Lobbying for Regulation Reform by Industry Leaders

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Abstract

We investigate a free-entry market in which incumbents engage in lobbying for changing regulations, which affect the cost of all firms equally. We find that incumbents have incentive to weaken or strengthen regulations, depending on the demand condition.

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1 Introduction

Regulations affect the costs of industry, and incumbent firms often try to influence the behavior of the policymakers (Lowry, 1992; Engel, 1997). Electric power companies, steel manufacturers, and automobile manufacturers often face stricter emissions and/or fuel efficiency regulations that raise costs. However, it is not always true that incumbent firms require weaker regulations. ARCO, the largest retailer of gasoline in California, proposed a stricter (greener) gasoline regulation in the 1990s and DuPont, the largest chlorofluorocarbons (CFCs) producer, played a substantial role in strengthening the international regulation on alternative CFCs in the 1980s (Cai and Li, 2016). In 2016, the Japan Vacation Rental Association proposed a stricter regulation as a countermeasure to neighborhood noise, which might increase the future costs of incumbents as well as new entrants at several regulatory reform councils.[1]

A natural interpretation of such cost-increasing lobbying is that a stricter regulation raises rivals' costs more significantly, and strengthens the competitive advantage of the incumbent dominant firms. Based on discussions of "raising rivals' costs" developed by Salop and Scheffman (1983), Cai and Li (2016) formulated a model in which a stricter regulation affects costs non-uniformly among firms. The authors showed that firms whose competitive advantages are improved by a stricter regulation might engage in cost-raising lobbying.

In this study, we show that even when a stricter regulation uniformly raises the cost of all firms, including both incumbents and new entrants, incumbents might engage in lobbying for a stricter regulation. We show that in free-entry markets, incumbents attempt to raise (reduce) common costs when the demand function is strictly convex (concave).[2]

[1] http://www.mlit.go.jp/common/001127433.pdf (in Japanese).

[2] Free entry is crucial for this result. The result—that an increase in the common regulation cost increases the industry profits—does not appear without new entries. In many contexts, free-entry markets yield contrasting implications. See Cato and Matsumura (2013), Etro (2007), Hattori and Yoshikawa (2016),

2 Model

There are $m(\geq 1)$ incumbent firms and infinitely many potential new entrants. Each potential new entrant (a follower) has a cost function $C_f(x) + F + rx$, where $C_f(x) : \mathbb{R}_+ \mapsto \mathbb{R}_+$ is the production cost, $F \in \mathbb{R}_{++}$ is the fixed-entry cost, and r is a regulation cost that is determined by the lobbing by the incumbent firms. Each incumbent firm (a leader) has a cost function $C_l(x) + F + rx$, and the entry cost F has already been sunk. We assume that, for $k = f, l$, C_k is twice differentiable, $C_k' > 0$, $C_k'' > 0$, $\lim_{x \to 0} C_k'(x) \to 0$, and $\lim_{x \to \infty} C_k'(x) \to \infty$. r is a regulation cost per unit that is determined by the lobbying by the incumbent firms. Let X be the total output in the market. The (inverse) demand function is given by $P(X) : \mathbb{R}_+ \mapsto \mathbb{R}_{++}$, where $P(X)$ is twice differentiable and $P'(X) < 0$ for all X as long as $P > 0$.

Each incumbent engages in cost-raising or cost-reducing lobbying activities. Each incumbent firm i $(i = 1, ..., m)$ chooses the level of lobbying activities $y_i \in [\underline{y}, \overline{y}]$ with $-\infty < \underline{y} < 0 < \overline{y} < \infty$. A positive (negative) y_i implies that the incumbent i attempts to increase (decrease) the common regulation cost. Both cost-raising and cost-reducing lobbying activities require cost and are given by $g(y) : [\underline{y}, \overline{y}] \mapsto [0, \infty]$, which is finite and differentiable on $(\underline{y}, \overline{y})$. We assume $g' > 0$ $\forall y \in (0, \overline{y})$, $g'(0) = 0$, $g' < 0$ $\forall y \in (\underline{y}, 0)$, $g'' > 0$, $\lim_{y \to \overline{y}} g'(y) \to \infty$, and $\lim_{y \to \underline{y}} g'(y) \to \infty$. We further assume that g'' is sufficiently large so that all relevant second-order conditions are satisfied. The regulation cost r is given by $r = h(y_1, y_2, ..., y_n)$ with $\forall i, \partial h/\partial y_i > 0$ and $h(0, ..., 0) = r^*$.[3]

The game proceeds as follows. In the first stage, each incumbent firm i $(i = 1, ..., m)$ chooses $y_i \in [\underline{y}, \overline{y}]$. In the second stage, after observing r, each incumbent firm i independently chooses x_i. In the third stage, after observing r and the total output by the incumbents, potential new entrants choose whether they enter the market. In the fourth stage,

Lahiri and Ono (1995, 2007), Lee (1999), and Matsumura and Kanda (2005).

