MORE IS LESS?
REGULATION IN A RENT SEEKING WORLD

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ABSTRACT

Competition between two interest groups that engage in strategic lobbying to influence regulatory decisions is examined. Several new insights emerge. First, increases in gross surplus can be detrimental to all parties. Second, a model that stresses strategic lobbying decisions may explain patterns of regulation and deregulation in cases that contradict the predictions of models based solely on the decision calculus of a support maximizing. Third, a simultaneous increase in both groups' marginal lobbying costs benefits the low cost group and harms the high cost group.

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1. Introduction

Regulatory policy has changed substantially in a number of key industries in recent years. The wave of deregulation that began in the 1970s, the use of profit sharing and price cap plans in telecommunications, and wholesale and retail wheeling of electricity are important examples. Such policy changes may be spurred by shifting economic conditions. Employing a model in which two opposing interest groups seek to influence the decision of a standing regulator, I examine the impact of exogenous changes in economic conditions. I also examine the effects of changes in the marginal cost of exerting pressure for favorable regulatory decisions. The analysis makes several new contributions to the Economic Theory of Regulation (ETR) pioneered by Stigler (1971).

The existing literature predicts that an increase in the potential surplus in a regulated market will make at least one group better off, although the gains may be partially offset by increased political competition. In my model the adverse political effects of such changes may swamp the gross gains entirely, making all parties worse off. This can occur because the increase in the available surplus may increase wasteful lobbying activity and also reduce the likelihood that the regulator will make the decision leading to the largest (gross) social value. Thus, changes in regulatory policy that increase the gross surplus available and could therefore lead to Pareto improvements under ideal circumstances may in fact result in Pareto inferior outcomes. For instance, improvements in policy governing the access of potential competitors to local telecommunications networks or electricity transmission or distribution networks that allow potential competitors to operate more efficiently will also make the incumbents more resistant to competition.

In the decades prior to the deregulation of the airline, trucking, and long-distance telecommunications industries, the growth of trade between geographically distant locations coupled with technological advances led to their rapid growth. In the past, attempts to use the ETR to explain the deregulation of these industries have been stymied because they appear to have been deregulated at a time when the regulated firms were still enjoying regulatory rents (Peltzman 1989 and Levine 1989). In my model the continued accrual of rents to regulated firms is not inconsistent with growing pressure for deregulation. In the model, once an industry has grown to the point where the regulated firm is no longer the most efficient producer at the margin, further growth increases the magnitude of the deadweight loss due to regulation. This in turn increases the incentives of those harmed by regulation to lobby for deregulation by more than it increases the incentives of the firm to lobby for continued regulation, increasing net pressure for deregulation. Thus the very forces that sustained rents for the regulated firms may have moved the industries toward deregulation.

The prevailing literature also demonstrates that interest groups gain when the efficiency with which they deliver political pressure increases. I extend the analysis to show that groups with a high cost of delivering political pressure benefit more from an increase in their opponent's marginal lobbying cost than from an equal decrease in their own. This may help to explain why campaign finance reform often generates more popular support than projects designed to increase voter participation. If special interest groups generate pressure more efficiently than the general population, limiting the power of the former may be the most effective way to improve the welfare of the latter.

The remainder of the paper is organized as follows. Section 2 presents the basic model. Section 3 presents the primary findings of the paper concerning the effects of changes in

underlying economic conditions and regulatory policy. Section 4 considers changes in the marginal cost of exerting pressure to influence regulatory decisions. Section 5 concludes.

2. The Model

There are two primary approaches to the study of questions of economic policy in a political environment. The first stresses the platform choices made by candidates engaged in electoral competition.[1] The second stresses the policy choices made by a standing regulator or government. While the first approach may provide important insights into the general direction of public policy, the second seems better suited to the study of particular regulatory policies in individual markets. Thus, the second approach has been most widely used to model the positive political economy of regulatory policy, particularly by Stigler (1971), Peltzman (1976), Becker (1983 and 1985), and other works in the tradition of the ETR.[2] In addition to its widespread theoretical use, a large body of empirical evidence supports the notion that the ability of interested parties to exert political pressure plays a crucial role in the determination of regulatory policy.[3] Accordingly, I follow earlier works in the tradition of the ETR and model regulatory outcomes as dependent upon the lobbying activities of affected interest groups.

A binary decision is to be made by a regulatory authority; for example whether to allow competition in a telecommunications or electricity market or to require a license to enter some profession. Two opposing groups seek to influence the decision. It is perhaps easiest to envision one as a regulated firm and the other as a group of large (industrial) consumers (e.g., a Wilson (1968) type syndicate). For example, a regulated telecommunications firm may exert pressure to prevent competition while industrial and commercial consumers (who can perhaps take advantage of pre-existing trade associations to organize their lobbying efforts), lobby to allow it.

The two groups will be referred to as "the Firm" and "the Consumer" for expository purposes, but the model is applicable more generally.

