Section 13

Real authority and expertise

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Gov 2006 – Harvard

April 23, 2020

Plan for today

- Talk about Aghion and Tirole (1997), "Formal and Real Authority in Organizations", JPE.
- Talk about Callander (2008), "A Theory of Policy Expertise", QJPS.
- Questions about the previous lectures?

Aghion and Tirole (1997)

Intuition: in many organizations the boss has formal authority to make a decision, but "rubber-stamps" what the agents propose. The boss has formal authority but doesn't exercise it. The agents then have *real authority*.

Example: the president is the head of the executive, and has the power to decide everything. But he only focuses on a few decisions.

Why does this happen? When is it more likely?

Intuition

There is a principal and an agent. One of them gets to make a decision. There is asymmetric knowledge about the payoffs.

Suppose that the principal has formal authority to make the decision, but she doesn't know the value of the options. The agent knows, and proposes a policy. The principal can implement the proposal or find out what is the best proposal for her, at some cost.

If their interests are somewhat aligned, the principal may implement the agent's proposal, even though she knows it's not the best for her.

A further reason to grant real authority to the agent is to provide incentives: if the principal commits not to override the agent's decision, the agent has more incentives to acquire the information in the first place. Thus the agent has more *initiative*.

The model

There is a Principal P and an Agent A.

There is a status quo that gives them utility 0.

There are two projects. One gives utility $b > 0$ to the agent and utility $\alpha B > 0$ to the principal. The other gives utility $B > 0$ to the principal and utility $\beta b > 0$ to the agent. We have $\alpha, \beta \in [0, 1]$, which measure the degree of alignment of incentives.

At cost $g_A(e)$, the agent learns with probability e about the two projects.

At cost $g_P(E)$, the principal learns with probability E about the two projects.

We assume $g_i(0) = 0$, $g_i'(0) = 0$, $g_i'(1) = +\infty$, $g_i' > 0$, $g_i'' > 0$. Example: $g_i(e) = -\log(1-e) - e$ or $g_i(e) = \frac{e^2}{1-e}$.

Centralization

Timing:

1. The agent chooses e and the principal chooses E.
2. If the agent finds out about the projects she chooses one and communicates it to the principal.
3. The principal observes the projects (if there she found out or she received a recommendation). She chooses a project and implements it (if there she has at least one to choose from).

Analysis:

- The principal chooses the B project if she finds it, and otherwise chooses the agent's project if the agent proposes one.
- The agent proposes her preferred project.

Payoffs and equilibrium

We have

$$u_P = EB + (1-E)e\alpha B - g_P(E),$$
$$u_A = E\beta b + (1-E)eb - g_A(e).$$

The Nash equilibrium is defined by the FOCs:

$$(1-e\alpha)B = g_P'(E),$$
$$(1-E)b = g_A'(e).$$

The choices e, E are strategic substitutes: the more the principal invests, the less the agent invests, and conversely.

Payoffs are supermodular in $(E, -e, B, -b)$, so the game is supermodular and we get the comparative statics:

- If B increases, E increases and e decreases.
- If b increases, e increases and E decreases.

Technical comment

Equilibrium existence is not obvious. The best responses given by the FOCs

$$(1-e\alpha)B = g_P'(E),$$
$$(1-E)b = g_A'(e)$$

define a dynamical system $E \mapsto$ the best response e by $A \mapsto$ the best response $f(E)$ by P. An equilibrium is a fixed point, i.e., E such that $f(E) = E$.

A fixed point E is *stable* if $|f'(E)| < 1$. Let's see what that means here. Let $h_P = (g_P')^{-1}$ and $h_A = (g_A')^{-1}$. We have $f(E) = h_P\left((1-e\alpha)B\right) = h_P\left((1-h_A\left((1-E)b\right)\alpha)B\right)$. So

$$f'(E) = h_P'\left((1-h_A\left((1-E)b\right)\alpha)B\right) h_A'\left((1-E)b\right)\alpha Bb.$$

By the inverse function theorem we have $h_P'(x) = [(g_P')^{-1}]'(x) = \frac{1}{g_P''[(g_P')^{-1}(x)]} = \frac{1}{g_P''(h_P'(x))}$ and $h_A'(e) = \frac{1}{g_A''(h_A(x))}$. Hence we have

$$f'(E) = \frac{\alpha Bb}{g_P''(e)g_A''(E)}$$

and the equilibrium is stable iff $f'(E) < 1$, i.e., $\alpha Bb < g_P''(e)g_A''(E)$. We'll assume that.

