Bargaining and Collusion in a Simple Regulatory Model with Soft Information

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Abstract

Within a standard three-tier model, we study the possibility of collusion between a monopolistic firm and a regulatory agency. The regulatory policy is modelled as the outcome of a bargaining process between the agency and the firm. We show that the efficient firm has a stake in collusion only if the agency's bargaining power is high enough and total collusion gains are now lower than in the standard approach. Then, we investigate the principal's optimal response to collusion.

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1. Introduction

We examine the possibility of collusion between a monopoly and a regulatory agency within a standard three-tier model, when regulation is the outcome of a *bargaining* process between the agency and the firm. Our setup aims to generalize the standard model, where all the bargaining power is allocated to the agency, since regulation usually does *not* reduce to a passive enforcement of a policy.[1] The bargaining power of each party depends on the legislation disciplining the regulatory process, which usually allows the firm to participate actively. Hence, a low bargaining power of the agency does *not* mean its capture, but it depends on the firm's capability to support its own interests within legislation.[2] The actual legislation shape can be viewed as the result of contract incompleteness, whose analysis is not pursued here. With a legislation giving room for bargaining between the agency and the firm, we study the possibility of collusion between the two parties, which as usual deals with cost manipulation, and we show that the principal's optimal response to this threat crucially depends on players' bargaining powers.

We find that the efficient firm has a stake in collusion only if the *agency*'s bargaining power is high enough and total collusion gains are now *lower* than in the standard approach. Then, we investigate the optimal response to collusion.

2. The model

The benevolent principal, *Congress*, cares about consumer surplus only. It hires a regulator which supervises firm's costs and bargains with the firm over a regulatory policy.[3] Congress offers the agency a contract with a compensation $T^{CS}(r) \geq 0$ contingent on the agency's report r (see below).

Consumers buy a quantity $q(p)$ and pay a two-part tariff, with unit price p and fixed charge S. Given a demand $q(p) = 1 - p$, consumer surplus is

$$CS\left(p, S; T^{CS}\right) = \frac{(1-p)^2}{2} - S - T^{CS}. \tag{1}$$

Firm's profit is

$$\pi\left(p, S; c_i\right) = pq(p) + S - c_i q(p), \tag{2}$$

[1] See Spulber (1989), Armstrong and Sappington (2007).

[2] For instance, the firm could threaten to appeal before courts against agency's decisions to obtain some revisions. Moreover, the agency must fulfil a set of precedural requirements, which limit the command and control policies. For the U.S. case see the Administrative Procedure Act of 1946 and the Negotiated Rulemaking Act of 1990.

[3] As usual, full delegation of contracting authority arises from Congress's lack of time, skills or resources to run this task, see Laffont (2000).

where the marginal cost c_i, $i \in \{L, H\}$, is private information of the firm, c_L is drawn with probability $\nu \in (0,1)$ and $c_H < 1$ ensures that production is first-best efficient.[4] Define $\Delta c \equiv c_H - c_L > 0$.

The *regulatory agency*, which is drawn with probability $\gamma \in (0,1)$, has utility

$$V_B = CS, \tag{3}$$

as it internalizes Congress's interests and settles for the minimum transfer to finance its activity ($T^{CS} = 0$). With probability $(1-\gamma)$ the agency is nonbenevolent and only cares about its private transfer T,[5] i.e.

$$V_{NB} = T, \tag{4}$$

which may come either from consumers through T^{CS} or from the firm at the collusive stage (see below). The supervisory technology is perfectly informative. However, the signal is *soft* information (i.e. never verifiable) and thus it can be manipulated. The self-interested regulator may convey a report $r \in \{c_L, c_H\}$ different from the actual c_i and share total collusion gains (if any).[6]

The *timing* of the game is the following.

(I) Nature independently draws a type for the agency and the firm, and privately informs them.

(II) Congress offers the agency a contract with $T^{CS}(r)$.

(III) If the contract is signed, the agency performs its audit. The firm learns the agency's type.[7]

(IV) The agency reports r to Congress and may collude with the firm.

(V) Negotiations over a regulatory policy $\{p, S\}$ take place.

(VI) Contracts are executed.

3. Regulation when collusion is tolerated

Using the (asymmetric) Nash solution, the regulatory policy negotiated between a *benevolent* agency and a firm of type c_i solves

$$\max_{\{p(c_i),S(c_i)\}} \left[V_B\left(p\left(c_i\right), S\left(c_i\right)\right)\right]^{\alpha} \times \left[\pi\left(p\left(c_i\right), S\left(c_i\right)\right)\right]^{1-\alpha} \ s.t.\ V_B \geq 0,\ \pi \geq 0,$$

[4] W.l.g. we neglect fixed costs which can make the activity naturally monopolistic.