The Consumer's payoff is u^c if the regulator chooses its preferred outcome (the Consumer wins) and u^f otherwise ($u^c > u^f$). Similarly, the Firm's profits are π^f if the regulator chooses its preferred outcome (the Firm wins) and π^c otherwise ($\pi^f > \pi^c$). The Consumer and the Firm may exert lobbying effort, denoted e^c and e^f respectively, to influence the regulatory decision. Lobbying entails a constant unit cost of k^c for the Consumer and k^f for the Firm. The magnitude of the Consumer's marginal lobbying cost may be influenced by factors such as geographic dispersion. Legal restrictions on campaign contributions, for example, may influence the Firm's marginal cost of lobbying. The probability that the Consumer's preferred outcome is selected is taken as a function of both groups' lobbying efforts, denoted $p(e^c,e^f)$.

Group Behavior

The groups choose lobbying efforts simultaneously and non-cooperatively. Each group chooses its effort to maximize its expected payoff less lobbying costs, taking as given the other group's lobbying effort. Formally, the Consumer's problem and the Firm's problem are, respectively:

$$\underset{e^c}{\textbf{\textit{maximize}}} \quad w^c = p(e^c,e^f)u^c + [1-p(e^c,e^f)]u^f - k^c e^c, \qquad \text{and} \tag{1}$$

$$\underset{e^f}{\textbf{\textit{maximize}}} \quad w^f = p(e^c,e^f)\pi^c + [1-p(e^c,e^f)]\pi^f - k^f e^f. \tag{2}$$

Inspection of equations (1) and (2) shows that, ex-ante, both groups' objective functions are continuous in $p(\cdot)$. While the analysis to follow focuses on regulatory decisions that are binary (either one group or the other wins), the formal analysis would be the same if the regulator could implement any convex combination of the two groups' ideal points, with the particular convex

combination actually implemented determined by $p(\cdot)$. Therefore, all of the results below continue to hold for continuous regulatory decisions where the relevant portion of the payoff possibilities frontier can be adequately approximated by a straight line.

I also focus on the case in which each groups' probability of winning is given by the ratio of its lobbying effort to total lobbying effort, i.e.,

$$p(e^c, e^f) = \frac{e^c}{e^c + e^f}. \tag{3}$$

This simplification is also made primarily for expository convenience. The basic results presented below hold for any $p(\cdot)$ function and any effort cost functions that satisfy standard assumptions.[4] Two features of formulation (3) are important. First, diminishing returns to effort are present: additional effort by a group increases its probability of winning at a decreasing rate. Second, there are diminishing returns to the "lead" in lobbying effort that one group may have over its opponent. To illustrate, suppose the Consumer has exerted more lobbying effort than the Firm. If the Firm decreases its lobbying effort, increasing the Consumer's lead, consumer lobbying is less productive at the margin. Formally,

$$\frac{\partial^2 p}{\partial e^c \partial e^f} = \frac{e^c - e^f}{\left(e^c + e^f\right)^3} \gtreqless 0 \qquad \text{as} \qquad e^c \gtreqless e^f. \tag{4}$$

It is useful to define $U = \frac{u^c - u^f}{k^c}$ and $\Pi = \frac{\pi^f - \pi^c}{k^f}$ as the groups' normalized stakes. These normalized stakes index the importance of the decision to each group relative to their costs of influencing the outcome. For the remainder of the paper, "stake" will refer to these normalized stakes and "gross stake" will refer to the difference between a group's winning and losing payoffs. A group's reaction function specifies its optimal lobbying effort for any level of

lobbying effort supplied by the opposing group. $\boldsymbol{E}^c(e^f;U)$ and $\boldsymbol{E}^f(e^c;\Pi)$ will denote the reaction functions of the Consumer and the Firm, respectively. It follows from equations (1)-(3) that:

$$\boldsymbol{E}^c(e^f, U) = \left(e^f U\right)^{\frac{1}{2}} - e^f, \quad \text{and} \tag{5}$$

$$\boldsymbol{E}^f(e^c, \Pi) = \left(e^c \Pi\right)^{\frac{1}{2}} - e^c. \tag{6}$$

An increase in the Consumer's stake (due to changing payoffs or marginal lobbying costs) increases its marginal return to lobbying, and so increases its lobbying effort for any given level of firm lobbying $\left(\text{formally } \frac{\partial \boldsymbol{E}^c}{\partial U} > 0\right)$. The slope of the Consumer's reaction function is influenced by the relative expenditures of the two groups. If the Consumer's lobbying effort exceeds the Firm's, the Consumer increases its effort to protect its lead when the Firm's lobbying increases $\left(\text{so } \frac{\partial \boldsymbol{E}^c}{\partial e^f} > 0\right)$. If not, an increase in the Firm's lobbying makes prospects dimmer for the Consumer, and he scales back his lobbying effort accordingly $\left(\text{so } \frac{\partial \boldsymbol{E}^c}{\partial e^f} < 0\right)$. The results for the Firm are analogous.

Equilibrium

The unique Nash equilibrium is determined by the intersection of the reaction functions. The equilibrium values of Consumer and Firm effort, denoted $e^{c*}(U,\Pi)$ and $e^{f*}(U,\Pi)$ respectively, are given by equations (7) and (8). The corresponding probability that the Consumer's preferred outcome is selected, $p(e^{c*},e^{f*})$, will be denoted $p^*(U,\Pi)$ and is given by equation (9).

