and sophistication to the problems of regulation. However, the traditional principal-agent approach of this school rests on some key assumptions that raise questions about its applicability to regulation as it is actually practiced:

- The assumption that at some level of control, the principal behaves in the "public interest," as defined by economists. This appears rather optimistic; until quite recently, few if any regulators professed interest in, indeed knowledge of, economic efficiency. There is little evidence to support the idea that actual regulatory price-setting, for example, is guided in any way by efficiency considerations.

- The assumption that asymmetric information is the only, or at least the most important, problem of regulation. While there is no doubt that firms are likely to know things that regulators would find useful, problems of regulatory competence, political constraints on actions, bribes and other lobbying, are likely to have far greater influence on the economic performance of regulators than their state of information about, say, costs.

- There is nothing inherent in agency theory that is uniquely applicable to *public*, or *government*, control of firms. This approach to regulation thus limits the analysis to those problems of public regulation that are similar to, say, firm managers trying to control workers, or firm shareowners trying to control firm managers.

The strengths of the Toulouse School appear to be the weaknesses of the Chicago School, and vice-versa. Only recently have efforts been made to merge these two powerful themes. The earliest attempt is in Laffont and Tirole (1993, Ch. 11, Regulatory Capture). They develop an interesting model of interest group politics within the overall framework of agency theory; essentially, it is an agency model with (enforceable) side payments. While it was an important step forward, it still suffers from all three of the previous objections to agency theory. More recently, several papers bring together political economy and agency theory. Laffont (1996) examines the implications for the form of regulation and ownership of regulated firms, depending upon whether the political majority are owners of the firms or just consumers of its outputs. Laffont (1996) develops a political economy model of industrial policy, again within the context of asymmetric information. Tirole's (1997) paper on advocates explores the role of information provision in setting public policy, and examines when using advocates is a more efficient means of eliciting information than using impartial experts. This group of papers is perhaps an important step forward, in that it brings political control together with agency theory to determine optimal control structures.

The third school arose as international trade theorists developed a deep and rich literature on the political economy of interest group lobbying for protection and/or free trade. This literature began in the early 1970s, and is best summarized in Hillman (1989) and Magee, Brock, and Young (1989). More recently, several articles have appeared by Grossman and Helpman (1994, 1995, and 1996) and Dixit and Londregan (1995) in this tradition, using modern game-theoretic methods. The idea is to model how lobbying groups form and how they influence trade policy through the political process. The models developed are squarely within the Chicago School in their political economy analysis. Curiously, the regulatory economics literature appears to be devoid of references to this extensive work, which appears to have a great deal to teach about the political economy of regulation.

Those papers in which political factors play a key role almost never actually model the structure of voting or lobbying.[2] To take a recent example, Grossman and Helpman (1994)[3] define a game in which interest groups offer "contribution schedules" to government, which promise different contribution levels for the delivery of different protection levels associated with goods in which they have an interest. Government's objective function is the sum of its realized contributions plus (weighted) aggregate social welfare. Elections only enter indirectly: "contributions ... can be used to finance campaign spending..." However, this connection between lobbying, voting, and winning elections is never made explicit. All politics in these models is reduced form politics. Formally, lobbying is in the form of transfer payments to politicians in return for favorable actions on their part.[4]

The absence of structural voting models in this literature is not surprising; theoretical voting models often are unstable (cyclic voting) or discontinuous (a small change in a lobbying input, say, may be sufficient to reverse a policy and create large shifts in rents). The Downs' (1955) median voter theorem is perhaps the strongest (and best-known) result in this area, but it only applies under rather stringent conditions: a single dimension of policy, and voters with single-peaked preferences. These difficulties are sufficiently discouraging that structural modeling has been avoided.

But in certain problems of regulation, the stringent conditions of the Downs' theorem may be met. For example, I have argued elsewhere (1997) that the dominant distributional problem of US telecommunications for many years was the trade-off between the price of local telephone service and the price of long-distance service. Since a single firm provided both (prior to 1984), subject to non-negative profits, these two prices were negatively related. The job of determining this price trade-off fell to the Federal Communications Commission,[5] whose jurisdiction was limited to this industry. Therefore, no other issues (such as tax policy or trade protection) could be considered, and this really was a single policy dimension, in which individual voters/consumers have single-peaked preferences. Further, in such cases, the policy options (prices) and voter preferences are continuous, so that discontinuities of outcome are not a problem. The use of the median voter theorem in these cases is quite appropriate.[6]

To the extent that the effect of lobbying and political contributions is to influence voting, a structural model of voting is a perquisite to a structural model of lobbying.[7] It is to the construction and analysis of such a voting and lobbying model that we now turn.

3. The Basic Model

We consider a monopolist[8] that produces two services, a "mass" service M that everyone is likely to consume and a "specialized" service S that is consumed (perhaps intensely) by part of the population. An example from telephony would be local service as service M and toll service as service S; an example from information networks would be e-mail and local library text access as service M and full graphics worldwide capability as service S.

Demand Consumers are indexed by θ, $0 \le \theta \le 1$, with individual demand functions $q_Z(p;\theta)$, for services $Z = M,S$.

We assume:

1. $q_Z(p_Z;\theta) = \lambda_Z(\theta) \cdot Q_Z(p_Z)$; individual demand functions are separable in p and θ, demands for the two products are independent, and income effects are ignored. Consumer θ consumes the fraction $\lambda_Z(\theta)$ of total demand Q_Z for service $Z=M,S$, so $\int_0^1 \lambda_Z(\theta)d\theta = 1$.

2. $\lambda_M(\theta) > 0$, for all θ; everyone consumes the mass service.

The special assumption that each individual's demand function is a multiple of the aggregate demand function is by no means innocuous. It implies that all consumers with a positive λ consume at any price at which anyone consumes. In this formulation, the model is not appropriate for addressing regulatory questions of "universal service" or network externalities.

We use the convention that $\lambda(\theta) = \lambda_S(\theta) / \lambda_M(\theta)$ is an increasing function of θ;[9] consumers are indexed according to their ratio of specialized to mass demand.

Consumer θ's (indirect) utility is:

$$U(p_M, p_S;\theta) = U_M(p_M;\theta) + U_S(p_S;\theta) = \int_{p_M}^{\infty} \lambda_M(\theta) \cdot Q_M(z)dz + \int_{p_S}^{\infty} \lambda_S(\theta) \cdot Q_S(z)dz \quad (1)$$

with $U_Z' = -\lambda_Z(\theta) Q_Z(p_Z)$

and aggregate consumer surplus is:

$$W(p_M, p_S) = W_M + W_S = \int_{p_M}^{\infty} Q_M(z)dz + \int_{p_S}^{\infty} Q_S(z)dz, \quad (2)$$

with $W_Z' = -Q_Z(p_Z)$.

Total producer plus consumer surplus is:

$$T = W_M + \Pi_M + W_S + \Pi_S, \tag{3}$$

with $W_Z' + \Pi_Z' = (p_Z - c_Z)Q_Z'$.

Production the production technology is assumed to exhibit constant returns to scale and no economies of scope, thereby abstracting from the problems of 'natural monopoly' theory. The cost function is therefore $C(Q_M, Q_S) = c_M \cdot Q_M + c_S \cdot Q_S$, where the marginal cost coefficients are positive constants. The monopolist firm may choose whether or not to produce.

Regulation There is a government which (it is assumed) has chosen to regulate this monopolist. Candidates from each of two parties may run for an elective office of regulator, who then controls the prices charged by the monopolist. These candidates only care about being elected and have no preferences over prices. Candidates make promises during their election campaign about the level of prices they will permit the monopolist to charge if they are elected. The candidate receiving a majority of votes wins. All citizen/consumers vote in this election.

This majority-voting model of regulation should not be taken literally. It is meant to focus attention on price determination through political forces (rather than market forces), abstracting away from the rich institutional structure that characterizes regulation.[10] What is important is that greater voter support for a particular policy increases the likelihood it will be adopted.

Information and Commitment Perfect information is assumed: consumers, regulators, and firms know the full model, thereby abstracting away from agency theory. Additionally, platform promises made by candidate regulators prior to election are assumed to be binding commitments. Neither of these assumptions reflects the way the world works; our purpose here is to focus attention on the functioning of regulation in a politically-driven context *without* such imperfections, the impacts of which have been studied extensively elsewhere.

In this model, virtually all power is vested in voters; the regulated monopoly only has the power not to produce, and the politician/regulators are driven by competition to reflect the desires of the voters. Again, the function of this model is to focus on voting and the political process.

Characterizing Regulated Prices The familiarity of the majority-voting approach to political economy problems suggests that we can forgo the development of a formal model of the game in the interest of brevity. The price outcome $(\hat{p}_M, \hat{p}_S) = \hat{\mathbf{p}}$ of the game is characterized as follows:

(1) $\Pi(\hat{\mathbf{p}}) \geq 0$; the assumptions of (i) perfect information and (ii) the monopolist does not have to produce imply that citizen/consumers would see candidate platforms that promised unrealistically low prices as "pie in the sky," and correctly perceive that no output would be produced unless the firm has non-negative profits.