Delegation

Same story but the agent decides. So

$$u_P = e\alpha B + (1-e)EB - g_P(E),$$
$$u_A = eb + (1-e)E\beta b - g_A(e).$$

The NE is defined by the FOCs:

$$(1-e^d)B = g'_P(E^d),$$
$$(1-E^d\beta)b = g'_A(e^d).$$

Proposition. If equilibria are unique and stable then $E > E^d$ and $e < e^d$.

Delegation thus increases the incentives (the initiative) of the agent. But entails loss of control for the principal.

Proof. Consider a game with payoffs

$$u_P = (1 - e\tilde{\alpha})BE - g_P(E),$$
$$u_A = (1 - E\tilde{\beta})be - g_A(e).$$

What happens to the equilibrium E, e if $\tilde{\alpha}$ increases? Let's differentiate the FOCs implicitly:

$$(1 - e\tilde{\alpha})B = g_P'(E), \qquad -\frac{de}{d\tilde{\alpha}}\tilde{\alpha}B - eB = g_P''(E)\frac{dE}{d\tilde{\alpha}}$$
$$(1 - E\tilde{\beta})b = g_A'(e) \qquad -\frac{dE}{d\tilde{\alpha}}\tilde{\beta}b = g_A''(e)\frac{de}{d\tilde{\alpha}}.$$

Solving the system we get

$$(g_P''(E)g_A''(e) - \tilde{\alpha}\tilde{\beta}bB)\frac{dE}{d\tilde{\alpha}} = -eBg_A''(e),$$

so, assuming that the equilibrium is stable, we get $\frac{dE}{d\tilde{\alpha}} < 0$, and hence $\frac{de}{d\tilde{\alpha}} > 0$.

Similarly $\frac{dE}{d\tilde{\beta}} > 0$ and $\frac{de}{d\tilde{\beta}} < 0$. Since moving from centralization to delegation is to increase $\tilde{\alpha}$ from α to 1 and to decrease $\tilde{\beta}$ from 1 to β, we get the result. ■

Real authority under centralization

Delegation may not be an option (principal can't commit not to overrule the agent's decision). How can the principal induce extra effort from the agent under centralization?

In other words, how can you give the agent more real authority if you can't give her formal authority?

The paper discusses various ways: overload, multiple principals, reputation, urgency.

Overload. If the principal has too many agents, she cannot spend a lot of time monitoring each one, since the cost is convex. This is a way to commit not to overrule.

Multiple principals. Principals have an incentive to free-ride on monitoring, which increases initiative by the agent.

Reputation. In repeated interaction, the principal may be able to promise not to overrule the agent's recommendation.

Urgency. If the principal decides how much effort to allocate on monitoring after the agent makes a proposal, and there is little time before the decision has to be made, or waiting is costly, the principal effectively commits not to overrule.

Overload

Suppose that there are n agents, so

$$u_P = \sum_{i=1}^{n} [E_i B + (1 - E_i) e_i \alpha B - f] - g_P\left(\sum_{i=1}^{n} E_i\right),$$

where $(1 - E_i)b = g'_A(e_i)$. Assume that the equilibrium is symmetric, so

$$u_P = n[EB + (1 - E)e\alpha B - f] - g_P(nE) \equiv nR(E(n), e(n)) - g_P(nE(n))$$

and $(1 - E)b = g'_A(e)$. Suppose that n is a real number, and let's look at the optimal n. We have

$$\frac{du_P}{dn} = [R(E, e) - Eg'_P(nE)] + n\frac{\partial R}{\partial e}\frac{de}{dn} = 0.$$

Differentiating implicitly the FOCs that define a symmetric equilibrium,

$$(1 - e\alpha)B = g'_P(nE), \qquad (1 - E)b = g'_A(e),$$

we can verify that $\frac{de}{dn} > 0$, i.e., more agents $\Rightarrow$ more effort. Hence in equilibrium $R(E, e) - Eg'_P(nE)$, the marginal benefit of an additional agent ignoring the effect on effort, is negative. The organization has overload.