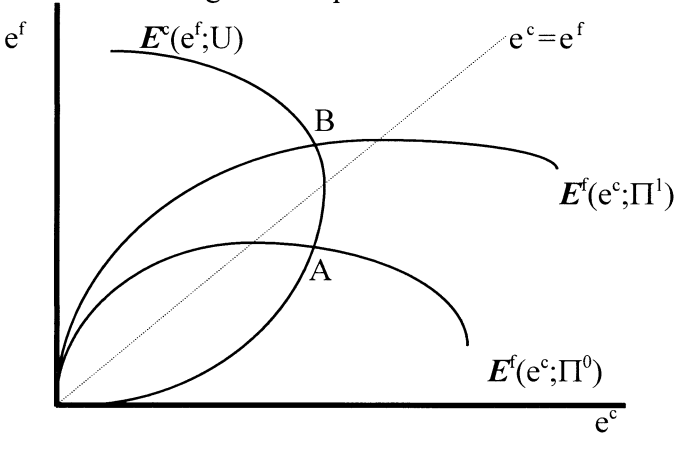
$$e^{c}*(U,\Pi)=\frac{\Pi U^{2}}{(U+\Pi)^{2}} \tag{7}$$

$$e^{f}*(U,\Pi)=\frac{U\Pi^{2}}{(U+\Pi)^{2}} \tag{8}$$

$$p*(U,\Pi)=\frac{U}{U+\Pi} \tag{9}$$

The Firm's lobbying effort exceeds (falls short of) the Consumer's lobbying effort and the Firm's chance of winning is more (less) than one-half if the Firm's stake is larger than the Consumer's stake. Intuitively, if the Firm's stake exceeds the Consumer's, the Firm has a higher incentive to lobby, leading to more lobbying by the Firm and a higher chance that the firm will win. Figure 1 below illustrates the two possibilities. In the figure, the Consumer's stake is held constant while the Firm's stake is varied. If the Firm has relatively little at stake, say Π^{0}, the equilibrium will be at a point like A where the Consumer is most likely to win. If, however, the Firm's stake is relatively large, say Π^{1}, the equilibrium will be at a point like B.

Figure 1: Equilibrium



Given equations (7)-(9), it is straightforward to determine the response of the equilibrium to shifts in the groups' stakes. Increases in the Consumer's stake (due to changes in payoffs or the

marginal cost of lobbying effort) shift its reaction curve to the right, increasing consumer effort. If the Firm's stake exceeds the Consumer's stake, so that firm effort is higher, the Firm increases its effort to protect its lead. Otherwise the Firm decreases its effort. In either case, the Consumer is more likely to win in equilibrium. The analysis of changes in the Firm's stake is analogous. Changes in institutions, such as campaign laws or the regulatory regime, or in underlying economic conditions, such as demand or production costs, can change the stakes of both parties. If both sides find they have more (or less) at stake, the response of the regulatory decision will depend on the relative magnitudes of the changes in stakes.[5]

Substituting from equations (7)-(9) into equations (1) and (2) gives each group's equilibrium expected welfare as a function of payoffs and marginal lobbying costs. Letting w^c* and w^f* represent the Consumer's and the Firm's equilibrium expected welfare, respectively, and rearranging gives:

$$w^c* = u^f + p*^2\left(u^c - u^f\right), \qquad \text{and} \tag{10}$$

$$w^f* = \pi^c + (1-p*)^2\left(\pi^f - \pi^c\right). \tag{11}$$

The Consumer's equilibrium expected welfare increases with increases in both its winning and losing payoffs. However, increases in the Firm's stake reduce the Consumer's expected equilibrium welfare because the Firm will lobby more intensely when it has more at stake. This means that increases in the Firm's winning payoff will make the Consumer worse off while increases in the Firm's worst case payoff will make the Consumer better off. The analysis is again analogous for the Firm.

3. Changes in Payoffs

In this section I develop new results concerning the effects of exogenous changes in payoffs on the expected equilibrium welfare of the individual groups and aggregate equilibrium expected welfare, defined as the sum of the Consumer's equilibrium expected welfare and the Firm's equilibrium expected welfare and denoted w*. Such changes may be due to changes in underlying economic conditions, technology, or regulatory policies. It will prove useful to define the "gross surplus" associated with a regulatory decision, S^c or S^f, to be equal to the sum of the Consumer's and the Firm's payoffs under that decision (i.e., $S^c = u^c + \pi^c$ and $S^f = u^f + \pi^f$).

Ignoring the effects of lobbying, changes that increase gross surplus under at least one decision but do not decrease it under either would be efficient in the sense that the sum of the Consumer's payoff and the Firm's payoff increase regardless of the decision made by the regulator. Under the interpretation of the model in which the regulator's decision is taken as implementing a particular convex combination of the decisions most favorable to the Consumer and the Firm, the utility possibilities frontier is shifted out by such changes, making Pareto improvements possible. However, any improvement in one group's winning payoff induces that group to lobby more. As a result, the other group is made worse off and aggregate welfare may fall. Thus, changes in policy or market conditions that would otherwise appear beneficial may have unexpected adverse welfare consequences. This leads to the following proposition.