(2) $\Pi(\hat{\mathbf{p}}) = 0$. Suppose the contrary: $\Pi(\hat{\mathbf{p}}) > 0$. By continuity of Π, there exists a price vector $\breve{\mathbf{p}} < \hat{\mathbf{p}}$ and $\Pi(\breve{\mathbf{p}}) > 0$. All voters would prefer $\breve{\mathbf{p}}$ to $\hat{\mathbf{p}}$, so the latter cannot be a voting equilibrium.

Therefore a candidate has a choice of only one price variable, with the zero profit constraint determining the other, i.e. $p_M = p_M(p_S)$. Not all prices p_M are feasible; only prices in the interval $\left[p_S^{\min}, p_S^{\Pi}\right]$ are undominated, where $p_S^{\Pi} = \arg\max \Pi_S(p_S)$ and $p_S^{\min} = p_M^{-1}\left(p_M^{\Pi}\right)$. Within this interval, it is easy to

show that a lower mass price requires a higher specialized price: $p'_M < 0$. Hence, individual welfare can be written as a function of the single variable p_M; e.g. $U(p_M(p_S), p_S;\theta) = U(p_S;\theta)$.

(1) $U(p_S;\theta)$ *is single-peaked in* p_S *for all* θ, under the assumption that the profit function is concave on the interval $\left[p_S^{\min}, p_S^{\Pi}\right]$.

(2) *There exists a unique majority voting equilibrium at the price that maximizes the median voter's* $\hat{\theta}$ *utility:* $\hat{p}_S = \arg\max_{p_S} U(p_S;\hat{\theta})$. This is simply the median voter theorem of Downs (1957); results (2) and (3) above are the conditions for which the theorem is true. We refer to this as *the median voter price.*

The median voter price-pair is

$$\hat{\mathbf{p}} = \underset{\mathbf{p}}{\operatorname{argmax}}\, U(\mathbf{p};\hat{\theta})\, s.t.\ \Pi(\mathbf{p}) = 0$$

$$= \left(\frac{c_M}{1 + \dfrac{\mu - \lambda_M(\hat{\theta})}{\mu\,\varepsilon_M}}, \frac{c_S}{1 + \dfrac{\mu - \lambda_S(\hat{\theta})}{\mu\,\varepsilon_S}} \right) \tag{4}$$

where μ is the Lagrangian multiplier on the constraint and ε_X is price elasticity of demand and $\varepsilon_X = \dfrac{p_X}{Q_X} \cdot \dfrac{dQ_X}{dp_X} < 0$. This immediately leads to the following results:

Proposition 0-1: *If* $\lambda_M(\hat{\theta}) \gtreqless \lambda_S(\hat{\theta})$, *then median voter pricing results in*

(i) $\lambda_M(\hat{\theta}) \gtreqless \mu \gtreqless \lambda_S(\theta^V)$

(ii) $p_M \lesseqgtr c_M$ *and* $p_S \gtreqless c_S$.

Proof: From equation (4) it can be seen that, in order to assure zero profits, it cannot be the case that both λ's are greater than μ, or that both λ's are less than μ. Therefore, the ordering of the λ's and μ must be as given in *(i)*, which from equation (4) implies the ordering of prices in *(ii)*. ■

This proposition shows that prices will favor the median voter uses more intensively. Only if the median voter's consumption pattern matches overall consumption ($\lambda_M = \lambda_S$) will efficient prices be selected. Much more likely, the median voter is likely to use more of service *M* and less of service *S* (as suggested by our terminology), so that the price of *M* will be below cost, subsidized by an above-cost price for service *S*. Further, the greater the disparity (the smaller is $\lambda(\hat{\theta})$), the greater will be the cross-subsidy. It is this cross-subsidy that is the source of inefficiency in this model.

4. No-Lobbying Model

It is no surprise that allocating resources by voting is not efficient, and it is hardly a surprise that voters will opt for subsidies that are in their favor. Even in this case of perfect information and regulators that are perfectly responsive to voters, inefficient outcomes result; hence, "regulatory failure." However, this result depends upon our use of aggregate surplus as the measure of efficiency. The problems involved with this definition of efficiency are well-known, in the absence of compensation. If we adopt the more careful but much weaker Pareto criterion for efficiency, then in this model *any* price-pair for which $\Pi(\mathbf{p}) = 0$ is efficient, since any other price-pair makes one of the consumer groups worse off.[11] In this latter view, regulation results in transfers among groups of citizen/consumers, and normative conclusions regarding their desirability cannot be reached on the basis of a scalar measure such as aggregate surplus. In this paper, we take the somewhat agnostic view that both aggregate surplus and the distribution of surplus are important and worthy of analysis, as evidenced by the results below. However, at the risk of abusing or confusing terminology, we reserve the term "efficient" prices to mean prices, which maximize aggregate surplus. In this context, it is this definition of efficiency that has discriminatory power.

In order to examine the issue of the relative efficiency of median voter prices (regulation) vs. unregulated monopoly prices, I consider the case in which the demand for service *M* exhibits constant elasticity and the median voter consumes no service *S*: $Q_M(p_M) = Ap_M^{\varepsilon_M}$, $\lambda(\hat{\theta}) = 0$.

Proposition 0-2: *Assuming (i) semilog demand and (ii) the median voter does not consume service S, then median voter prices are* $\left\{\begin{matrix} more \\ just\ as \\ less \end{matrix}\right\}$ *efficient as unregulated monopoly prices as:*

$$\left(\frac{\hat{p}_M}{c_M}\right)^{\varepsilon_M}\left[\frac{\hat{p}_M}{c_M} - \frac{\varepsilon_M + 1}{\varepsilon_M}\right] \gtreqless \left(\frac{\varepsilon_M}{\varepsilon_M + 1}\right)^{\varepsilon_M}\left[\frac{\varepsilon_M}{\varepsilon_M + 1} - \frac{\varepsilon_M + 1}{\varepsilon_M}\right].$$

Proof: First note that for $\lambda(\hat{\theta}) = 0$, the median voter prefers the monopoly price for service *S* $\hat{p}_S = p_S^{\Pi}$ which leads to the minimum price $\hat{p}_M = p_M^{\min}$ for service *M*, so that the surplus of service *S* is the same under either regime. The derivation of the inequality of the Proposition is straightforward. ■

The relative price for service *M* is determined primarily by the amount of profits from service *S* available to subsidize the below-cost price for *M*. This is shown in the Figure below.

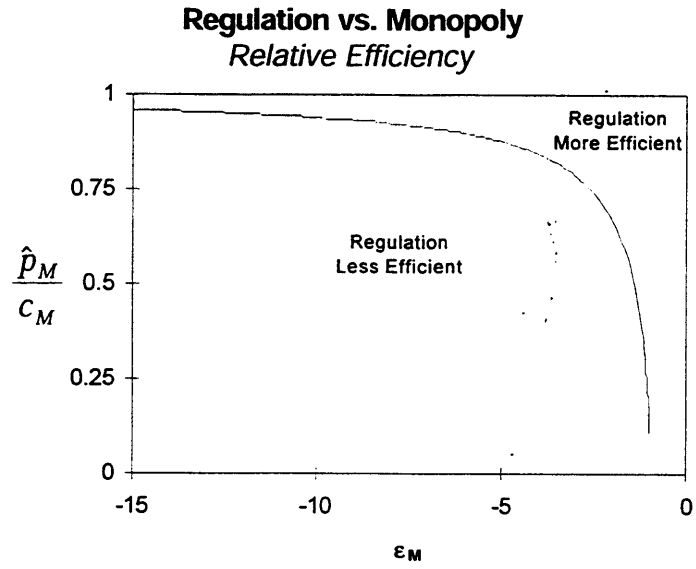

Figure 1

Clearly, regulation can be less efficient (that is, yield lower aggregate surplus) than unregulated monopoly on a parameter set of positive measure.

It could be argued that this result depends upon our definition of efficiency as maximum unweighted consumer plus producer surplus. In fact, this is not true. As long as producer surplus has any positive weight, then there will be a region of the chart in Figure 1 in which regulation results in lower (weighted) surplus than unregulated monopoly. If producer surplus has a lower weight than consumer surplus, then the boundary separating the two regions in Figure 1 will be below and to the left of the one shown, so that the region in which regulation is less efficient is smaller. However, as long as the weight on producer surplus is positive, this region is non-empty.

The problem is well-behaved in that as the median voter consumes more specialized service, regulated prices are closer to marginal cost and aggregate surplus is greater.

Proposition 0-3: *If* $\lambda(\hat{\theta}) \gtreqless 1$, *then* $\frac{d\hat{p}_M}{d\lambda(\hat{\theta})} \lesseqgtr 0, \frac{d\hat{p}_S}{d\lambda(\hat{\theta})} \gtreqless 0, \frac{d\hat{T}}{d\lambda(\hat{\theta})} \lesseqgtr 0$.

