Lecture 7: Managerial Incentives and Market Competition

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Motivation

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- How does aggregate economic environment affects managerial incentives?
  - This is fundamentally related to efficiency of firm.
- How does it behave empirically?
- References:
  - Klaus Schmidt: "Managerial Incentives and Product Market Competition" *Review of Economic Studies*
  - Michael Raith: "Competition, Risk and Managerial Incentives" *American Economic Review*
  - Vicent Cunat and Maria Guadalupe: "Globalization and the Provision of Incentives inside the Firm: the Effect of Foreign Competition" *Journal of Labor Economics*

Previous Research

- Hart (1983): A common shock is transmitted through market price. More competitive market $\rightarrow$ relative performance is more precise $\rightarrow$ higher-powered incentive contracts.
- Scharfstein (1988): Hart's result crucially hinges on assumption that manager is infinitely risk averse, and that income above a subsistence level has no value for manager.

Schmidt (1997)

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  1. Threat-of-liquidation effect: Competition $\uparrow \rightarrow$ Prob. of liquidation $\uparrow \rightarrow$ High incentive power

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- Two effects due to intensified competition:
  1. Threat-of-liquidation effect: Competition $\uparrow$ $\rightarrow$ Prob. of liquidation $\uparrow$ $\rightarrow$ High incentive power
  2. Value-of-a-cost-reduction-effect: Ambiguous.
- In total, effect of intensified competition on managerial incentives is ambiguous.

Premises

- Agents are all neutral.
- Cost realization: $c \in \{c^L, c^H\}$.
- Prob. for c_L: p. Cost of raising Prob. is $G(p)$.

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- Cost realization: $c \in \{c^L, c^H\}$.
- Prob. for c_L: p. Cost of raising Prob. is $G(p)$.
- Ex post profit for firm: $\pi = \pi(c, \phi, \epsilon)$, where ϵ is random error and ϕ is degree of competition.
- Assumption 1: Standard assumptions on $\pi(c, \phi, \epsilon)$.

Payoffs

- Principal's payoff:

$$U^P = \max\{0, \pi(c, \phi, \epsilon)\} - w,$$

- Agent's payoff: $U^m = w - G(p)$ if no liquidation and $U^m = w - G(p) - L^m$ if liquidation happens.

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- If $c = c^L$: Prob. of liquidation is zero. If $c = c^H$: Prob. of liquidation is $l(\phi)$ and $l^{'}(\phi) > 0$.

Objective Function

- Principal's optimization problem at date 0 is

$$\max_{p,w^L,w^H} p[\Pi^L - w^L] + (1-p)[\Pi^H - w^H]$$

s.t.

$$p \in \arg\max_{p' \in [0,1]} p' w^L + (1-p')w^H - G(p') - (1-p')I(\phi)L^m \quad (IC)$$

$$pw^L + (1-p)w^H - G(p) - (1-p)I(\phi)L^m \geq \bar{U}^m \quad (PC)$$

$$w^j \geq 0 \quad j \in \{L, H\} \quad (WC)$$

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- Assumption 2: Assure global concavity.

Objective Function (Cont.)

- FOC: $G^{'}(p) = w^L - w^H + l(\phi)L^m$.
- FB: $G^{'}(p^{FB}) = \Pi^L - \Pi^H + l(\phi)L^m$.

Objective Function (Cont.)

- FOC: $G^{'}(p) = w^L - w^H + l(\phi)L^m$.
- FB: $G^{'}(p^{FB}) = \Pi^L - \Pi^H + l(\phi)L^m$.
- Note that we can achieve FB, if there is no WC.
- Assumption 3: manager's cost to work for firm and to choose p^{FB} is smaller than expected increase in profits:

$$\bar{U}^m + G(p^{FB}) + (1 - p^{FB})l(\phi)L^m < p^{FB}(\Pi^L - \Pi^H)$$

- Under Assumption 3, there is no way to *fully* incentivize agent without giving him rent.

Solution

- Optimal SB effort level $p^{SB} = \max\{p^*, \bar{p}\}$:

$$\textit{If PC does not bind}: \; G'(p^*) + p^* G''(p^*) = \Pi^L - \Pi^H + I(\phi)L^m$$

$$\textit{If PC binds}: \; \bar{p}G'(\bar{p}) - G(\bar{p}) = I(\phi)L^m + \bar{U}^m$$

and

$$w^H = 0; \quad w^L = G'(p^{SB}) - I(\phi)L^m.$$

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$$w^H = 0; \quad w^L = G^{'}(p^{SB}) - l(\phi)L^m.$$

- Rent for agent:

$$U^m - \bar{U}^m = pw^L - G(p) - (1-p)l(\phi)L^m - \bar{U}^m$$

- Term $p^* G^{''}(p^*) = \frac{d(U^m - \bar{U}^m)}{dp}$ captures rent accruing to agent (SB).

