Ec717a: Authority and Delegation with Incomplete Contracts/Commitment (Aghion-Tirole, Dessein)

Dilip Mookherjee

Boston University

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Introduction

- Key Question in Organization Theory: when should (and should not) a Principal delegate decision-making authority to a subordinate Agent?
- Some assumption underlying the Revelation Principle (RP) has to be dropped (since RP when it applies says that delegation cannot strictly dominate centralized authority)
- We have seen some answers where contracts are incomplete owing either to writing costs (Dye, Battigali-Maggi) or communication costs (Mookherjee-Tsumagari)
- More common/popular/'easier' approach is to drop the assumption of perfect commitment ability of P

Incomplete Commitment and Delegation

- The RP says that centralized decision-making cannot be worse than delegation, because P can always replicate outcomes of the latter with some revelation mechanism
- Specifically: if under delegation, A makes decision $d(\theta)$ and is paid $t(\theta)$ in some state θ (privately observed by A), then:
    - P can commit to a rev. mechanism where A is asked to communicate a report of θ
    - P commits to selecting the same decision $d(\theta)$ and offering the same payment $t(\theta)$ to A when A reports θ
    - A will have an incentive to report truthfully
    - Hence the outcome of the centralized mechanism is the same as under delegation

Incomplete Commitment and Delegation, contd.

- What can go wrong with this argument?
- The centralized mechanism could be too costly to write, or involve excessively detailed communication
- Or maybe P cannot commit to 'implementing' this contract — after hearing the report θ, P is tempted to select some other decision (d', t'), different from $(d(\theta), t(\theta))$
- P is herself the victim of short term opportunism, undermining credibility: expecting P to deviate ex post could motivate A to lie, or even exit the organization

Aghion-Tirole (JPE 1997)

- AT construct a simple model of trade-off between centralization and delegation when P cannot commit to a centralized revelation mechanism
- Can view this as a model of decision-making within a bureaucracy between a boss/minister (P) and advisor/secretary/bureaucrat (A)
- A receives a fixed salary, so transfer payments play no role in providing incentives

Aghion-Tirole, contd.

- Main issue: P and A have to collectively make a choice between many different projects (and doing nothing)
- They can both invest costly effort in gathering information about the returns to these projects
- Project returns to P and A differ, so there is a conflict of goals
- P can delegate project choice to A (possibly better informed decisions, but these are biased in A's favor and P's supervision is weak)
- Or P can retain authority and decide after getting A's recommendation (reduce bias, but decision could be less well informed, and A would have less initiative to acquire information)

Implicit Assumption

- P cannot commit to a revelation mechanism
- But P can commit to delegation
- Ex post, when A makes a decision that deviates from what P prefers, P would be tempted to overrule A
- Implicit assumption is that commitment to delegate is easier than commitment to decisions that are responsive to A's recommendations in centralization
- AT (and most papers following this approach) do not provide a rationale for this (e.g., in terms of building a reputation for commitment)

Aghion-Tirole Model: Details

- A number of potential projects ($k = 1, 2, \ldots$), at most one of which has to be selected
- Null project (status quo) $k = 0$ yields zero benefit to both
- Projects are *ex ante* identical; *ex post* benefits are $(B_k, b_k)_k$ where:
    - k^* is optimal project for P, yielding benefit $B > 0$
    - k^{**} is optimal project for A, yielding benefit $b > 0$
    - $k^* = k^{**}$ with probability $\alpha \in (0, 1)$, parameter of *goal congruence*
    - If $k^* \neq k^{**}$ then $B_{k^{**}} = 0$ and $b_{k^*} = 0$
    - $B_k = -NB, b_k = -Nb$ if $k \notin \{k^*, k^{**}\}$, where N is large

Aghion-Tirole Model: Details, contd.

- Both P and A invest in costly research effort E, e at personal cost $g_P(E), g_A(e)$ respectively (strictly increasing, strictly convex functions satisfying Inada conditions)
- P (resp. A) privately discovers returns of all projects with probability E (resp. e), learns nothing with probability $1 - E$ (resp, $1 - e$)
- In the absence of any information, it is better for both to choose the null project than some randomly chosen project (since costs of choosing the wrong project are very large)

Aghion-Tirole Model: contd.