Proof: see Faulhaber (1997). ■

It is no surprise that allocating resources by voting is not efficient, and it is hardly a surprise that voters will opt for subsidies that are in their favor. Even in this case of perfect information and regulators that are perfectly responsive to voters, inefficient outcomes result. What is new to this work is that allocating resources by voting can be less efficient than allocating resources in a monopoly market structure: "regulatory failure" can indeed be worse than market failure.

However, while the median voter model is instructive in focusing regulatory pricing, it misses much of the richness of political institutions that I am attempting to capture. The model is akin to a perfect competition market model, in which consumers (voters) have all the power and firms (politicians) struggle to meet their needs. Just as the perfect competition model has its place in market analysis, but should not be confused with reality, so our voting model also has its place in political analysis, but needs to be further

enriched to include, among other things, the power of firms to influence political outcomes through lobbying expenditures. It is to this task that I now turn.

5. Lobbying Model: Exogenous Firms

Lobbying is a resource-consuming activity, usually undertaken by firms, unions, trade associations, or other voluntary organizations that cannot vote, with the objective of influencing political outcomes. In general, this can take two forms: (i) straight bribery, in which a firm pays a politician to change a law or regulation; or (ii) campaign contributions, either in kind or in cash, to help elect the politician. In more competitive political systems, we would expect the second form to predominate, and getting elected (for example, in the US) is enormously expensive. In dictatorships and other less competitive systems, we would expect the first form to predominate, in which entrenched politicians and bureaucrats demanded *baksheesh* from captive constituents. In this paper, I focus exclusively on the second form (without denying the existence of the first form), in which corporate funds are used, directly or indirectly, to influence electoral outcomes.

Exactly how such funds are used to influence elections is not a settled issue in the literature. Grossman and Helpman (1996) follow Baron (1994) in distinguishing between *informed* and *uninformed* voters, with the latter more likely to be swayed by campaign messages, presumably financed by special interests. Although not explicit in either paper, it appears that the uninformed, or "impressionable", voters are not utility-maximizers, but rather subject to the whims of the campaign.

In order to incorporate lobbying, the model of the previous sections is extended to include three factors: (i) "rationally ignorant" voters, who know their interests but find it too costly to determine whether or not a particular election involves their interests, and therefore their probability of voting is low (possibly zero); (ii) two firms (or lobbying associations)[12] which have an interest in the electoral outcome but do not vote. These firms are exogenous, in that there are no ownership links with voters, the regulated firm, or any regulator; they each act independently of any other agent in the model. I assume these firms are consumers of services offered by the regulated firm; one firm prefers high S prices (and therefore low M prices), the other prefers low S prices; (iii) firms can invest in informing specific voters that a particular election is important; the more they invest in informing voters of type θ, the higher the probability that type θ voters actually vote.

The logic of this model is straightforward; the firm that prefers low S prices may be willing (*ceteris paribus*) to expend resources to inform high-θ voters (that is, those who prefer low S prices as well) to increase their likelihood of voting. The firm's campaign expenditures may thus change the median (among those who actually vote) to a voter with greater θ, and therefore alter the announced price positions of the regulator-candidates to one with a lower p_S.

Voters The probability that voters of type θ vote in a particular election is a function of resources expended to inform them. I denote this probability of voting by $\psi(x(\theta))$ [13], where $x(\theta)$ is the total amount spent on informing voter θ, and $\psi' > 0$, $\psi'' < 0$. Assume that there is a continuum [0,1] of voters of each type, so that the measure of voters who vote is equal to their probability of voting.

Lobbying Firms There are two firms, S and M, each of which prefers low prices for its namesake service. Operating profits of the firms are denoted $\Pi^M(p_S)$, $\Pi^S(p_S)$, with $\Pi^{M'} > 0$, $\Pi^{S'} < 0$. Firm Z (=M,S) chooses an expenditure profile $x^Z(\cdot)$ in order to maximize total profits $\Pi^Z(p_S) - \int_0^1 x^Z(\theta)d\theta$. These firms are independent of all other agents in the model; we assume that the owners and managers of the

firm have no other interest in the regulated prices other than the profits of these two firms. If voters (or regulators, or the regulated firm) own shares in this firm, they are myopic with respect to their investment interests and to their control of the firm.

Expenditures for informing voters can either be made directly by the firm, or the firm can use a politician as its intermediary. In the latter case, the firm is outsourcing its political information function, which we would expect to be the norm, as most firms are not experts at this.[14] Although the model has firms making expenditures directly, it should be taken to include the use of politician-intermediaries as well.

Firms are assumed able to inform only those voters it chooses to inform. For example, a chemical firm may wish to inform pro-growth voters that a particular election is important to it, but not so inform pro-environmental voters. I assume that the technology of political marketing permits this "micro-targeting" of voters is feasible, through direct mail, local TV advertising, telephone appeals, etc.

Median Voter With firms spending $x^S(\theta), x^M(\theta)$, $\theta \in [0,1]$ to inform voters, the median $\hat{\theta}$ of those who actually vote solves

$$\int_0^{\hat{\theta}} \psi(x^M(\theta) + x^S(\theta))d\theta = \int_{\hat{\theta}}^1 \psi(x^M(\theta) + x^S(\theta))d\theta .$$

Incorporating this into the model of the previous sections, the electoral outcome depends upon the preference of the median voter: $\hat{p}_S = p_S(\hat{\theta}(x^M(\cdot), x^S(\cdot)))$, with $p_S' < 0$.

The Game The median voter, and thus the electorally determined price, depends upon the lobbying expenditures of each firm. The firms play a single-stage contribution game, in which each chooses an expenditure profile, which determines the median voter, which determines the price. The game is defined by

$$\max_{x^S} \Pi^S(p_S(\hat{\theta}(x^M(\cdot), x^S(\cdot)))) - \int_0^1 x^S(\theta)d\theta$$
$$\max_{x^M} \Pi^M(p_M(\hat{\theta}(x^M(\cdot), x^S(\cdot)))) - \int_0^1 x^M(\theta)d\theta$$

Proposition 1-1: *Firm M (firm S) only lobbies voters $\theta < \hat{\theta}$ ($\theta > \hat{\theta}$).*

Proof: For firm *M*, $\dfrac{d\Pi^M}{dx^M(\theta)} = \underbrace{\Pi^{M'}}_{+} \underbrace{\dfrac{d\hat{p}_S}{d\hat{\theta}}}_{-} \underbrace{\dfrac{d\hat{\theta}}{dx^M(\theta)}}_{+} - \underbrace{dx^M(\theta)}_{+} < 0$, and similarly for firm *S*. ■

This result is similar to the Contribution Specialization Theorem of Brock, Magee and Young (1989, Chs. 3-4).

Proposition 1-2: *Firm M (firm S) allocates its lobbying resources equally among all voters $\theta < \hat{\theta}$ ($\theta > \hat{\theta}$).*

Proof: Follows immediately from the concavity of ψ. ■

This proposition ensures that the firm lobbying profile is a scalar. This permits the median voter expression to simplify to

$$\int_0^{\hat{\theta}} \psi(x^M)d\theta = \int_{\hat{\theta}}^1 \psi(x^S)d\theta$$

$$\hat{\theta}(x^M, x^S) = \frac{\psi(x^M)}{\psi(x^S)+\psi(x^M)},$$

and the lobbying game to simplify to

$$\max_{x^S} \Pi^S(p_S(\hat{\theta}(x^M, x^S))) - x_S(1-\hat{\theta}(x^M, x^S))$$

$$\max_{x^M} \Pi^M(p_M(\hat{\theta}(x^M, x^S))) - x_M\hat{\theta}(x^M, x^S)$$

where the second term in each maximand is the per-voter expenditure times the number of voters being informed. The first-order conditions are

$$-Q^S \frac{dp_S}{d\hat{\theta}} \frac{\partial\hat{\theta}}{\partial x_S} - (1-\hat{\theta}) + x_S \frac{\partial\hat{\theta}}{\partial x_S} = 0;$$

$$-Q^M \frac{dp_M}{dp_S} \frac{dp_S}{d\hat{\theta}} \frac{\partial\hat{\theta}}{\partial x_M} - \hat{\theta} - x_M \frac{\partial\hat{\theta}}{\partial x_M} = 0.$$

Proposition 1-3: *Equilibrium contribution strategies* (x^M, x^S) *satisfy*

$$\frac{x^S - \Pi^{S'}}{x^S} = -\frac{1}{\varepsilon_{1-\hat{\theta}}} \text{ and } \frac{x^M - \Pi^{M'}}{x^M} = -\frac{1}{\varepsilon_{\hat{\theta}}},$$

where $\Pi^{Z'}$ *is the partial derivative of operating profits with respect to* $\hat{\theta}$, *and* ε *is the elasticity of the median voter* $\hat{\theta}$ *with respect to* x^Z.

