

Lecture 4. Supervision, Collusion and Delegation

Collusion

Consider the following adverse selection problem. A principal hires an agent to perform a task that is worth V to the principal. The agent performs the task at an unobservable cost $c \in \{0, 1\}$.

The agent knows c , the principal knows $Pr\{c = 0\} = \frac{1}{2}$.

The principal can offer a compensation $P = 1$ if the task is done, in which case the agent performs the task regardless of its cost. In alternative, the principal can offer $P < 1$, in which case the agent performs the task only if $c = 0$ (among compensations $P < 1$ the principal finds $P = 0$ optimal). The principal prefers $P = 1$ to $P = 0$ if and only if $V - 1 \geq \frac{V}{2}$ (or equivalently, $V \geq 2$). Assume in what follows that $V \geq 2$.

Consider how things change if the principal can hire a supervisor to observe and report the cost of the agent. The principal can pay z to the supervisor. If $c = 0$, the supervisor observes the true cost with probability p (and this is hard, verifiable, information) and he does not observe anything with probability $1 - p$. If $c = 1$ the supervisor never observes anything. The supervisor can disclose an observation of $c = 0$, or hide it, but he cannot falsify it. If the principal hires the supervisor, and the supervisor reports truthfully, then the principal can offer $P = 0$ when the supervisor reports $c = 0$ and $P = 1$ otherwise. The expected payoff of the principal is:

$$V - 1 - z + \frac{p}{2}.$$

Whenever $z \leq \frac{p}{2}$, the principal hires the supervisor.

Suppose that supervisor and agent can collude. Following Tirole (1986) collusion can be modeled as an enforceable side contract in which a side payment of T from the agent is worth $kT < T$ to the supervisor. The agent can pay the supervisor to report nothing whenever he observes $c = 0$. Tirole (1986) shows that it is without loss of generality to consider contracts in which the agent does not have any incentive to collude with the supervisor.

If the principal can ask an initial transfer from the supervisor and then compensate the supervisor for reporting $c = 0$, then the principal can offer a compensation $w \geq k$ if the supervisor

reports $c = 0$, and ask the supervisor to pay initially $\frac{p}{2}w$. As a result, the principal can prevent collusion at no cost. If the supervisor cannot pay in advance, then the principal can offer to pay the supervisor k for reporting $c = 0$. Whenever $\frac{p}{2}k > z$ collusion increases the expected cost of the principal. k is the lowest payment to the supervisor that the agent is not willing to outbid (the agent needs to spend 1 to ensure that the supervisor gets k , and the agent is not willing to spend more than 1 on bribes, as a bribe ensures a wage of 1 instead of a wage of 0).

Delegation

Mookherjee (2006) reviews the literature on cost and benefits of delegating decision making to better informed agents. The question is relevant in many contexts, e.g. internal organization of firms: when should the central office delegate to the divisions' heads? Other contexts: (1) regulation of public utilities: should it be in the hands of the central government or of the regional ones? (2) procurement contracting: should the purchaser contract with one main contractor and let this contractor deal with subcontractors or should the purchaser contract directly with all contractors?

The main theme is the comparison between a centralized system in which a Principal asks Agents about their types, and based on the reports the Principal takes some action and a decentralized system in which the agents are free to decide among a set of actions.

Origin of this literature: debate over the role of the state in assigning resources in the productive process. Argument against centralization: relevant information is dispersed in the market; arguments in favor of centralization: externalities, public goods, distributional equity.

The Revelation Principle (R-P) can be understood as a proof of the superiority of centralization when communication is costless: when the R-P holds, asking for types and deciding is never dominated by other mechanisms. The R-P holds if the following assumptions hold:

- absence of cost of communication btw P and A's,

- absence of information processing costs of the P,
 - absence of contract complexity costs,
 - absence of coordination among A's,
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- ability of the P to commit to a mechanism and not renegotiate it.

So one approach is to assume that the R-P holds, and study under what conditions delegation can replicate the performance of the best centralized mechanism. A second approach is to dispense with some assumptions necessary for the R-P to hold.

Canonical setting:

A model of private information about production costs. Players: a principal P , one or two agents A_1, A_2 . The production function is $q = f(q_1, q_2)$; A_i produces q_i at cost $C_i(q_i, \theta_i)$. Agent A_i is privately informed about the realization of θ_i . Agents observe their type before contracting, so they earn information rents. The main trade-off is between producing the efficient quantity and paying information rents to the agents.

2 possible arrangements: **centralization (C)** where the principal deals with the 2 agents at the same time and **delegation to a supplier (DS)** in which the principal only deals with A_1 and A_1 deals with A_2 .

First approach:

Consider conditions for DS=C, that is, when delegation is optimal while the R-P holds. If delegation can achieve the same outcome as centralization, it might be an easier way for the principal to deal with the issue. Note that in the case of DS, A_1 has monopsony power towards A_2 (sort of like a monopolist has). DS runs into a problem of Double Marginalization of Rents similar to a sequence of monopolists. Delegation has two problems:

- (1) A_1 (the promoted one) does not choose the optimal contract with A_2 (from the point of view of the principal); in particular A_1 allocates to himself a larger-than-desirable (from the point of view of the principal) share of the project, because the information rent is proportional to the share of the project.

- (2) The principal does not observe the contract between A_1 and A_2 , thus the information rent of A_1 is larger than in the centralized case.

These 2 problems can be solved if **all** the following conditions hold:

- 1) the principal can observe the quantity q_1 , or can observe the subcontracting cost incurred (so the principal can tax in-house production of A_1 or subsidize delegation of tasks to A_2)
- 2) the principal can contract with A_1 before A_1 contracts with A_2 ,
- 3) A_1 is risk neutral and there are no limits to liability for A_1 .

With the exception of cases of perfect complementarity, all these conditions are necessary for delegation to be optimal. In case of complementarity (e.g. Baron and Besanko (1992), where $q = \min \{q_1, q_2\}$) the first problem is absent, thus the first condition is irrelevant and the other two conditions are not necessary.

Second approach:

Laffont and Martimort (1998), among others, looks at situations in which the conditions necessary for the Revelation principle to hold are violated. In particular, they allow for collusion among the two agents, and they allow for limits in communication between agents and the principal. They focus on a rather special case of production functions: $q = \min \{q_1, q_2\}$. Cost: $\theta_i q_i$, where $\theta_i \in \{\underline{\theta}, \bar{\theta}\}$ for $i \in \{1, 2\}$. Collusion among agents is modeled as a binding side contract (as in Tirole 1986). These side contracts involve transfers between the two agents and a commitment to report in a certain way. The key difference between the two types of organizations is that under centralization collusion is modeled as a side contract offered by a third party that cares about the utility of the two agents in the same way, while under decentralization it is agent 1 that offers a contract to agent 2.

They show that with no limits on communication between principal and agent centralization and delegation perform equally well.

Then they introduce limits to communication in the form that the principal can only be informed of the average productivity of the agents: in case the reports to the principal are such that one

agent is reported to be efficient and the other inefficient, the principal only learns that one of them is efficient.

They show that under these limits to communication centralization performs less well than delegation.

References:

Baron and Besanko (1992), "Information, Control and Organizational Structure," *Journal of Economics and Management Strategy*

Laffont and Martimort (1998), "Collusion and Delegation," *Rand Journal of Economics*