Proposition 1. *Suppose that gross surplus increases under at least one regulatory outcome and decreases under neither. If either group's stake increases, aggregate equilibrium expected welfare may fall. If, in addition, one group's worst case payoff (u^f or π^c) declines and the percentage increase in that group's stake is larger than the percentage change in the other group's stake, both groups' equilibrium expected welfare might fall.*

The basic intuition behind Proposition 1 is straightforward. Changes that increase gross surplus can change the stakes of both groups and therefore alter political activity in a complex way. If the groups have more at stake, wasteful lobbying expenditures will increase.[6] Further, the probability of a particular regulatory decision will change. This may mean that the decision with the highest social value becomes less likely. On net, consumers and/or producers may end up worse off, and aggregate welfare may be lower.[7]

If both a group's payoffs increase, that group can only be worse off if is less likely to win in equilibrium from equations (10) and (11). Intuitively, this is because diminishing returns limit increases in lobbying expenditures on both sides. From equation (9), the group with the larger percentage increase in its stake will be more likely to win, and thus better off if both of its payoffs increase. Therefore, an increase in gross surplus can make both groups worse off simultaneously only if at least one group experiences a decline in at least one of its payoffs, albeit a small enough one that gross surplus still increases under the regulatory outcome in question. Since both groups are made better off when either group's worst case payoff increases, and since a decline in either group's group winning payoff makes the other group better off, declines in one group's winning payoff, offset by larger increases in the other group's winning payoff so that gross surplus increases, will always increase social welfare. Therefore, a change

that increases gross surplus will make both groups worse off only if at least one group's worst case payoff (u^f or π^c) declines. Further, if only one group's worst case payoff declines, the percentage increase in that group's stake is larger than the percentage increase in the other group's stake.

It is instructive to consider factors that influence the potential for an increase in gross surplus to have adverse welfare consequences beyond the necessary conditions stated in Proposition 1. Reflection on the model reveals four obvious candidates. First, when the increase in gross surplus is more heavily concentrated in an outcome that is unlikely to occur, the realized gain in gross surplus is likely to be smaller and therefore more easily outweighed by changes in lobbying. Second, when the change in stakes brought about by the increase in gross surplus makes the outcome with the highest gross surplus less likely, the realized gain in gross surplus is again diminished and more easily outweighed by changes in lobbying. Third, the beneficial effects of sufficiently large increases in gross surplus will swamp the negative effects because diminishing returns to lobbying effort limit the corresponding increases in lobbying costs. Therefore, relatively small increases in gross surplus that alter the relative stakes of the groups are most likely to have adverse welfare consequences. Finally, when one group is dominant before and after the change, in the sense that their normalized stake is much higher than the other group's, there will be little lobbying. Therefore, increases in gross surplus are more likely to have adverse welfare effects when neither of the groups is dominant after the increase in gross surplus or when a group that was dominant before the increase in gross surplus at least becomes less dominant afterward.

Proposition 1 differs from what one would expect from the early rent seeking formulations of Tullock (1967), Krueger (1974), and Posner (1975). Those works, either implicitly or explicitly, assumed that political competition exactly exhausted expected rents. This would happen, for instance, in a competition for a monopoly franchise between a large number of identical firms. In such a situation, any change in the available rents would leave the competing groups with expected gains unchanged at zero. The adverse consequences of Proposition 1 arise when the number of groups is limited and those groups do not place identical values on securing a favorable decision. For example, once a monopoly franchise has been awarded, the collection of groups actively competing for favorable regulatory decisions is typically reduced to a single firm, a relatively small number of organized groups of customers, and potentially a few other interested parties such as environmental groups.

Proposition 1 also differs from the work of Peltzman (1976) and Becker (1983 and 1985). Peltzman (1976) (and others) argue that regulation insulates individual constituencies from exogenous shocks by spreading the impact of these shocks across all constituencies. Therefore, gross gains would be distributed across all groups, making them all better off. This conclusion arises because the regulator in Peltzman's model optimally equalizes the marginal return to allocating benefits across non-strategic groups. While the basic insight that regulators will tend to engage in cost and benefit spreading under certain circumstances is important, some qualification is called for when the groups strategically alter their lobbying activity in response to the prevailing stakes. Becker (1983) found that more efficient taxation would be unanimously supported while more efficient subsidization would be supported by one group but might be supported or opposed by the other. In the setting studied here, some improvements that increase gross surplus will be supported by no one. This is because Becker's formulation does not allow

for changes that enhance gross surplus, potentially allowing everyone to receive higher payoffs, but reduce one or both groups' worse case payoffs. Actual changes in policy or market structure may, however, do just that.

A Parameterized Example

To make the ideas presented above more concrete, I now present a detailed example in which the groups' payoffs are explicitly tied to parameters that characterize underlying economic conditions. There are n identical consumers of the Firm's product, each with reservation value v. Upon making a capital investment and incurring a fixed cot of I, the Firm can produce up to $q < n$ units at no additional cost and can produce at levels beyond q at a constant unit cost of c. Initially, the Firm operates without competition under some form of economic regulation (e.g., rate of return regulation or price cap regulation). If this continues the Firm's payoff will be $\bar{\pi}$, as determined by previous regulatory decisions. Similarly the Consumer's payoff will be the value of the product less production costs and the transfer to the Firm, $nv - (n-q)c - I - \bar{\pi}$.