Proof: Follows immediately from the first-order conditions. ■

This modified Ramsey rule is similar to that in Grossman and Helpman (1994). It characterizes the Nash equilibrium in terms of the responsiveness of voters to lobbying and the responsiveness of firm profits to electoral outcomes.

It is of particular interest to examine the effects upon equilibrium lobbying expenditures of changes in voter responsiveness to lobbying. It might be expected that over time, voters may become inured to constant media exposure on political issues, so that voter responsiveness may be decreasing, especially in media-intensive countries. If that occurs, would special interests increase their lobbying expenditures in order to compensate for this lower responsiveness, or would they decrease their lobbying as its investment value fell? The following Proposition gives the answer to this.

Proposition 1-4: *As voter responsiveness* ε *increases, lobbying expenditures decrease:*

$$\frac{dx^M}{d\varepsilon_{\hat{\theta}}} < 0, \quad \frac{dx^S}{d\varepsilon_{1-\hat{\theta}}} < 0.$$

Proof: (for firm M): Totally differentiating the modified Ramsey rule and using $\Pi^{M''} > 0$, we have

$$\frac{\partial}{\partial x_M}\left(\frac{x_M - \Pi'}{x_M}\right)dx_M = \frac{\partial}{\partial \varepsilon_{\hat{\theta}}}\left(-\frac{1}{\varepsilon_{\hat{\theta}}}\right)d\varepsilon_{\hat{\theta}} \Leftrightarrow \left(\frac{\Pi' - x_M\Pi''}{x_M^2}\right)dx_M = \left(\frac{1}{\varepsilon_{\hat{\theta}}^2}\right)d\varepsilon_{\hat{\theta}} \Leftrightarrow$$

$$\frac{dx_M}{d\varepsilon_{\hat{\theta}}} = \underbrace{\left(\frac{x_M^2}{\varepsilon_{\hat{\theta}}^2}\right)}_{+}\left(\frac{1}{\underbrace{\Pi'}_{-} - \underbrace{x_M}_{+}\underbrace{\Pi''}_{+}}\right) < 0.$$ A similar derivation holds for firm S. ■

The result suggests that as voters become more skeptical and less responsive to campaign spending, the equilibrium response is to increase such spending. The US experience of substantial increases in the cost of election campaigns in the face of ever more skeptical voters is perhaps explained by this result.

Unfortunately, the complexity of the model does not permit closed form solutions to other interesting questions, such as how lobbying contributions respond to changes in the distribution across consumers of service S demand, or if efficiency is increased when lobbying is permitted. In order to answer these questions, numerical simulations of the model under different parameter assumptions are analyzed.

Lobbying Model with Exogenous Firms: Simulations

The simulation strategy of this paper is (i) specify "baseline" functional forms and parameter values for each element of the model; (ii) vary each model parameter over a range of values (holding the other parameters at baseline values) and examine model outcomes as a function of each parameter. The results are displayed in a series of graphs, with a model parameter on the horizontal axis and a model outcome on the vertical axis. Model elements and their baseline values are:

Model Element	Functional Form	Parameter Values
Consumer Demand Q_S, Q_M	$Q_Z = A_Z - b_Z p_Z$	$Q_Z = 1000 - 20p_Z$
Pdf of Demand $\lambda(\theta)$ for Service S	$\lambda(\theta) = (\alpha+1)\theta^{\alpha}$	$4 \cdot \theta^3$
Firm Demand Q^S, Q^M	$Q^Z = A^Z - b^Z p_Z$	$Q^Z = Q_Z$
Unit Cost c_S, c_M	constant marginal cost	$c_S = c_M = 20$
Voter Response to Lobbying $\psi(x)$	$\psi^Z(x) = m + (1-m)e^{-g^Z x}$	$\psi^Z(x) = 0.10 + 0.90e^{-0.01x}$

Table 1: Baseline Functional Forms and Parameter Values

The assumption of linear demand is straightforward; additionally, it is assumed that voter/consumer demand is equal to firm demand for both services. Firm demand is important as the area under the firm's derived demand curve is the (incremental) profit of the firm. The assumed pdf of the distribution of demand for service S is a simple one-parameter family, in which $\alpha = 0$ corresponds to a uniform demand (in which case service S has the same distribution as service M) and the distribution becomes more skewed toward higher θ as α increases. Note that this baseline functional form slightly generalizes the model in that voters may respond to lobbying differently for the different firms.

The following graphs give a view of the baseline:

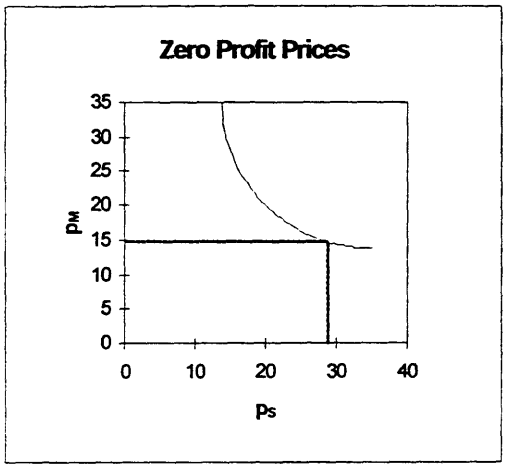

Figure 2

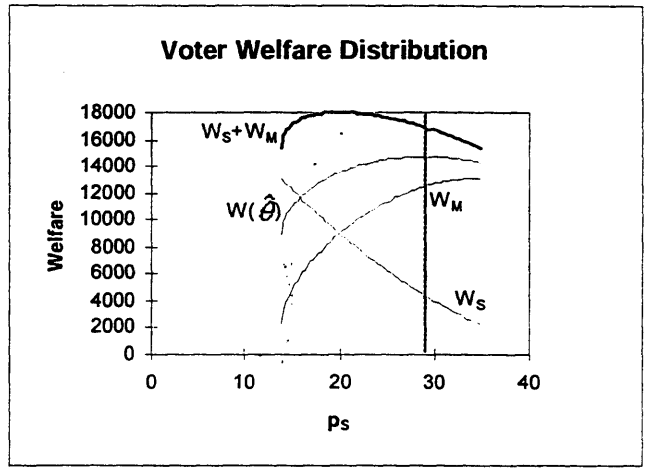

Figure 3

Figure 2 shows the zero profit locus in price space; Figure 3 shows welfare as a function of p_S: surplus for each service, aggregate surplus, and surplus of the median voter. With the rather skewed distribution of consumption of service S ($\alpha = 3$) the median voter consumes about half as much of service S as service M. As a result, the median voter's welfare is maximized at $p_S = 29.06$, substantially above the marginal cost of 20, which price maximizes aggregate surplus.

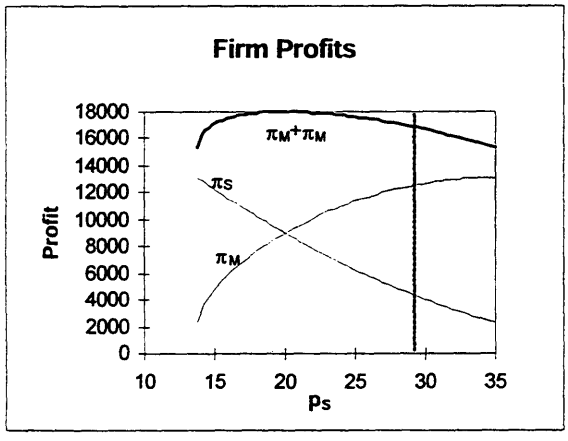

Figure 4

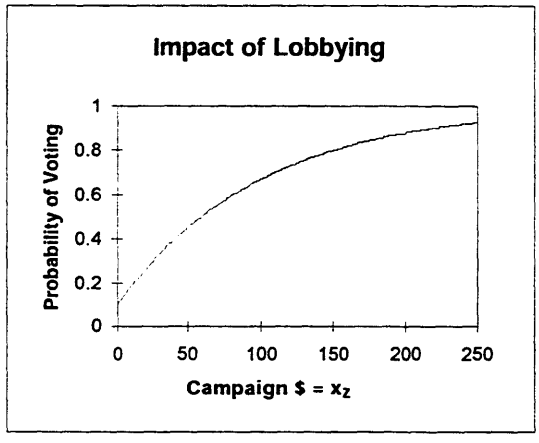

Figure 5

Figure 4 illustrates the incentives for each firm to lobby on opposing sides of the price issue. Figure 5 shows how responsive voters are to lobbying expenditures. Even with no expenditures, a small fraction of voters (10%) vote anyway; greater expenditures lead to higher probabilities of voting.

Model outcomes are: (i) lobbying expenses of each firm: x^S, x^M; (ii) voter participation ψ^S, ψ^M; (iii) median voter $\hat{\theta}$; (iv) prices p_S, p_M; (v) aggregate voter welfare; (vi) firm profits; and (vii) total welfare.