[3] We assume that $P(0) > r^*$ because otherwise no firm might engage in production in equilibrium.

after observing the number of new entrants n, each new entrant j ($j = m+1, ..., m+n$) independently chooses x_j. We assume that the demand is sufficiently large and/or F is sufficiently small so that $n > 0$ holds in all relevant subgames.

3 Equilibrium

We solve the game by backward induction. In the fourth stage, follower i ($i = m{+}1, ..., m{+}n$) simultaneously chooses x_i to maximize its profit, given r and $X_l \equiv \sum_{i=1}^{m} x_i$. The first-order condition is given by

$$P'x_i + P - C_f' - r = 0. \tag{1}$$

We assume the second-order condition is satisfied (i.e., $2P' + x_i P'' - C_f'' < 0$). A sufficient condition for this is $P' + x_i P'' < 0$ (i.e., strategies are strategic substitutes). Another sufficient condition is that C_f'' is sufficiently large. We assume symmetric equilibrium in this stage. Let x_f^* be the equilibrium output of each follower at this stage.

In the third stage, infinitely many potential new entrants decide whether to enter the market. The number of entrants n is given by the zero profit condition:

$$Px_f^* - C_f - rx_f^* - F = 0. \tag{2}$$

Equations (1) and (2) determine n and x_f^* given X_l and r.

We now present how the total output of incumbents X_l affects the equilibrium price of the subgame starting from the third stage. This property is known in the literature on free-entry markets (see Etro, 2007; Ino and Matsumura, 2012).

Lemma 1: The output of incumbents X_l does not affect the equilibrium price P.

Proof: See the Appendix.

Lemma 1 states that the output of the incumbents does not affect the equilibrium price. A larger X_l reduces the residual demand for new entrants, and thus, reduces the number of entering firms. However, it does not affect x_f^*. Because the equilibrium price is equal to the average cost of each new entrant (i.e., $P = r + (C_f(x_f^*) + F)/x_f^*$), X_l does not affect the equilibrium price as long as $n > 0$.

We now discuss the second stage. Each incumbent i ($i = 1, ..., m$) chooses x_i to maximize $Px_i - C_l - rx_i - g(y_i)$ given r. From Lemma 1, all incumbents take price P as given in this stage. The first-order condition is

$$P = C_l' + r. \tag{3}$$

We denote each incumbent i's output by $x_i = x_l^*$.

In the first stage, each incumbent i ($i = 1, ..., m$) chooses y_i to maximize $\pi_i = Px_l^* - C_l - rx_l^* - g(y_i)$. The first-order condition is

$$\partial\pi_i/\partial y_i = x_l^*(\partial P/\partial r - 1)\partial r/\partial y_i + \partial x_l^*/\partial y_i(P - C_l' - r) - g' = 0. \tag{4}$$

The second term in (4) is zero from (3). Because x_l^* and $\partial r/\partial y_i$ in the first term in (1) are positive, each incumbent chooses positive y_i (i.e., engages in cost-raising lobbying) if and only if $\partial P/\partial r > 1$.

We now present our main result.

Proposition 1: For all $i(= 1, ..., m)$, $y_i >\ (<, =)\ 0$ if $P'' >\ (<, =)\ 0$. That is, incumbent $i(= 1, ..., m)$ attempts to increase (attempts to decrease/does not attempt to affect) the common cost r if the demand function is strictly convex (strictly concave/linear).

Proof: See the Appendix.

Thus, in free-entry markets, incumbents might attempt to increase the common cost, depending on the demand conditions. In addition, our result suggests potential danger of using linear demand in the analysis of free-entry markets. In our model, the common cost does not affect the profit of the incumbents (and thus, $y = 0$) under linear demand. This result, however, never holds under any type of non-linear demand.

