“Multitask Principal-Agent Analyses”

A discussion of Milgrom and Holmstrom JLEO ‘91
Introduction
Diverse Levels of Measurability Shape Incentive Design
Incomplete Contracts and Multi-Task

Incomplete Contracts

Focus on *Ownership* (Opportunistic Bargaining)

Multitask Principal-Agent

Incentive design *given there is a principal*
Model
### Timeline

<table>
<thead>
<tr>
<th>Step</th>
<th>Event</th>
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<tbody>
<tr>
<td>1</td>
<td>Principal commits to wage function $w(x)$</td>
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<tr>
<td>2</td>
<td>Agent chooses efforts $t \in \mathbb{R}^k$</td>
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<tr>
<td>3</td>
<td>Principal observes contractible parameters $x = \mu(t) + \epsilon$</td>
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<td>4</td>
<td>Agent resp. principal get payoffs $\mathbb{E}[u(w(x) - C(t))]$, $\mathbb{E}[B(t) - w(x)]$</td>
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**Functional Forms**

- $u(w) = -e^{-rw}$
- $\epsilon \sim N(0, \Sigma)$
Tractability

- **Theorem** (Holmstrom-Milgrom ‘87):
  - If all past performance indicators are available to the agent, and
  - time horizon is fixed

  then *wages* only depend on the final stage and are linear in the aggregate contractible characteristics.

  \[ \omega(x) = \alpha x + \beta, \]

  \( \alpha \) commission rate, \( \beta \) wage

  ➜ (+Normality) Maximise certainty equivalent.
  ➜ Derive First-Order Conditions for the problem.
Incentive Measures Considered

- Grouping Tasks into Jobs
- Limiting Outside Activities
- Transferring Ownership
- Performance-based pay
Two Predictions
Fixed wage can be optimal

- If agents have to subdivide attention $C(t_{test}, t_{curiosity}) = C(t_{test} + t_{curiosity})$
- and student’s curiosity is hard to measure: $x = \mu(t_{test}, t_{curiosity}) + \varepsilon = t_{test} + \varepsilon$
- then any performance-based pay will induce teacher to substitute away from $t_{curiosity}$
- This lowers principal’s payoff $\mathbb{E}[B(t_{test}, t_{curiosity}) - w(x)]$
  (If the agent likes to work a bit even without commission.)
Make or Buy (Contractor or Employee)

- There is an asset (e.g. goodwill) whose value is unmeasurable. (attention-division still assumed.)
- Employment: agent gets returns of asset
- Contracting: principal gets returns of asset

**Employment:**
- Agent get a fixed wage
- No performance-based incentives not to shift attention *away* from asset-building

**Contracting:**
- Agent gets a positive commission
- Performance-based incentives to shift attention *towards* work for firm
Thank you!
Extension/Variation

(Holmström-Milgrom AER ‘94)

Multiple Measurable Efforts

- If agent splits attention, levels of incentives for different tasks matter. 
  - Incentive instruments are complements under variation of measurement precision.
  - E.g.: under exogenous improvement of output, the optimal
    - commission rate
    - measure of ownership of the agent
    - permission level of outside activities
  - jointly increase.