In determining total welfare, a judgment must be made about how lobbying expenditures are to be treated. If lobbying costs are simply a transfer from firms to politicians (however venal), it can be argued that there are no welfare implications to this, unless we wish to express a social preference for one or the other of these groups. However, in this paper, lobbying costs are not bribes, but rather involve the purchase of television time, distributing leaflets, direct mail appeals, and so forth, which represent real resource use. It can be argued that using economic resources to encourage citizens to vote and to inform them of their

interests is not only not a social waste, it is socially beneficial; it can also be argued that these resources are a non-productive use of economic resources (apart from whatever changes in prices are wrought). In this paper, I adopt the view that these resources are non-productive, and consequently total welfare is calculated by adding consumer plus producer surplus and subtracting out lobbying expenses. This is not meant as a philosophical position; rather it permits answering a more limited question: does the cost of lobbying (the Posner effect, mentioned earlier) exceed the benefit of improved price efficiency (the Becker effect)?

In the baseline case, firms spend an average of 5% of their profits on lobbying in equilibrium. This is not equally distributed, however; because of the skewness of the distribution $\lambda(\theta)$, firm S is relatively disadvantaged, and spends more (10% of earnings) on lobbying than firm M (which spends 3% of earnings) in equilibrium.

The fact that the distribution of demand for service S is skewed to higher θ suggests that examining model outcomes as a function of the skewness parameter α may be instructive. Below are plotted lobbying expenses, voter participation, prices, and total welfare as a function of the skewness parameter α, with and without lobbying.

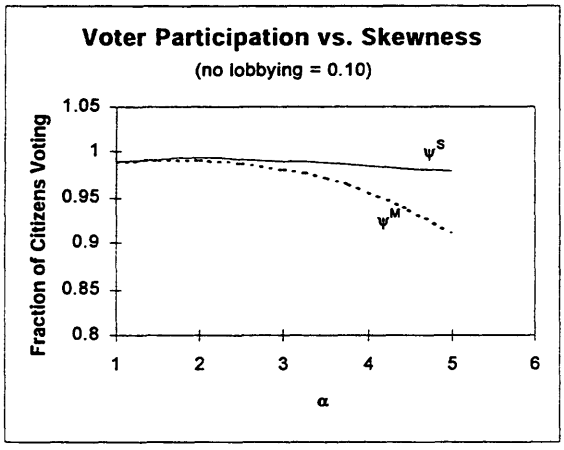

Figure 6

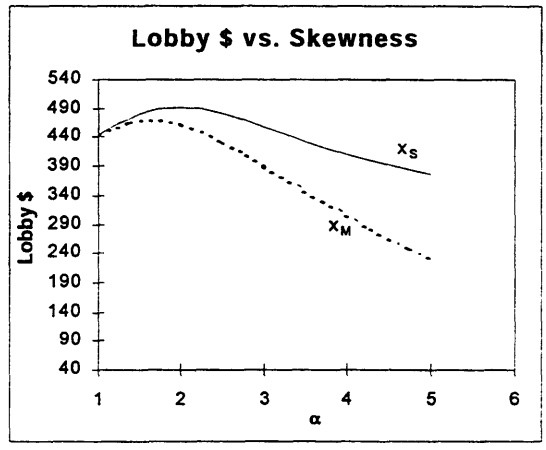

Figure 7

Even with a uniform distribution of demand for both services, both firms lobby to gain an advantage. One outcome of this is that voter participation rates increase from 10% to over 90%. However, as Figure 8 shows, prices change very little as a result of lobbying. The change in skewness dominates the small lobbying effect. Aggregate voter/consumer welfare improves slightly, but the lobbying firms are worse off, because the cost of lobbying far outweighs the price benefits achieved (vs. no lobbying).

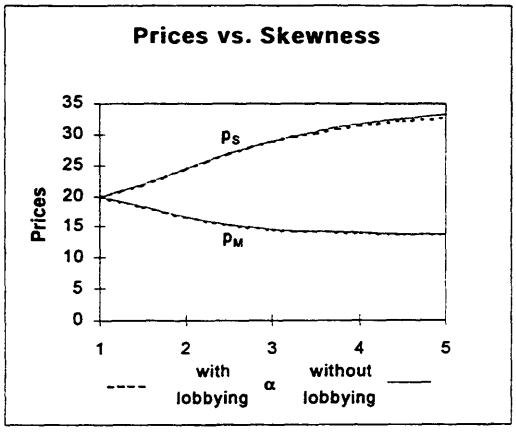

Figure 8

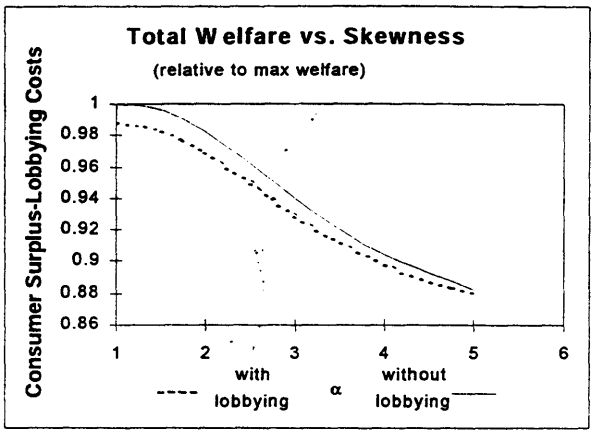

Figure 9

The net result is that the small increase in price efficiency is more than offset by the cost of lobbying (assumed here to be an otherwise non-productive use of resources). Total aggregate welfare is greater in the no-lobbying case. Note also that the efficiency effects of changes in skewness dominate the efficiency effects of lobbying vs. no lobbying.

Figures 10 and 11 show lobbying expenditures and total welfare as a function of voter responsiveness to lobbying $g^S = g^M$ (assumed equal for both firms for purposes of illustration).

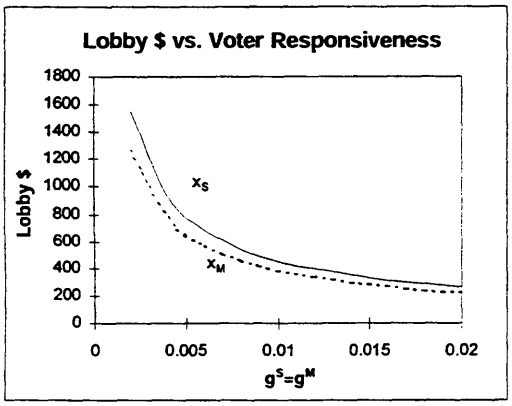

Figure 10

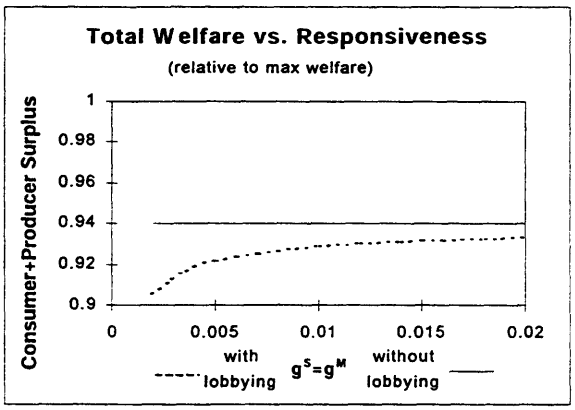

Figure 11

Figure 10 graphically illustrates Proposition 1-4: as voter responsiveness increases, lobbying expenditures decrease. Again, total welfare is less with lobbying compared to no lobbying in all cases.

In fact, this characterizes every case examined in these simulations (far more than reported here, but available from the author): total welfare is always less with lobbying than without lobbying. This indicates that the Becker effect of improved welfare due to the price effects of lobbying is outweighed by the Posner effect of the cost of lobbying.

If lobbying expenditures exceed total efficiency gains (including firm profits) from improved prices, then surely the firms themselves must find lobbying inefficient relative to no lobbying, and that in fact is the case. In every simulation result, the profits of both firms are less with lobbying than with no lobbying. Why, then, do firms lobby? In this model, the two firms are playing a prisoner's dilemma game; both

firms would be better off without lobbying, but each would have an incentive to renege on any cooperative agreement. In most practical cases, it would be expected that the lobbying game would be repeated; the folk theorem suggests that repeated play "solves" the problem, and efficient outcomes would result. However, this appears not to happen in practice, possibly because it is difficult to monitor an opponent's lobbying activities.[15]

In this model, therefore, the competitive lobbying game leads to little improvement in price efficiency but involves costs that appear to be higher than the efficiency gains. Therefore, the Posner effect outweighs the Becker effect. I now turn to a model in which the over-investment in lobbying is avoided through common shareowners.