A competitive fringe could provide the product at a constant unit cost of $\tilde{c} < c$. The regulator must decide whether or not to deregulate and allow competition. Under competition, the competitive price would be $\tilde{c}$, the Firm's payoff would be would be either $q\tilde{c} - I$ or zero, whichever were greater (assuming I is a fixed cost, not a sunk cost), and the Consumer's payoff would be $n(v - \tilde{c})$. I assume that the Firm's payoff would be higher under continued regulation and the Consumer's would be higher under competition. Using equation (9), performing some algebraic manipulation, and letting K denote the ratio of the Consumer's marginal lobbying cost to the Firm's, the equilibrium probability of deregulation is:

$$\tilde{p}^* = \frac{(n-q)(c-\tilde{c}) + I + \bar{\pi} - q\tilde{c}}{(n-q)(c-\tilde{c}) + (1+K)(I+\bar{\pi} - q\tilde{c})}. \qquad (12)$$

Now, consider the welfare impact of a decline in the competitive price. Obviously, such a change will make the Firm worse off since it will face stiffer competition if the regulator does decide to deregulate. The effect on the Consumer's welfare is less clear cut. While the Consumer will be better off if the regulator chooses to deregulate, the Firm will now be more resistant to deregulation. Using equation (10) and rearranging terms, the Consumer's welfare is:

$$w^{c}* = nv - (n-q)c - I - \overline{\pi} + \tilde{p}^{*2}\left[(n-q)(c-\tilde{c}) + I + \overline{\pi} - q\tilde{c}\right]. \tag{13}$$

In the parameter range in which the Firm produces under deregulation ($q\tilde{c} \geq I$), differentiating with respect to the competitive fringe's marginal cost gives:

$$\frac{\partial w^{c}*}{\partial \tilde{c}} = 2np^{*3}\left(1 + \frac{kq}{n} - \frac{3}{2p^{*}}\right). \tag{14}$$

Thus, decreases in the competitive fringe's marginal cost may either increase or decrease the Consumer's expected equilibrium welfare. To further illustrate the potential for reductions in the competitive price cost to significantly reduce the Consumer's welfare, consider the specific numerical calculations summarized in Table 1 below. In the table, L represents aggregate lobbying expenditures (ie., $L = k^{c}e^{c} + k^{f}e^{f}$) and the following parameter values are assumed: $v = 1$, $n = 1$, $q = .5$, $k^{c} = 10$, $k^{f} = 1$, $I = .15$, $\overline{\pi} = .1$, and $c = .75$. These parameter values represent a situation in which: 1) the Firm's marginal lobbying cost is substantially less than the Consumer's, but not so much so that the Consumer is irrelevant, 2) there is substantial room for competition, but the Firm would remain very important in a deregulated market as long as $\tilde{c} \geq .3$ so that the firm would remain in the market under deregulation, and 3) under regulation the Firm receives substantial rents that are nevertheless much smaller than consumer surplus. While these are reasonable parameter assumptions for the purpose at hand, Consumer welfare falls with

decreases in the competitive price over a much wider area of the parameter space, as indicated by equation (14).

Table 1: Effects of Reductions in the Competitive Price

$\tilde{c}$	u^c	π^c	S^c	e^c	e^f	L	p*	w^{c}*	w^{f}*	W*
0.500	0.500	0.100	0.600	0.000	0.000	0.000	1.000	0.5000	0.1000	0.6000
0.495	0.505	0.098	0.603	0.002	0.000	0.018	0.839	0.4664	0.0976	0.5640
0.490	0.510	0.095	0.605	0.003	0.001	0.028	0.730	0.4469	0.0954	0.5423
0.485	0.515	0.093	0.608	0.003	0.002	0.034	0.651	0.4344	0.0934	0.5278
0.480	0.520	0.090	0.610	0.004	0.002	0.037	0.592	0.4258	0.0917	0.5175
0.475	0.525	0.088	0.613	0.004	0.003	0.040	0.545	0.4196	0.0901	0.5097
0.450	0.550	0.075	0.625	0.004	0.006	0.048	0.412	0.4047	0.0837	0.4883
0.425	0.575	0.063	0.638	0.005	0.009	0.054	0.348	0.3992	0.0784	0.4776
0.400	0.600	0.050	0.650	0.005	0.011	0.059	0.310	0.3967	0.0738	0.4705
0.375	0.625	0.038	0.663	0.005	0.013	0.064	0.286	0.3954	0.0694	0.4648
0.350	0.650	0.025	0.675	0.005	0.015	0.069	0.268	0.3948	0.0652	0.4599
0.300	0.700	0.000	0.700	0.006	0.019	0.079	0.245	0.3946	0.0570	0.4515
0.250	0.750	0.000	0.750	0.007	0.020	0.094	0.273	0.4029	0.0529	0.4558
0.200	0.800	0.000	0.800	0.009	0.021	0.110	0.298	0.4128	0.0492	0.4620
0.150	0.850	0.000	0.850	0.010	0.022	0.126	0.322	0.4243	0.0460	0.4702
0.100	0.900	0.000	0.900	0.012	0.023	0.141	0.344	0.4372	0.0430	0.4802
0.050	0.950	0.000	0.950	0.013	0.023	0.156	0.365	0.4516	0.0403	0.4920

In the first row of the table, the competitive price is just high enough to make the Firm indifferent between continued regulation and deregulation. In each of the next five rows, the competitive price is reduced by 1% from its original value. Having begun from a point where the Firm's stake was zero, it is not surprising that the first 1% decline in the competitive price yields the largest relative decline in the Consumer's welfare. What may be surprising is that the Consumer's welfare continues to decline with small reduction's in the competitive price until it reaches .3125, 37.5% below the level at which the Firm would not resist deregulation. Some may be surprised by another aspect of Table 1. As the competitive price falls through the first

six rows, the increase in gross surplus is actually smaller than the increase in aggregate lobbying expenditures. Thus, the potential adverse welfare consequences referred to in Proposition 1 do not necessarily hinge on the presence of a reduction in the probability of the decision with the highest gross surplus - increases in lobbying expenses alone can outweigh the gain in gross surplus.