[5] See Laffont and Tirole (1991).

[6] In line with the literature the agency cannot forge the signal against the firm's will. For instance, the firm is able to prove before Congress its actual costs.

[7] See Kofman and Lawarrée (1996).

where $\alpha \in (0,1)$ is the agency's bargaining power. As argued in Section 1, α arises from regulatory legislation, hence it is independent of the agency's type. Using (1), (2) and (3), the equilibrium *price* is

$$p(c_i) = c_i, \tag{5}$$

as bargaining is efficient. Firm's profits and consumer surplus are simply

$$\pi(c_i) = S(c_i) = (1-\alpha)\, TGT(c_i) \tag{6}$$

$$CS(c_i) = \alpha TGT(c_i), \tag{7}$$

where $TGT(c_i) \equiv \frac{1}{2}(1-c_i)^2$ denotes total gains from trade.

A *self-interested* agency may find it profitable to collude with the firm through a false report and agreeing on a policy consistent with that report. The following proposition shows when this is the case.

Proposition 1 *Define* $\widetilde{\alpha} \equiv \frac{\Delta c}{2-c_H-c_L} \in (0,1)$. *Then, if* $\alpha \in (0, \widetilde{\alpha}]$ *collusion is never attractive. If* $\alpha \in (\widetilde{\alpha}, 1)$ *only* c_L*-firm has a stake in collusion* $\Delta\pi(c_H; c_L) \equiv \pi(c_H; c_L) - \pi(c_L; c_L)$ *given by*

$$\Delta\pi(c_H; c_L) \equiv \Delta c(1-c_H) - (1-\alpha)(TGT(c_L) - TGT(c_H)). \tag{8}$$

Proof. Using (5) and (6), the c_H-firm's extra profit from $r = c_L$ is

$$\pi(c_L; c_H) - \pi(c_H; c_H) = -\frac{\Delta c}{2}[\alpha(2-c_H-c_L) + \Delta c] < 0,$$

while the c_L-firm's extra profit $\Delta\pi(c_H; c_L)$ is

$$\begin{aligned}
\Delta\pi(c_H; c_L) &= \Delta c(1-c_H) - (S(c_L) - S(c_H)) \\
&= \Delta c(1-c_H) - (1-\alpha)(TGT(c_L) - TGT(c_H)) \\
&= \frac{\Delta c}{2}[\alpha(2-c_H-c_L) - \Delta c],
\end{aligned}$$

which is positive iff $\alpha \in (\widetilde{\alpha}, 1)$. ■

The inefficient firm never colludes, while the efficient firm finds it profitable when $\alpha \in (\widetilde{\alpha}, 1)$. Collusion pays off only if the extra gain from a higher price $\Delta c(1-c_H)$ outweighs the subsidy loss $(1-\alpha)(TGT(c_L) - TGT(c_H))$. Interestingly, the *stronger* the agency, the *higher* the firm's extra profit from collusion because the agency's bargaining power reduces subsidy loss. Put differently, a weak firm, which gets a small fraction of the total pie (see (6)), has a high extra profit from collusion it can share with the agency. With a standard take-it-or-leave-it offer ($\alpha \to 1$), collusion gains are maximized, i.e. $\Delta\pi = \Delta c(1-c_H)$. Hence, bargaining *mitigates* the firm's collusion incentives.

4. The institutional responses to collusion

When collusion is a threat, Congress can (*1*) tolerate *collusion*; (*2*) *incentivize* the agency through a reward;[8] (*3*) *shut down* the inefficient firm. Option *1* yields

$$\begin{aligned} E\left[CS^C\right] &= \gamma\left[\nu CS\left(c_L\right) + \left(1-\nu\right)CS\left(c_H\right)\right] + \left(1-\gamma\right)CS\left(c_H\right) \\ &= CS\left(c_H\right) + \nu\gamma\Delta CS, \end{aligned} \tag{9}$$

where $\Delta CS \equiv CS\left(c_L\right) - CS\left(c_H\right)$. With option *2* Congress pays *both* types of regulator[9] the lowest reward to deter collusion, which is given by total collusion gains in (8) discounted by the shadow cost of side transfers μ :[10]

$$E\left[CS^I\right] = \nu CS\left(c_L\right) + \left(1-\nu\right)CS\left(c_H\right) - \nu\frac{\Delta\pi}{1+\mu}. \tag{10}$$

Option *3* removes collusion incentives, but at the cost of forgoing production of the inefficient firm, i.e.

$$E\left[CS^S\right] = \nu CS\left(c_L\right). \tag{11}$$

Comparing (9), (10) and (11) yields the following result.