6. Lobbying Model: Endogenous Firms

In the previous model, firms were introduced as entities with economic interests in the outcome of voting, but could not vote themselves. However, firms have no relation with voters; they are exogenous to the model. In this model, I (partially) correct this; firms are owned by voter/consumers,[16] and their preferences are honored in firms' lobbying expenditure decisions.[17]

In this model, voter/consumers are also stockowners of the firms. The pdf of the distribution of stockownership across the population is $\mu(\theta)$, with cdf = $M(\theta)$. The interpretation is that voter/consumers in the interval $[0,\theta]$ own $M(\theta)$ of all corporate assets in the market. In accordance with optimal portfolio theory, I assume that all voters hold the market portfolio,[18] which in this case means that each voter/consumer/stockowner owns portions of each firm proportional to their market capitalization.

Stockowners control each firm through voting which is weighted by number of shares owned. Not all stockowners need vote, but I assume that the pdf $\mu(\theta)$ characterizes both all stockowners and voting stockowners. I again use the median voter theorem to characterize the corporate governance outcome; however, in this case it is the owner of the median *share* (not the median owner) whose preferences are maximized in the electoral outcome. The owner of the median share is $\tilde{\theta}$, which satisfies

$$\int_0^{\tilde{\theta}} \mu(\theta)d\theta = \int_{\tilde{\theta}}^1 \mu(\theta)d\theta, \text{ or } \mathrm{M}(\tilde{\theta}) = 0.5.$$

Since (by assumption) all stockowners, including the owner of the median share, own proportional shares of each firm, then the owner of the median share is the same for both firms.

This is a two-stage game; in the first stage, the median share owner sets lobbying expenditures, maximizing his surplus as above. In the second stage, candidates take positions and voters go to the polls, with their turnout determined by the lobbying expenditures in the previous stage. Candidates accurately forecast who the median voter will be in this stage, and adopt positions that appeal to this median voter, thus establishing the price p_S. In the first stage, the median share owner anticipates the voter response in the second stage in determining his first stage lobbying expenditures. There is no strategic interaction of the firms, and all profits are internalized by the stockowners.

In the second stage, voters are aware of their shareowning interests, and consequently take them into account when voting. Lobbying costs are sunk in this stage. Thus, voter preferences are characterized by

$$p_S(\theta) = \arg\max_{p_S} H(p_S;\theta)$$
$$= \arg\max_{p_S} W_M(p_S;\theta) + \lambda(\theta)W_S(p_S;\theta) + \mu(\theta)\left[\Pi^M(p_S) + \Pi^S(p_S)\right]$$

The median voter in the second stage is determined by lobbying expenditures in the first stage: $\hat{\theta}(x^M, x^S) = \dfrac{\psi(x^M)}{\psi(x^S)+\psi(x^M)}$. As before, the price outcome of voting reflects the preferences of the median voter: $\hat{p}_S = p_S(\hat{\theta})$.

In the first stage, the median share owner anticipates the results of the second stage, and chooses lobbying expenditures (x^M,x^S) to satisfy

$$\max_{x_M, x_S} W_M(\hat{p}_S;\tilde{\theta}) + \lambda(\tilde{\theta})W_S(\hat{p}_S;\tilde{\theta}) + \mu(\tilde{\theta})\left[\left(\Pi^M(\hat{p}_S) - x^M\hat{\theta}\right) + \left(\Pi^S(\hat{p}_S) - x^S(1-\hat{\theta})\right)\right]$$

There are two salient differences between this model and that of the previous section: (i) the median share owner controls the lobbying expenditures of both firm and receives a share of profits from both firms, and therefore fully internalizes lobbying costs and benefits. (ii) As a consequence, there is no lobbying game between firms and the prisoner's dilemma is avoided.

Proposition 2-1: *In equilibrium, at most one firm lobbies*

Proof: Assume not; let (x^M, x^S) > 0 be the lobbying amounts preferred by $\tilde{\theta}$. The median voter function $\hat{\theta}(x, x_S)$ implicitly defines x^S as a function of x^S holding $\hat{\theta}$ constant, with $\dfrac{dx^S}{dx^M} > 0$. Define $\bar{x}^S = x^S + \int_{x^M}^{0} \dfrac{dx^S}{dx^M}\,dx < x^S$ (if positive; if not, use x^M). The median share owner $\tilde{\theta}$ can achieve the same price result $p_S(\hat{\theta}(x^M, x^S)) = p_S(\hat{\theta}(0, \bar{x}^S))$ at lower cost, since $0 + \bar{x}^S < x^M + x^S$. Therefore, ($x^M$, x^S) > 0 cannot be optimal for $\tilde{\theta}$. ■

A related result ties together this model with the previous model.

Proposition 2-2: *Any price outcome p_S of the model of the previous section can be achieved in this model at lower cost.*

Proof: Variant of the proof of Proposition 2-1. ■

N.B. It cannot be concluded from this Proposition that equilibrium outcomes of this model yield a greater level of surplus than equilibrium outcomes of the previous model.

The intuition of both results is that the owner of the median share internalizes lobbying costs, and *any* lobbying competition between the two firms is wasteful. This avoids the prisoner's dilemma problem of the previous model, in the which lobbying efforts of the two firms largely canceled each other out.

It might be supposed that the median share owner would prefer to have one or the other firm lobby to the point where he is the median voter as well. This is not the case; while this strategy would maximize his gross benefits, there are costs to achieving it, so net benefits are not maximized at this point. This

suggests that the median share owner lobbies to shift the median voter to be closer to him, but not all the way. This is captured in the next Proposition.

Proposition 2 - 4 : *If* $\tilde{\theta} > 0.5$ *then* $\tilde{\theta} > \hat{\theta}$;
$\tilde{\theta} < 0.5$ *then* $\tilde{\theta} < \hat{\theta}$;
$\tilde{\theta} = 0.5$ *then* $\tilde{\theta} = \hat{\theta}$ *and* $x_M = x_S = 0$.

Proof: See Appendix.

The intuition is that no lobbying is needed if the median share owner is the median individual, so that he is also the median voter with no cost. If the median share owner differs from 0.5, his lobbying expenditures shift the median voter to be closer to his position, but not all the way.

It might be supposed that if $\tilde{\theta} < 0.5$, then the median share owner would choose $x^M > 0$, $x^S = 0$, so that $\hat{\theta} < 0.5$ (and therefore $\tilde{\theta} < \hat{\theta} < 0.5$). This, however, is not the case. In this case, $\tilde{\theta}$'s *consumption* interest in service M is in higher p_S, but if firm S is sufficiently larger than firm M, $\tilde{\theta}$'s *investment* interest in firm S may outweigh his consumption interest, and he lobbies for a below-cost p_S: $x^M = 0$, $x^S > 0$.

Unfortunately, the model's complexity does not permit easy analysis; model simulations are employed to examine how model outcomes vary with model parameters around the baseline previously developed.

Lobbying Model with Endogenous Firms: Simulations

The distribution of stockownership is assumed to be of the form $\mu(\theta) = (\beta + 1)\theta^{\beta}$, for $-1 < \beta < \infty$. An egalitarian distribution of equal stockownership by all corresponds to $\beta = 0$. Greater β results in a stockownership distribution skewed toward higher θ, that is, toward consumers of service S; as $\beta \to \infty$, stockownership is very highly concentrated with voters near $\theta = 1$. For $\beta < 0$, stockownership is skewed toward consumers of service M; as $\beta \to -1$, stockownership is very highly concentrated with voters near $\theta = 0$.

Lobbying as a function of this skewness parameter shows an interesting pattern, as seen in Figure 12. First, lobbying expenditures are far lower than in the previous model. Second, for values of β greater than zero, $x^S > 0$; however, it is less for highly skewed distributions ($\beta > 4$). This appears to be due to the increasing importance of the median share owner's investment interest relative to his consumption interest, so the median share owner is more interested in maximizing total firm profit, with his consumer surplus of less interest.