Above, I pointed out four circumstances that increase the potential for growth in gross surplus to reduce welfare. Three of them are clearly present in the region where the Consumer's welfare declines with reductions in the competitive price. First, from equation (14) it follows that if either group were sufficiently dominant, the Consumer's welfare would increase with decreases in the competitive price. Second, while small decreases in the competitive price (in the region above .3125) make everyone worse off, a sufficiently large decrease would make the Consumer better off, at least relative to prices between .495 and .3125. Third, the increases in stakes occasioned by declines in the competitive price will make the outcome with the highest gross surplus less likely, at least in the region where the Firm's stake is relatively small. The fourth circumstance, however, works to limit declines in welfare in when the competitive price is close to .5 because the increase in gross surplus is concentrated in the outcome that is most likely. However, when the competitive price falls below .4688, further increases in gross surplus are concentrated in the least likely outcome, extending the range over which aggregate welfare falls with reductions in the competitive price.

Applications

Proposition 1 has potential implications for several current regulatory issues. For instance improvements in the quality of products or services potentially subject to universal service requirements may make regulated firms lobby harder against universal service requirements (to

engage in cream skimming) and customers lobby harder for them. All parties might find their equilibrium expected welfare reduced if the new technology imposes additional costs on the Firm under universal service, lowering their worst case payoff. Similarly, the use of two-part tariffs instead of simple linear prices has been widely advocated as a potential remedy for the deficit created by marginal cost pricing in strong natural monopolies. However, in a political setting the Firm may use the additional pricing flexibility to extract more consumer surplus than needed to cover its fixed costs. Both parties will have more at stake when the level of the two-part tariff is determined than when a linear price is set, resulting in higher lobbying. While the greatly increased ability to extract surplus using two-part tariffs will tend to make the Firm better off, both consumer and aggregate equilibrium expected welfare might be reduced.

Since lobbying activity can result in undesirable outcomes, institutions that constrain or reduce lobbying may enhance social welfare. Consider the role that profit sharing can play in this regard. Whenever the profit sharing scheme is not extremely regressive, the transfer to the Consumer is higher when the Firm's profits are larger, so profit sharing reduces the Firm's stake ($d\pi^f < d\pi^c < 0$ and $d\Pi < 0$) and the Consumer's stake ($du^f > du^c > 0$ and $dU < 0$). Profit sharing unambiguously increases the Consumer's welfare because it increases both of the Consumer's gross payoffs and reduces the Firm's stake. Profit sharing also unambiguously increases aggregate welfare. Further, the Firm may gain on balance if the effect of the reduced consumer lobbying outweighs the direct effect of reduced gross payoffs.[8]

The above example of a regulatory decision on whether or not to allow a competitive fringe to compete freely with a single firm that has previously operated under strict regulation may be applied to several questions in a straightforward way. For instance, changes in policy or

technology that reduce the potential cost independent power providers (IPPs) would incur to deliver power to final consumers may make customers lobby harder for retail competition in electricity provision.[9] Similarly, regulated electric utilities would lobby harder against retail competition since the competition they would face if final customers could choose their supplier would stiffen. The end result could be reduced equilibrium expected welfare for all parties. Another possibility is that both sides may simply agree to keep certain policy changes that would increase efficiency off of the table unless forced into considering them in regulatory proceedings by the regulator or some outside party. Cross sectionally, the model predicts that under some circumstances states in which potential competitors are either very efficient or very inefficient at the margin relative to the incumbent producer will tend to allow competition before those in which the potential competitors are only moderately more efficient at the margin. In telecommunications, analogous arguments may be made for the effects of changes in policy and technology governing competitive access to networks operated by local incumbents.

As discussed above, the regulator in Peltzman (1976) spread shocks across all groups, so declining rents to firms would be symptomatic of a general decline in wealth under the existing regulatory regime. Therefore, in their exploration of the ability of the ETR to explain several cases of deregulation, Peltzman (1989) and Levine (1989) focus on the erosion of rents accruing to firms in the regulated industry. In the cases of airline, long-distance telecommunications, and trucking deregulation, they question the predictive power of the ETR on the grounds that deregulation eliminated substantial rents over the opposition of their recipients. In my model, deregulation hinges on the relative stakes of those favoring regulation and those favoring deregulation. Therefore, deregulation may become more likely even if rents to the firm under regulation remain high (or are growing) if increases in the stakes of those opposed to regulation

outweigh the continued interest of the firm (industry) in maintaining regulation. Put this way the insight may not be very surprising, but it has often been overlooked.