Finally, we briefly discuss the welfare implications. Ino and Matsumura (2012) showed that the existence of leaders always improves welfare in free-entry markets. However, in our model, an increase in r reduces total social surplus unless it reduces social costs, which are not discussed in this note. Thus, if the demand is strictly convex, this welfare loss might dominate the welfare gain pointed out by Ino and Matsumura (2012) and the existence of leaders could be harmful for social welfare.

4 Concluding remarks

In this study, we demonstrate that the incumbents might engage in cost-raising lobbying even when it uniformly raises the cost of both incumbents and new entrants. Incumbents engage in such lobbying if the demand function is strictly convex. A stricter regulation, however, might increase the cost of new entrants more significantly. In this case, cost-raising lobbying might appear even when the demand function is strictly concave.

In our setting, cost-raising lobbying is harmful for welfare. It increases the cost of production (regulation cost) directly, and the lobbying activity itself is wasteful from the welfare viewpoint. The former effect is also harmful from the viewpoint of consumer welfare. However, this result may not hold in the presence of negative externality of production. An increase in the price reduces the social loss of the negative externality and it may improve welfare. Incorporating the negative externality into our analysis and investigating welfare and policy implications remains for future research.

Appendix

Proof of Lemma 1

We show that $dx_f^*/dX_l = 0$. Then, from (2), we obtain that P is independent of X_l.

Differentiating (1) and (2), we obtain

$$\begin{pmatrix} x_f^* P' + x_f^{*2} P'' & (n+1)P' + nx_f^* P'' - C_f'' \\ x_f^{*2} P' & nx_f^* P' + P - C_f' - r \end{pmatrix} \begin{pmatrix} dn \\ dx_f^* \end{pmatrix} = \begin{pmatrix} -P' - x_f^* P'' \\ -x_f^* P' \end{pmatrix} dX_l. \tag{5}$$

Using (1), $nx_f^* P' + P - C_f' - r = (n-1)x_f^* P'$. It follows that

$$\det \begin{pmatrix} x_f^* P' + x_f^{*2} P'' & (n+1)P' + nx_f^* P'' - C_f'' \\ x_f^{*2} P' & nx_f^* P' + P - C_f' - r \end{pmatrix} = -x_f^{*2} P'(P' + x_f^* P'') - x_f^{*2}(P')^2 + x_f^{*2} P' C_f'' < 0 \tag{6}$$

because the second-order condition of the fourth stage ensures $P' + x_f^* P'' < C_f'' - P'$. Applying Cramer's rule to (5), we obtain $dx_f^*/dX_l = 0$. Q.E.D.

Proof of Proposition 1

We show that $y_i > \ (<, =)\ 0$ if $dP/dr > \ (<, =)\ 1$. Thus, all we have to show is that $dP/dr > \ (<, =)\ 1$ if $P'' > \ (<, =)\ 0$.

Because P depends on $X \equiv nx_f^* + X_l$, we obtain

$$\frac{dP}{dr} = (x_f^* \frac{dn}{dr} + n\frac{dx_f^*}{dr} + \frac{dX_l}{dr})P'. \tag{7}$$

Differentiating (1)–(3) yields

$$\begin{pmatrix} x_f^* P' + x_f^{*2} P'' & (n+1)P' + nx_f^* P'' - C_f'' & P' + x_f^* P'' \\ x_f^{*2} P' & (n-1)x_f^* P' & x_f^* P' \\ x_f^* P' & nP' & P' - \frac{C_l''}{m} \end{pmatrix} \begin{pmatrix} dn \\ dx_f^* \\ dX_l \end{pmatrix} = \begin{pmatrix} 1 \\ x_f^* \\ 1 \end{pmatrix} dr. \tag{8}$$

Dividing the second row of (8) by $x_f^* P' dr$, we obtain

$$x_f^* \frac{dn}{dr} + n\frac{dx_f^*}{dr} + \frac{dX_l}{dr} = \frac{dx_f^*}{dr} + \frac{1}{P'}. \tag{9}$$

Substituting (9) into (7), we obtain

$$\frac{dP}{dr} = 1 + P' \frac{dx_f^*}{dr}. \tag{10}$$

Thus, $dP/dr >\ (<, =)\ 1$ if $dx_f^*/dr <\ (>, =)\ 0$.

Applying Cramer's rule to (8), it follows that

$$\frac{dx_f^*}{dr} = \frac{x_f^* P''}{-P'(P' + x_f^* P'') - (P')^2 + P' C_f''}, \tag{11}$$

where the denominator is negative from (6). Because $x_f^* > 0$, the sign of dx_f^*/dr is the opposite to that of P''. Q.E.D.

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