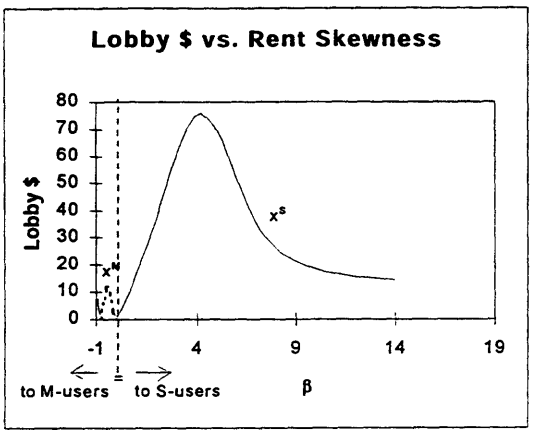

Figure 12

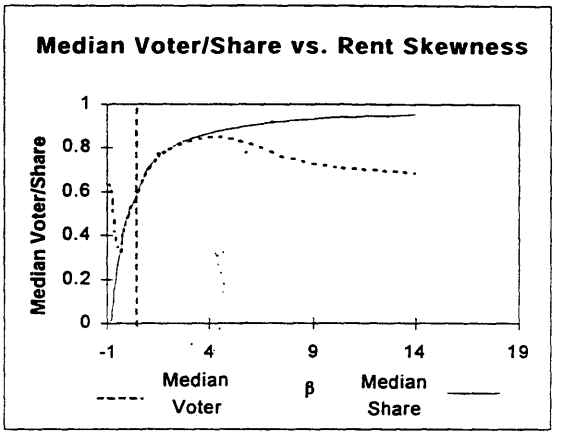

Figure 13

Third, for $\beta < 0$ but not too close to -1, $x^M > 0$, as expected, since the median share owner has a consumption preference for service M. However, as stockownership becomes more concentrated with β near -1, the median share owner's preferences are dominated by his investment interests, and we find $x^S > 0$, $x^M = 0$. This is also evident in Figure 13, in which both the median share owner and the median voter are shown as a function of β. This illustrates Proposition 2-4: the two are equal at $\beta = 0$; for this distribution, $\tilde{\theta} = 0.5$ (in Figure 12, it can be seen that $x^M = x^S = 0$ at this point). For values of β in a neighborhood of 0, the two are quite close, indicating that the consumption interest of the median share owner predominates the investment interest. For values of β further from 0, however, investment interest dominates and the median share owner chooses lobbying expenditures for firm S which lead to prices which yield higher aggregate producer profits. In this case, they also lead to the median share owner close to -1 choosing a median voter in excess of 0.5.

Since lobbying is much more efficient in this model as compared to the previous one, the Posner effect is considerably muted. This appears in examining total welfare as a function of β, in Figure 14. Lobbying increases total welfare in most of the range of β, although not all. The increases in welfare as stockownership becomes more concentrated can be seen in Figure 15, which shows how the median share owner's total surplus is divided between consumer surplus and producer surplus.

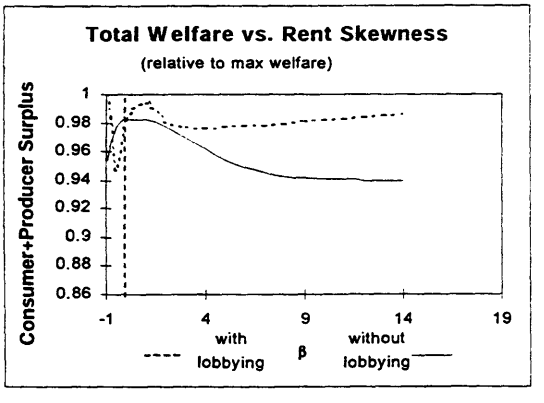

Figure 14

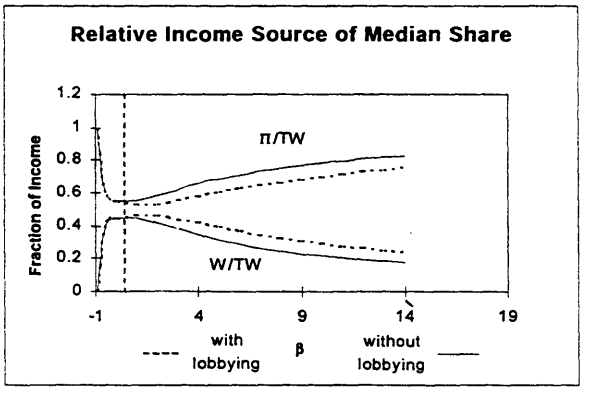

Figure 15

Relative consumer surplus of the median stock owner is strongest when stockownership is most dispersed: $\beta = 0$, and relative producer surplus increases as $\beta \to \infty$ and $\beta \to -1$. This explains the willingness of the median share owner to sacrifice consumer surplus for producer surplus.

While total surplus is greater with lobbying in many cases, the ability of shareowners to control elections does have disturbing consequences. Without lobbying, voters/consumers/shareowners would choose prices that involve a subsidy from service S to service M: $p_S > c_S$, $p_M < c_M$, as shown in Figure 16. However, the lobbying ability of the median share owner yields prices that reverse that subsidy: $p_S < c_S$, $p_M > c_M$. In this model, lobbying has more than overcome the politically induced inefficiency of the no-lobbying model. It would appear to achieve greater efficiency not merely by mitigating the popular would toward greater economic efficiency, but by actually thwarting it.

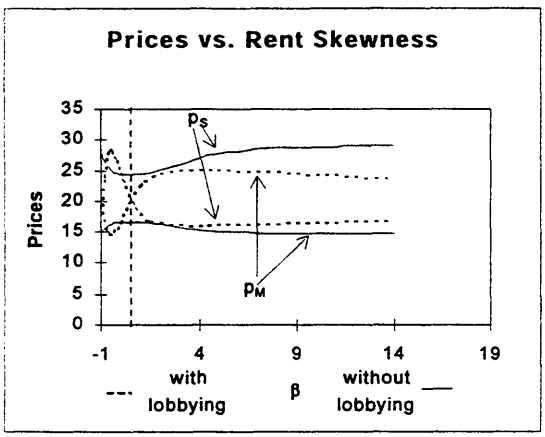

Figure 16

Are there any real-life situations in which the endogenous firm-lobbying model might apply? The conditions are: (i) a competitive political sector, so the median voter model applies, and (ii) highly concentrated ownership in the corporate sector. These conditions can be found in both the developed and the less developed world; countries with an active and competitive political sector in which producer interests appear to dominate consumer interests would be likely venues to test the hypotheses of this model.

7. Conclusions

The object of this paper is to use a political economy model of regulation, in the spirit of the Chicago School and drawing on the work of international trade theorists, to derive testable hypotheses about the behavior of regulators and firms.

The principal result of the no-lobbying model is that regulatory failure, even when politics works exactly as it is designed to do, can do worse than the market failure it was designed to correct. The analysis focuses on comparative institutions; neither case is compared to an unattainable ideal, but rather two second-best solutions are compared.

The principal result of the lobbying model with exogenous firms is that although lobbying does slightly improve the efficiency of prices, the prisoner's dilemma lobbying game generates substantial expenditures that more than offset any price efficiency gains in all the cases examined. Thus the Becker effect of improved efficiency is more than offset by Posner effect of wasteful rent-seeking activities. This model would seem applicable to countries with a competitive political sector and a widely distributed corporate ownership, so voter/consumers act as "price-takers" with respect to their investment interests.

The principal result of the lobbying model with endogenous firms is that efficiency is generally (but not always) improved. However, stockowners interest in and ability to lobby for high profits can overwhelm popular sentiment, not merely mitigating popular subsidies in favor of more efficient prices but actually reversing such subsidies to favor firms (though more efficient in aggregate). This model would seem applicable to countries with a competitive political sector and concentrated ownership of corporations, so that those who own firms exercise control over decisions by firms in their portfolio, leading to collusive (and legal) lobbying.

What distinguishes the set of models developed here from previous work is (i) an explicit model of voting, (ii) an explicit model of lobbying; and (iii) an explicit link between the two. The model is explicit and structural, rather than reduced form as in most of the literature. While the median voter model is hardly new, its application in regulatory models appears quite appropriate to this class of problems. Coupled with the lobbying model, this approach yields rich insights into the theory and practice of regulation in a political context.

--Appendix —

Proof of Proposition 2-4: (Assume $x^S > 0$, $x^M = 0$). The median share owner is modeled as choosing lobbying expenditures which determines the price: $p_S(\hat{\theta}(0, x^S))$. Since $p_S' < 0$ and $\hat{\theta}' > 0$, this function can be inverted, so the median share owner can be modeled as choosing a price, which has a total cost $C(p_S) = x^S(\hat{\theta}(p_S))(1 - \hat{\theta}(p_S))$. The median share owner's first stage problem can be re-written as

$$\hat{p}_S(\tilde{\theta}) = \arg\max_{p_S} H(p_S; \tilde{\theta}) - C(p_S).$$

Assume first that $\tilde{\theta} > 0.5$ so that $p_S(\tilde{\theta}) < p_S(0.5)$. We have $H' < 0$, $H'' > 0$, $C' < 0$, for $p_S(0.5) > p_S > p_S(\tilde{\theta})$, and $H' = 0$ at $p_S(\tilde{\theta})$. If $H'(p_S(0.5); \tilde{\theta}) \leq C'(p_S(0.5))$, there is a boundary solution and $\hat{p}_S(\tilde{\theta}) = p_S(\hat{\theta}) = p_S(0.5) > p_S(\tilde{\theta})$. Otherwise, there is an interior solution, with $p_S(0.5) > p_S(\hat{\theta}) > p_S(\tilde{\theta})$. In either case, $\hat{\theta} = \hat{\theta}(\hat{p}_S(\tilde{\theta})) < \tilde{\theta}$. A similar argument shows that for $\tilde{\theta} < 0.5$, $\hat{\theta} > \tilde{\theta}$.