The fact that MCI's application to provide long distance service was a crucial step toward competition in long-distance service provides some evidence that the stakes of potential competitors are indeed important, but what systematic factors might cause the stakes favoring deregulation to grow relative those favoring regulation?[10] Inspection of equation (12), which gives the probability of deregulation in my simple parameterized example, provides one candidate. If the regulated producers are inefficient at the margin, as the market becomes larger the costs imposed on those burdened by regulation will grow more rapidly than rents to the regulated firms. This suggests that the more rapidly the market for the products of a regulated industry grows, the more likely it is that that industry will be deregulated, provided that the regulated firms are inefficient producers at the margin.[11]

Airlines, long-distance telecommunications, and trucking are all involved in commerce and communications across significant geographic distances. The increasing importance of interstate and inter-community trade during the decades leading up to the deregulation of these industries, together with advances in technology and growth in infrastructure, suggest that the stakes of their consumers and potential competitors may have been growing rapidly and for related reasons. While most industries grow over time, obviously many industries continue to operate under economic regulation.[12] The model predicts that the strongest candidates for deregulation will be those that grow most rapidly and are inefficient producers at the margin. While a full econometric investigation is beyond the scope of this paper, a brief consideration of how well this prediction squares with summary data seems in order. From 1947 to 1972, nominal revenues to air carriers, motor carriers, and telecommunications firms grew at an average annual rate of

12.69%, 10.56%, and 9.49%, respectively, while nominal GDP grew at an average annual rate of only 6.75%. Thus, each of these industries was in fact growing quite rapidly relative to the rest of the economy prior to their deregulation. In contrast, farm receipts grew at an average annual rate of just 3.32% over the same period, and widespread governmental intervention in agricultural markets still persists.[13]

4. Marginal Lobbying Costs

Previous investigations have shown that individual groups gain when the efficiency with which they exert political pressure increases.[14] However, institutional changes such as restrictions on campaign contributions, ethics laws, or motor voter programs affect the lobbying costs of all groups. Each group's welfare falls when its own marginal lobbying cost increases but rises as its opponent's marginal lobbying cost increases. The magnitude of these effects depends critically upon the initial values of the marginal lobbying costs. Intuitively, an equal increase in each group's marginal lobbying cost causes a larger decline in the normalized stake of the group with the lower marginal lobbying, making the group with the higher marginal lobbying cost more competitive and therefore more likely to win. Also, since the group with the higher marginal lobbying cost exerts less lobbying effort relative to what they stand to gain from a favorable decision than the group with the lower marginal lobbying cost, the direct increase in their lobbying expenses will tend to be small relative to impact of the gain in their chances of winning. This leads to Proposition 2, which follows formally from differentiation of equations (10) and (11).

Proposition 2. Groups that are less (more) efficient at utilizing the political process gain (are harmed) when all groups experience equal increases in the marginal cost of lobbying effort.

Proposition 2 may help to explain why public efforts to increase voter participation are not always well received by those they are intended to benefit. If the general public is less efficient at generating political pressure in support of its interests than are special interest groups, making it harder for special interest groups to deliver pressure would potentially enhance welfare much more efficiently. In general it is easily shown that weak groups benefit from across the board increases in marginal lobbying costs while very strong groups benefit from across the board decreases in marginal lobbying costs. The fact that the dominant effect switches where the two marginal lobbying costs are exactly equal, rather than being somehow dependent on the gross stakes of the groups, is an artifact of the functional form employed, particularly the assumption of constant marginal cost.

5. Concluding Remarks

The version of the Economic Theory of Regulation developed above led to several new results. In particular: 1) changes in policy or technology that increase the potential gross surplus in regulated markets can reduce welfare, 2) a more consistent explanation of deregulation is possible when changes in the stakes of those opposed to regulation are considered in addition to changes in the rents accruing to the regulated industry, and 3) the group whose marginal lobbying cost is higher (lower) benefits (is harmed) when all groups experience equal increases in their marginal lobbying costs. These conclusions hold more generally, provided the basic structure of the model is not altered.

Several other extensions merit investigation. A complete theory of the outcome function is needed to permit a fully general analysis of non-binary decisions and alternative institutional designs. Similarly, allowing more groups may prove to be important. To see why, notice that with linear and nondiscriminatory pricing, the interests of all consumers are aligned; they all

want a lower price. With non-linear pricing or third degree price discrimination, this link is destroyed, probably allowing politically strong consumers and the firm to benefit at the expense of politically weak consumers.[15] The incorporation of informational asymmetries might also yield important insights.

FOOTNOTES

[1] Ausin-Smith (1997) provides a useful survey of public choice models of interest group activity.

[2] The ETR began in earnest with Stigler's (1971) paper. Peltzman (1976) analyzes a model in which a support-maximizing regulator allocates the benefits and costs of regulation across groups. Becker (1983 and 1985) constructs a model in which groups exert pressure to increase the value of their net transfers from a government, taking the outcome for any combination of group pressure in reduced form. One exception, Goodman and Porter (1988), explicitly adds electoral competition in a setting otherwise similar to Peltzman (1976). Other closely related works include Rasmusen and Zupan (1991), Grossman and Helpman (1994), and Finkelshtain and Kislev (1997). Laffont and Tirole (1990 and 1991) Dewatripont and Tirole (1995), Rajan and Zingales (1995), and Laffont (1996) offer interesting analysis of related, but somewhat less similar, models. While the questions I pursue differ, the technical set up of the basic model is quite similar to that employed in the rent seeking literature. See, for instance, Tullock (1980), Congleton (1983), Hillman and Riley (1989), Paul and Wilhite (1990), Leininger (1993), and Linster (1993).