- P cannot commit to a contract/revelation mechanism (where project choice is chosen according to some probability distribution, given their respective recommendations)
- In the absence of any contract, P can instead allocate *authority* or ex post decision rights (analogous to Grossman-Hart-Moore property right theory)
- Two choices:
  - P has formal authority
  - P delegates authority to A

P-authority

- *Ex post:* A makes a project recommendation to P, who decides
- Outcome in the *ex post* game (in dominant strategies):
  - If A is informed, recommends project k^{**}, otherwise remains silent
  - If P is informed, selects k^{*}; if P is uninformed accepts A's recommendation, otherwise chooses null project

P-authority: Ex ante Information acquisition incentives

- *Ex ante payoffs:*

$$\begin{aligned} u_P &= EB + (1-E)e\alpha B - g_P(E) \\ u_A &= E\alpha b + (1-E)eb - g_A(e) \end{aligned}$$

- *Incentive Implications:*

$$\begin{aligned} (1-\alpha e)B &= g_p^{'}(E) \\ (1-E)b &= g_A^{'}(e) \end{aligned}$$

- P's (supervision) incentive E increasing in B, decreasing in α
- A's 'initiative' e increasing in b, decreasing in E (P's 'interference')

Delegated Authority

- P can communicate a suggestion, but A can decide whether to accept P's suggestion, or overrule it
- Exact reverse of P-formal authority, including behavior patterns
- *Ex ante payoffs:*

$$
\begin{aligned}
u_P^d &= e\alpha B + (1-e)EB - g_P(E) \\
u_A^d &= eb + (1-e)E\alpha b - g_A(e)
\end{aligned}
$$

P Authority vs. Delegated Authority

- Assuming a unique stable effort equilibrium in either regime:

$$E^d < E, e^d > e \tag{1}$$

- Whichever party has decision rights has stronger information acquisition incentives
- This suggests (but AT do not provide any results): If A has much higher ability (lower cost of research), and goal conflict $1-\alpha$ is small, it can be in P's interest to delegate authority; otherwise retaining authority could be better
- Not sure this is true (eg if P has no ability to do any research, outcomes are the same under either allocation of authority)

Dessein (RES 2002) Model

- Related but different model, which provides a clearer analysis of the choice between Delegation and Centralization
- Project choice $y \in \Re$
- $m, m+b$ is optimal project choice for P and A respectively, where $b > 0$ is common knowledge while m is unknown:

$$\begin{aligned} U_P(y,m) &= U_P(m,m) - l(|y-m|) \\ U_A(y,m) &= U_A(m+b,m) - l(|y-m-b|) \end{aligned}$$

where $l^{''} > 0$ and $l^{'}(0) = 0$

Key Difference from AT Model

- *Given Information Structure:* A observes m; P is uninformed with prior $F(.)$, density $f(.)$ on $[-L, L]$
- Also consider choice between P-authority and Delegation
- Delegation outcome is straightforward: A selects $m + b$
- P-authority: A communicates a project recommendation to P, then P makes a decision (cannot commit ex ante) — reduces to Crawford-Sobel model of strategic information transmission
- Focus is on effect of bias on quality of communication between P and A, and resulting trade-offs on P's welfare

P-authority Outcomes

- Set of PBE outcomes in the communication game: partition equilibria with the following properties:
  - at most $N(b)$ distinct messages sent by A, where $N(b)$ is a non-increasing function, tends to ∞ as $b \to 0$
  - For any N between 1 and $N(b)$, there is a PBE where $[-L, L]$ is partitioned into $(a_{i-1}, a_i], i = 1, \ldots, N$ with $a_0 = -L, a_N = L$, and A sends message m_i when $m \in (a_{i-1}, a_i]$, $m_{i-1} < m_i$
  - Upon receiving message m_i, P chooses y_i to minimize expected value of $l(|y - m|)$ conditional on $m \in (a_{i-1}, a_i]$
  - Type a_i of A is indifferent between sending message m_i and m_{i+1}, given P's strategy
- P and A are both better off in a more communicative (higher N) equilibria; $N(b)$ equilibrium Pareto-dominates all others

Comparison of P's Welfare

As bias b becomes small, both delegation and centralization provide P with higher welfare: which one dominates?

Proposition

(a) Fix prior F. If bias b is sufficiently small, delegation is better.

(b) Fix bias b. If prior uncertainty is small enough, centralization is better.

Proof of (b): If F is informative enough, centralization (even without any communication) approaches the first-best. But with given bias $b > 0$, welfare loss in delegation is always b.

Proof outline for (a)

- If b is small enough (given F), communication in centralization will approach perfect revelation: number of partitions in equilibrium goes to infinity, and width of each interval goes to zero, so density within each interval is approximately uniform.
- With uniform distribution, width of any interval equals width of previous interval plus $4b$

Proof outline for (a)

- If b is small enough (given F), communication in centralization will approach perfect revelation: number of partitions in equilibrium goes to infinity, and width of each interval goes to zero, so density within each interval is approximately uniform.
- With uniform distribution, width of any interval equals width of previous interval plus $4b$ (type a_i must be indifferent between y_i, y_{i+1} where $y_i = \frac{a_{i-1}+a_i}{2}$; hence $a_i = \frac{y_i+y_{i+1}}{2} - b$)
- This implies average width $A(b)$ of an interval bounded below (strictly) by $4b$ for b small
- Average distance of y^* from m in centralization in turn is bounded below (strictly) by $A(b)/4$, i.e., by b (strictly) for b small