Effect of Increased Bankruptcy Cost

- Suppose L^m increases
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  - Principal must benefit (revealed preference argument).
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- If PC is not binding.
  - Principal must benefit (revealed preference argument).
  - Effect on agent's payoff is ambiguous.
- If PC is binding.
  - No effect on agent's payoff.
  - Effect on principal's payoff is ambiguous.

Market Competition and Incentive power

- Suppose ϕ increases.
- If PC is not binding:

$$\frac{dp^*}{d\phi} = \frac{[\partial\Pi^L(\phi)/\partial\phi - \partial\Pi^H(\phi)/\partial\phi] + (dl(\phi)/d\phi)L^m}{2G''(p^*) + p^* G'''(p^*)}$$

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- Threat-of-liquidation effect $((dl(\phi)/d\phi)L^m)$ exists in both cases and is positive
- It becomes cheaper for principal to incentivize agent.
- Value-of-a-cost-reduction-effect appears only when PC does not bind, since $\bar{p}$ is independent of Π^H and Π^L.
- And direction of its effect is ambiguous.

Raith (1997)

- Endogenize firm structure (number of firms in equilibrium) and discuss how market size and reduction in transport costs affect managerial incentives.
- Also discusses how managerial incentives are related to volatility of firm performance.

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- Endogenize firm structure (number of firms in equilibrium) and discuss how market size and reduction in transport costs affect managerial incentives.
- Also discusses how managerial incentives are related to volatility of firm performance.
- Different from Schmidt (1997):
  - No role for bankruptcy.
  - Agent is risk averse.
  - Only value-of-a-cost-reduction-effect exists.

Setup

- A Salop (1979) circle model with optimal incentive contract.
- Firms are homogeneous, and cost realization is

$$c_i = \bar{c} - e^i - u_i,$$

  where $u_i \sim N(0, \sigma^2)$.
- Free entry with fixed entry cost: F.

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- Two questions: Is linear contract optimal? What happens if managerial compensation is based on profit or sales (more realistic?)?

Setup (Cont.)

- Agent's utility: $-e^{-r[w_i - ke_i^2/2]}$. Reservation utility: zero.
- Agent's objective function

$$\max_{e_i} s_i + b_i e_i - \frac{1}{2} r b_i^2 \sigma^2 - \frac{k}{2} e_i^2 .$$

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- Consumer's utility (the circle model):

$$V_i(x) = y + a - p_i - t(x - z_i)^2.$$

- Three exogenous parameters: Transport cost t, market size m, and cost of entry F.

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- Three exogenous parameters: Transport cost t, market size m, and cost of entry F.
- Firms post prices after observing *realized* cost.
- Assumption 1: existence of hinterland $\rightarrow$ σ can't be too big.
- Assumption 2: existence of hinterland $\rightarrow$ incentive power can't be too strong $\rightarrow$ marginal cost of exerting effort (k) can't be too small.

Optimal Incentive Contract

- Proposition 3: optimal incentive power is

$$b = \frac{m}{n(1 + kr\sigma^2)}.$$

- Let us fix n (number of firms in equilibrium)
  - $m \uparrow \rightarrow b \uparrow$ (market size effect).

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- Let us fix n (number of firms in equilibrium)
  - $m \uparrow \rightarrow b \uparrow$ (market size effect).
  - t and F do not affect b directly. Why?
  - Business-stealing-effect and business-stolen-effect (or scale effect) perfect offsets each each other..
- However, key is to endogenizing n.

Incentive Power and Market competition

- Proposition 4: The equilibrium number of firms (n^*) increases with transport costs t (decreases with product substitutability), increases, but less than proportionally, with market size m, and decreases with the cost of entry.
- Intuitions...

Incentive Power and Market competition

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- Key is change in equilibrium number of firms (n^*).
- After all, only value-of-a-cost-reduction-effect plays a roll.
- Existence of "X" inefficiency.

Incentive Power and Volatility

- Proposition 7: With endogenous market structure, the variance of firms' gross and net profits is higher in markets with more substitutable products and in larger markets, but lower in markets with lower entry costs.

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- Insight: Incentive Power and Volatility (or riskiness) are just correlated (no causal relationship).

Managerial Effort, Firm Heterogeneity and International Trade

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- How do managerial incentives affect aggregate productivity and welfare?
- Paper one: Import Competition and Agency Problems in Family Firms.
- Paper two: Agency Problem, Trade Liberalization, and Aggregate Productivity.