Now assume $\tilde{\theta} = 0.5$; then $p_S(0.5) = \arg\max H(p_S; \tilde{\theta})$ can be achieved with no lobbying ($x_M = x_S = 0$); any other price p_S reduces $H(p_S; \tilde{\theta})$ and increases $C(p_S)$, and therefore cannot maximize $H(p_S; \tilde{\theta}) - C(p_S)$. Thus, $\hat{p}_S(0.5) = p_S(0.5)$, and $\hat{\theta} = \tilde{\theta} = 0.5$, $x_M = x_S = 0$. ■

-- References --

Baron, David P. (1994) "Electoral Competition with Informed and Uninformed Voters," *American Political Science Review*, **88**, 33-47.

Becker, Gary S. (1983) "A theory of competition among pressure groups for political influence," *Quarterly Journal of Economics*, XCVIII, 371-400.

Creedy, J. and P. Francois (1993) "Voting over income tax progression in a two-period model," *Journal of Public Economics* **50**, 291-298

Dewitripont, Mathias, and Jean Tirole (1996) "Advocates", working paper, Université de Toulouse.

Dixit, Avrinash and John Londregan (1995) "Redistributive Politics and Economic Efficiency," *American Political Science Review*, **89**, 856-66.

Downs, A.nthony (1957) *Economic Theory of Democracy* (HarperCollins: New York).

Faulhaber, Gerald R. (1997) "Voting on Prices: the Political Economy of Regulation," in *Interconnection and The Internet: Selected Papers from the 1996 Telecommunications Policy Research Conference*, ed. Greg Rosston and David Waterman (Lawrence Erlbaum Assoc.: Mahwah, NJ).

Grossman, Gene M. and Elhanan Helpman (1996) "Electoral Competition and Special Interests," *Review of Economic Studies*, **63**, 265-286.

_____ and _____ (1994) "Protection for Sale," *American Economic Review*, **84**, 833-850.

_____ and _____ (1995) "Trade wars and trade talks," *Journal of Political Economy* **104**, 675-708.

Hillman, Arye L. (1989) *The political economy of protection*, (Harwood Academic Publishers: Chur, Switzerland ; New York).

Laffont, Jean-Jacques (1996) "Industrial Policy and Politics," *International Journal of Industrial Organization*, **14** 1-27.

_____ (1994) The new economics of regulation ten years after, *Econometrica* 62, 507-537.

_____ and Marcel Boyer (1997) "Toward a Political Theory of the Emergence of Environmental Incentive Regulation," working paper, Université de Toulouse I.

_____ and Jean Tirole (1993) *A Theory of Incentives in Procurement and Regulation* (MIT Press: Cambridge, MA.).

Magee, S.P., Brock, W.A., and Young, L. (1989) *Black Hole Tariffs and Endogenous Policy Theory* (Cambridge, UK; Cambridge Univ. Press).

Peltzman, Sam (1980) "The growth of government," *Journal of Law & Economics* 23, 209-87.

Posner, Richard A. (1975) "The Social Cost fo Monopoly and Regulation," *Journal of Political Economy*, **83**, 807-27.

Roberts, K.W.S. (1977) "Voting over income tax schedules," *Journal of Public Economics* 34, 329-340.

Stigler, G. (ed.) (1988) *Chicago Studies in Political Economy* (University of Chicago Press: Chicago, IL).

White, E., 1985, Voting for costly regulation: evidence from banking referenda in Illinois, 1924, *Southern Economics Journal* 51, 1084-98.

Ye, M. and A. Yezer, 1992, Voting, spatial monopoly, and spatial price regulation, *Economic Inquiry* 30, 29-39.

-- Notes --

[1] Whether or not political contributions are an economic waste is an issue of dispute. If political contributions are simply bribes that increase politicians' and lawyers' incomes, then this is simply a transfer, not a waste. However, if contributions are used to divert resources from more productive uses, then they are a waste. I observe that in the US, politicians use the overwhelming majority of money that finds its way into the political process to get reelected, not to buy ranches in Wyoming or other personal wealth. Political campaigning does use real resources, such as television time, the labors of campaign workers, etc., that could be put to more productive uses. In this paper, I take the view that political contributions are pure waste.

[2] There are several papers in which voting is explicit. Beard (1995) is closest in spirit to this paper, in which he uses a median voter model to determine 'popular' two-part tariffs for regulated monopolies. Several papers in public finance have addressed how a progressive income tax in a two-period model can emerge from a median voter model (Roberts (1977) and Creedy and Francois (1993), among many others). White (1985) examined voting behavior in banking referenda in Illinois, but his focus was not on formal voting models. Closely related to the present work is Ye and Yezer (1992) and following papers that examine regulatory pricing of freight movements in spatial monopolies; their results appear to be highly specialized to their application, however, and few general results emerge.

[3] In their informative introduction, the authors identify two types of models in the trade literature: the *political support* approach, in which the government's objective function has as arguments the welfare of designated interest groups (but not contributions), and the *political competition* approach, in which contributions are explicit and affect electoral outcomes.

[4] The absence of elections in these models suggest this approach is most appropriate in countries in which elections are non-existent or unimportant, and interest groups achieve their ends by bribing the dictator's family or the local warlord.

[5] I am obviously ignoring the role of state regulatory commissions here, as political jurisdiction is not the issue. These commissions' scope of industry authority was also quite limited by their legislative charter.

[6] The structure of US regulation appears to force certain issues (such as prices) to be single-dimensional, with little or no scope for introducing multiple dimensions. This appears to obtain in Great Britain as well, but not in other countries, in which governments determine regulated prices, along with a great many other things, legislatively. It is interesting to note, however, that the empirical predictions of the models of this paper concerning, say, telephone prices, appear to apply equally to countries regardless of regulatory institution. This suggests that the median voter model may be somewhat more robust than its stringent formal assumptions would indicate.

[7] It is likely that a substantial portion of political contributions are spent directly on electoral activities, such as television advertising, campaign organization, and so forth, all activities whose purpose is to influence voters, with the remainder perhaps best characterized as bribes to politicians. It is plausible that the more competitive the political climate, the greater will be the resources devoted to electoral activities and the less to outright bribes, so that politicians capture the most rents in dictatorships and other low-competition systems.

[8] To keep the analysis uncluttered, we do not specify the source of the monopolist's market power. It is closest to the spirit of the analysis to think of the monopolist as owning an exclusive franchise.

[9] This condition need not uniquely determine the ordering of the index. If we further assume that $\lambda_S' \geq 0, \lambda_M' < 0$ then the ordering is unique.

[10] In fact, some states in the US do elect regulators, but this is not relevant to the analysis here. The point is that even appointed regulators are subject to political forces. For example, if regulators permit a politically sensitive price (such as telephone local access, or residential electricity) to rise too quickly, legislators will hear from their constituents and the relevant regulatory oversight committee is likely to inform the regulators that their operating budget is in danger of being cut unless they are more sensitive to constituents' needs. Whatever, the mechanism, the

model attempts to capture the political fact (at least in the US) that regulators need to be responsive to the wishes of the voters.

[11] To be completely general, the welfare of the stockholders of the monopoly should also be taken into account. In this view, any price-pair for which $\Pi(\mathbf{p}) \geq 0$ is efficient, since any other price-pair makes either one of the consumer groups worse off or makes the stockholders of the monopoly worse off. The discriminatory power of this definition is, of course, almost nil.

[12] For clarity, I treat these entities as single firms that make profit-maximizing decisions. In general, these lobbying entities could be trade associations, unions, voluntary organizations of voters, even temporary coalitions organized around a particular issue. I thus avoid the problem of collective choice inherent in such entities.

[13] In general, the probability of voting may also depend directly on voter type: $\psi(x(\theta),\theta)$, so that some types may be more politically active and so easier to "get out the vote." Our assumption that all voters respond to information identically is made for analytic ease.

[14] In the case of unions and voluntary organizations, we would expect the direct method to be more prevalent. For example, the AFL-CIO's Committee on Political Education (COPE) was a formidable lobbying machine which used the time and energy of committed members to pass out leaflets, organize telephone appeals, even drive voters to the polls, in favor of issues that were important to labor.

[15] Even where monitoring is possible in a repeated game, however, firms may not opt for the cooperative solution; for example, many firms engage in costly advertising that only affects market share, not market size. Clearly, firms would be better off with a cooperative solution, yet this does not appear to occur in industries such as household cleaning products, foods, and other consumer goods. I would like to than Olivier Compte of CERAS for pointing out this analogy.

[16] Clearly, voter/consumers can also be involved with the lobbying firms as consumers of their products and/or as their employees, as well as shareowners. I leave these extensions to future research.

[17] This could occur if either (i) stockholders closely monitor such expenditures and can overcome free rider problems in exercising their control rights; (ii) the agency problem between stockholders and managers is minimal. The circumstances under which each could obtain are discussed below.

[18] The assumption that all stockowners hold the market portfolio should be viewed as a partial equilibrium hypothesis. In general equilibrium, stockowners may wish to alter their portfolio to take into account their employment wages and their consumption.