Callander (2008)

Recall the model of delegation to a biased expert that we analyzed in the problem set.

- There is a state of the world $\theta \sim U[0,1]$.
- An expert A knows it and sends a recommendation $p \in \mathbb{R}$ to a policymaker P.
- P chooses a policy x.
- Payoffs are $u_P = -(x-\theta)^2$ and $u_A = -(x-\theta-b)^2$.

We saw that if b is small then the policymaker prefers to delegate. That means to commit to implement A's recommendation.

Problem: under delegation, A recommends her preferred policy, which is $p = \theta + b$. Now, P is tempted to *invert* this recommendation, i.e., to recover the expert's knowledge, which is θ, and then to choose her preferred policy. Recovering θ from p is too easy — just subtract b.

If P cannot commit, we are left with cheap talk, which implies that a lot of the expertise is wasted, since recommendations are reduced to intervals ("low", "medium", "high").

But is it always the case that it is so easy to recover expert knowledge from a single policy recommendation?

The policy process

In the cheap talk model, a policy x produces an *outcome* $y = x - \theta$.

Preferences are over outcomes: $u_P = -y^2$ and $u_A = -(y-b)^2$.

We call the mapping policy $\rightarrow$ outcomes the *policy process* ψ. In this case, $\psi(x) = x - \theta$.

The expert knows the policy process for some set of policies (called an *issue*).

In the case of cheap talk, if you know the outcome $y = \psi(x)$ of just one policy x, you recover θ, and thus the whole policy process ψ. The process is *invertible*.

Given (x, y), if you want outcome $y + d$, the policy you want is $x + d$, since $\psi(x + d) = x + d - \theta = y + d$.

Policy complexity

Suppose that given (x, y) you can't know exactly which policy yields outcome y' for any $y' \neq y$. But you know that

$$\psi(x + d) \sim N(y + d, \sigma^2 |d|).$$

This means that you know the outcome of policy $x + d$ with uncertainty. On expectation it's the same as before. The variance increases with the distance d. This means that for policies close to x you are pretty sure about the outcome. But if you want to implement a very different policy, the outcome becomes less predictable.

In this case we learn something about the policy process after knowing (x, y), but not the whole process. Hence we call it *partially invertible*. We don't become experts after hearing just one recommendation by an expert.

The bigger σ, the less we know given (x, y). We call σ the level of *complexity* of the issue.

Complexity gives experts real authority

Let's consider the cheap talk game with a partially invertible policy process with $\sigma^2 \geq 2b$.

- An expert A knows the policy process ψ, chooses an outcome $y \in \mathbb{R}$, a policy x such that $\psi(x) = y$, and sends the policy recommendation x to a policymaker P.
- P chooses a policy $x + d$.
- Payoffs are $u_P = -\hat{y}^2$ and $u_A = -(\hat{y} - b)^2$, where $\hat{y} = \psi(x + d)$.

Backwards induction:

If P thinks that A chose x such that $\psi(x) = y$, and moreover suppose that $y \geq 0$, then P considers subtracting $d \geq 0$ from x to get an outcome closer to 0. So she maximizes

$$\begin{aligned}\mathbb{E}[-\hat{y}^2] = -\mathbb{E}[\psi(x-d)^2] &= -\mathbb{E}[\psi(x-d)]^2 - \mathrm{Var}(\psi(x-d)) \\ &= -(y-d)^2 - \sigma^2 d.\end{aligned}$$

So she chooses $d = \max\{y - \frac{\sigma^2}{2}, 0\}$.

Since $\sigma^2 \geq 2b$, the expert chooses $y = b$, and the policymaker implements it. Complexity thus gives real authority to the expert if the bias is not too high.