Lemma 1 *When collusion can occur, i.e. if* $\alpha \in (\widetilde{\alpha}, 1)$*, Congress prefers*
(i) tolerating to incentivizing iff $\frac{\Delta\pi}{1+\mu} > \left(1-\gamma\right)\Delta CS$
(ii) shutdown to incentivizing iff $\nu\frac{\Delta\pi}{1+\mu} > \left(1-\nu\right)CS\left(c_H\right)$
(iii) shutdown to tolerating iff $\nu \in (\widetilde{\nu}, 1)$*, with* $\widetilde{\nu} \equiv \frac{\left(1-c_H\right)^2}{\left(1-\gamma\right)\left(1-c_L\right)^2+\gamma\left(1-c_H\right)^2} \in (0,1)$.

Points (*ii*) and (*iii*) state that shutdown is desirable if the efficient firm is enough likely. As for point (*i*), notice that a stronger agency increases collusion gains, and tolerating is better as it saves the incentive payment. On the other hand, this increases the consumer loss from collusion and makes deterring more desirable. From this trade-off and Lemma 1 we get the following corollary.

Corollary 1 *Let* $\alpha \in (\widetilde{\alpha}, 1)$.

[8] We assume that limited liability constraints prevent Congress from designing a system of punishments and fines against the agency, see Laffont (2000).

[9] This no-screening condition is quite common in the literature, see Tirole (1992) or Kofman and Lawarrée (1996). It may depend on institutional constraints which allow compensations contingent on the report only.

[10] This captures the inefficiency of side contracting, see Laffont and Tirole (1991).

1. *Define* $\widetilde{\mu} \equiv \frac{\gamma}{1-\gamma}$ *and* $\alpha^* \equiv \frac{\Delta c}{(2-c_H-c_L)[1-(1-\gamma)(1+\mu)]}$. *Then, if* $\mu < \widetilde{\mu}$ *and* $\alpha \in (\alpha^*, 1)$, *with* $\alpha^* > \widetilde{\alpha}$, *Congress prefers tolerating to incentivizing. Otherwise, the opposite holds.*

2. *Define* $\widehat{\nu} \equiv \frac{(1+\mu)(1-c_H)^2}{(1-c_L)^2+\mu(1-c_H)^2} \in (0,1)$ *and* $\alpha^{**} \equiv \frac{\nu(\Delta c)^2}{\nu(1-c_L)^2-[1+(1-v)\mu](1-c_H)^2}$. *Then, if* $\nu \in (\widehat{\nu}, 1)$ *and* $\alpha \in (\alpha^{**}, 1)$, *with* $\alpha^{**} > \widetilde{\alpha}$,*Congress prefers shutdown to incentivizing. Otherwise, the opposite holds.*

The following proposition summarizes.

Proposition 2 *Let* $\alpha \in (\widetilde{\alpha}, 1)$. *Then, with* $\nu \in (0, \widetilde{\nu}]$ *Congress prefers*
(a) allowing collusion for $\mu < \widetilde{\mu}$ *and* $\alpha \in (\alpha^*, 1)$
(b) incentivizing otherwise (see Corollary 1 (point (1)),
and shutdown is never optimal;
with $\nu \in (\widetilde{\nu}, 1)$ *Congress prefers*
(c) shutdown for $\nu \in (\max\{\widetilde{\nu}, \widehat{\nu}\}, 1)$ *and* $\alpha \in (\alpha^{**}, 1)$
(d) incentivizing otherwise (see Corollary 1 (point (2)),
and tolerating is never optimal.
When $\alpha \in (0, \widetilde{\alpha}]$ *collusion is never attractive (see Proposition 1).*

5. Conclusions

Parts (b) and (d) of Proposition 2 suggest that an incentive scheme is desirable, irrespective of the *ex ante* distribution of firm's types, when the low bargaining power of the agency makes its remuneration cheap. Moreover, tolerating collusion (part (a)) and shutdown (part (c)) are mutually exclusive alternatives. Interestingly, part (a) shows that when $\nu \in (0, \widetilde{\nu}]$ tolerating is the best option if the high bargaining power of the agency makes incentivizing too costly and side contracting is efficient ($\mu < \widetilde{\mu}$). Players' bargaining powers crucially drive potential for collusion and the optimal responses to this threat.

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