[3] The following are examples. Im, Kaserman, and Melese (1989) find a direct link between the regulatory expenditures of electric utilities and the approved rate base and rate of return. Similarly, Teske (1991) finds competition is more likely to be allowed in telecommunications markets in which government funded consumer advocacy is higher. Kaserman, Mayo, and Pacey (1993) find that states are more likely to deregulate intrastate

long distance when business usage is more pronounced (so business users have a larger stake), and residential cross subsidies are lower (so residential consumers have a smaller stake). Foreman (1995) finds intrastate long distance rates are lower when consumer incomes are higher (due to the high income elasticity of demand for long-distance services) and when large business interests are more pronounced. He also finds that prices are higher when there are more lobbyists per legislator, reflecting easier access for telecommunications firms.

[4] Letting $i = e^c, e^f$ and $C_i(e_i)$ represent the cost of lobbying effort, these assumptions are: 1) $\frac{\partial p}{\partial e_i} > 0$, 2) $\frac{\partial^2 p}{\partial e_i^2} < 0$, 3) there exists a function $h(e^c)$ with $h'(e^c) \geq 0$ such that $\frac{\partial^2 p}{\partial e_f \partial e_c} \gtreqless 0$ as $e^f \gtreqless h(e^c)$, 4) $C_i'(e^i) > 0$, and 5) $C_i''(e^i) \geq 0$. Skaperdas (1996) has shown contest success functions satisfy five reasonable axioms if and only if they take the form $p_i(y_i, y_j) = \frac{f(y_i)}{f(y_i) + f(y_j)}$ where $p_i(\cdot)$ is the probability group i wins, y_i is group i's effort, and $f(\cdot)$ is a positive increasing function. Letting the Consumer be group i and the Firm be group j and defining $f(y_i)=e^c$ and $f(y_j)=e^f$ and assuming constant marginal lobbying costs gives the formulation used here. Second order conditions hold globally. Contest success functions of this form have been widely used. See, for example, Tullock (1980), Rogerson (1982), Congleton (1983), Leninger (1993), Linster (1993), and Rajan and Zingales, 1995).

[5] These comparative statics essentially formalize Stigler's (1971) argument that groups with larger economic stakes or lower costs of exerting pressure are more likely to be the

beneficiaries of regulation. For changes in the marginal cost of effort, the results are analogous to Becker's (1983) finding that a group's relative efficiency at producing political pressure determines how they fare politically. Hillman and Riley (1989), Leininger (1993), and Linster (1993) show that groups lobby more and are more likely to win when the value they place on the political prize (here, a favorable decision) increases, holding constant the other group's valuation. Explicit consideration of changes in the groups' utilities under unfavorable decisions is, to my knowledge, unique to the present analysis.

[6] This is related to the finding in Hillman and Riley (1989) that rent seeking activity will be less intense when players' valuations of the political prize are less similar.

[7] In a two period model in which two sub-units allocate their resources between production and power seeking, Rajan and Zingales (1995) show that the sub-units may fail to agree to contractible changes that enhance gross surplus. This occurs because the transfers that implement "compensation" when power seeking is not of concern alter the balance of power between the sub-units. The prospect of this change in the balance of power can prevent agreement.

[8] Sappington and Weisman (1996) report that as part of the initial movement toward incentive regulation in the telecommunications industry, fourteen states and the District of Columbia had instituted earnings sharing plans as their primary form of regulation as of 1995. In addition to improved incentives for efficient operation, this analysis suggests these plans have desirable political properties that may have contributed to their popularity. This is particularly true if the uncertainty associated with the initial stages of a shifting regulatory climate led to a heightened potential for political conflict.

[9] Traditional electric utilities use a technology characterized by high fixed costs but very low marginal costs until capacity is pressed. Other techniques are then used to augment base production. Independent and competitive firms (IPPs) as well as the traditional regulated utility can use new low fixed cost technologies to produce power above base capacity. While customers might be expected to prefer to have the opportunity to choose their supplier (when feasible), regulated utilities will prefer to reduce potential competition by preventing their customers from gaining direct access to IPP power. Hunt and Shuttleworth (1996) provide a useful discussion of the potential for competition in electricity provision.

[10] See Brock (1994) for a discussion of the divestiture of AT&T.

[11] The public interest theory would say that once a single regulated firm becomes an inefficient producer at the margin, competition would emerge because it serves the public interest. In the spirit of Becker (1983 and 1985), my model illustrates that in a self interested political world there are still forces that favor aggregate efficiency that will at times lead to outcomes that have much in common with those predicted by the simple public interest theory.

[12] I am considering only industries that operate under more or less pure economic regulation. The regulation of insurance companies, pharmaceuticals, and physicians, for instance, may be significantly affected by informational and safety concerns that are beyond the scope of my model.

[13] Revenue data are from the Statistical Supplement to the Survey of Current Business, 1975.

[14] For instance, Tullock (1980) shows that "bias" in favor of one group makes that group better off, Rogerson (1982) shows that the political advantage of an incumbent monopolist

increases their expected payoff, and Becker (1983) shows that political success depends upon the groups' marginal productivity in the production of "influence".

[15] Beard and Thompson (1996) make a similar point in a different type of model.

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