Management and Organizational Structure of Large Organizations

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IOEA 2017, Cargese

Organizational Economics: What are we trying to understand?

- Organizational Performance and Productivity as a function of
  - managers
  - management practices
  - firm organization
- What determines management practices, firm organization, firm strategies, choice of managers/who leads the firm?

Independent or Endog. Variables	Dependent Variables
managers	Organizational Performance
management practices	Productivity
firm organization	
Corporate Governance	
Firm Environment	
Firm Size	
Firm Scope	

Organizational Structure of Large Organizations

- Organizational Economics: Large field, need to be selective.
- Focus on Organizational Structure of Large organization
  - Some history: Moral Hazard models and property rights theory
  - Two models of delegation.
  - Organizational structure of large organizations..

Basic moral hazard model of Holmström-Milgrom (1987, 1991)

- Production: $y = a$ where
  - $y =$ output
  - $a =$ agent's action (effort), $a \geq 0$
- Performance measure: $p = a + \varepsilon$
  - $\varepsilon =$ noise
- Cost of action (measured in \$): $\psi(e) = \frac{k}{2}e^2$
- Agent has reservation wage $\underline{w}$

Closed-form solution

- LEN framework: Three key features
  1. Linear contracts: $w = s + by$
  2. Exponential utility: $u(w, e) = -\exp\{-r[w - \psi(e)]\}$
  3. Normally distributed noise: $\varepsilon \sim N(0, \sigma^2)$
- Closed form solution

$$b = \frac{1}{1 + kr\sigma^2} < 1$$

and

$$e^* = b/k$$

Multitask Moral Hazard Model: Getting what you pay for.

- Holmström-Milgrom (1991) introduce multiple tasks into LEN framework. (Version here based on Gibbons (2005))
- When does paying for p increase y?

$$\begin{array}{ll} y = a_1 + \varepsilon & p = a_1 + \varphi \\ y = a_1 + a_2 & p = a_1 \\ y = a_1 & p = a_1 + a_2 \\ y = a_1 + \varepsilon & p = a_2 + \varepsilon \end{array}$$

- Cost of effort: $\psi(a) = \frac{1}{2}(a_1^2 + a_2^2)$

Multitask model: Getting what you pay for

- Key novelty: with multiple tasks $a = (a_1, a_2)$, "output" y and measured performance p typically not the same thing. Suppose

$$\begin{aligned} y(a) &= f_1 a_1 + f_2 a_2 + \varepsilon \\ p(a) &= g_1 a_1 + g_2 a_2 + \eta \end{aligned}$$

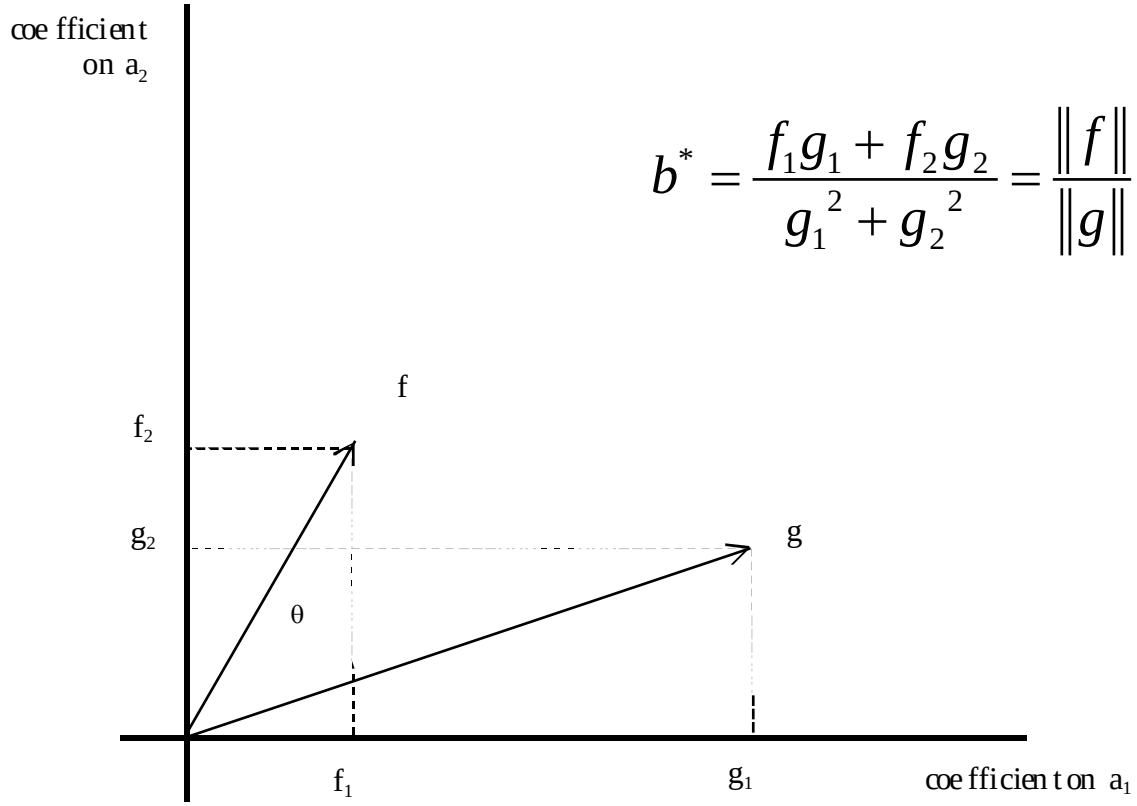
- Optimal linear contract $w = s + bp$ has

$$b = \frac{f_1 g_1 + f_2 g_2}{g_1^2 + g_2^2}$$

Remarks:

1. Not a consequence of risk aversion or limited liability
2. Instead, purely consequence of misalignment between y and p

Canonical Multi-task Model



$$b^* = \frac{f_1 g_1 + f_2 g_2}{g_1^2 + g_2^2} = \frac{\|f\|}{\|g\|}\cos(\theta)$$

From Contract Theory to Organizational Economics

- Since mid 90s, substantial research on optimal allocation of decision rights
- Builds on literature on Property rights/Incomplete contracts.
- We will:
  - First review two classic delegation models: Aghion and Tirole (1997) and Dessein (2002)
  - Then review three models of large (multi-divisional) organizations: Alonso, Dessein, Matouschek (2008); Stein (2002); Dessein-Garicano-Gertner (2010)
  - For the most part, no incentive contracts: Few efforts to develop comprehensive formal picture (Dessein-Garicano-Gertner is an exception).

Organizational Economics: From 'effort/investments' towards 'decision-making'

- Holmstrom-Milgrom (1987-1991)
  - How to motivate agents to provide effort?
- Property Rights Theory (Grossman and Hart 1987, Hart and Moore 1991)
  - First step towards a model of decision-making in organizations.
  - Incomplete contracts: Decisions are not contractible *ex ante*
  - Ownership of assets gives 'residual rights of control'

Property Rights Theory

- Coasian Bargaining: Decisions are contractible ex post
  - No inefficient decision-making!
- But Property rights matter for efficiency as they affect *ex ante incentives.*
  - Incentives to improve outside options in bargaining game
  - Incentives to increase surplus.
- One downside: Impact of authority on incentives often subtle and model-specific

Aghion and Tirole (JPE 1997)

- Aghion and Tirole (1997): Formal and Real Authority
  - Second step towards model of decision-making in organizations.
  - Authority does affect ex post decision-making (no more coasian bargaining ex post)
  - But allocation of authority is still a tool to motivate agents as in PRT.

Aghion and Tirole (JPE 1997)

- Principal and single agent. Two key features of situation:
  1. Agent's job is not just to "work hard", but to be creative or solve problems.
  2. Agent cares not (just) about money, but about which solution is chosen
     - In fact, no money/incentives in model ("agent is infinitely risk averse")

Aghion and Tirole (JPE 1997)

- Specifically, n possible projects to investigate
  - One is optimal for principal and gives her benefit B
  - One is optimal for agent and gives him benefit b
  - Alignment ("congruence") of preferences measured by $\alpha \leq 1$: P's best project gives A benefit αb; A's best project gives P benefit αB (AT actually have two parameters)
  - One project is "status quo": zero payoffs, always available
  - One project has payoff $-\infty$ for both

Information acquisition ('Initiative')

- Agent invests effort e, at cost $c_A(e)$: learns payoffs of all projects with probability e, otherwise does not learn anything.
- P invests effort E, at cost $c_P(E)$, to learn payoffs, learns all or none.

Principal with Formal Authority

- If P has formal authority
  - A recommends project to P if he knows payoffs
  - P chooses her preferred project (and thus possibly overrules A) if she knows payoffs
  - P "rubberstamps" A's recommendation if she *does not* know payoffs: Agent has "real authority"
  - If neither knows payoff, status quo

Principal with Formal Authority: Effort incentives

- **Effort Incentives:** Each player's effort is decreasing in the other player's effort!
- Agent's effort e matters only when P is uninformed!

Principal with Formal Authority: Effort incentives

- **Effort Incentives:** Each player's effort is decreasing in the other player's effort!
- Agent's effort e matters only when P is uninformed!
- P may ex ante want to commit to low E^* in order to get higer Agent effort e^*

  $=>$ commitment by P not to 'micro-manage'

Agent with formal authority: Incentives

- Only difference: if both informed, A's project is chosen.
- More effort from agent, less from principal
  $\Rightarrow$ P may want to formally delegate decision to A in order to better motivate him!

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- Only difference: if both informed, A's project is chosen.
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- Allocation of authority is (again) a tool to motivate agents (as in PRT).

Authority and Communication in Organizations: Dessein (RES 2002)

- Dessein (2002): Complete shift towards 'decision-making'
- No more effort or effort costs!
- Only 'conflict' over what is optimal decision (~as in second stage of Aghion and Tirole).

Authority and Communication in Organizations: Dessein (RES 2002)

- Basic setting: choice over investment project $y \in \mathbb{R}$
- Optimal choice depends on $\theta \tilde{} U[0,1]$, which A knows but P does not
- Payoffs (simplified model)
  - Principal: $\pi_P(y,\theta) = -(y-\theta)^2$
  - Agent: $\pi_A(y,\theta) = -(y-(\theta+b))^2$

  $\Rightarrow$ Agent is biased, prefers "bigger" projects:

- Centralize or decentralize (delegate)?

Dessein (RES 2002)

Dessein (2002): In order to use local information of agent.

- Why delegate?
- Why not keep control and *communicate?*
  - Why not keep authority and let Agent send message m about θ ?

Hierarchical Communication: Cheap Talk

Key assumption: Communication = Cheap Talk.

- Message m sent by Agent is not contractible
- P cannot commit to a mechanism from message m to transfer $t(m)$ and decision $y(m)$.
  - Otherwise revelation principle: Centralization always (weakly) optimal.

Cheap talk communication can at best be noisy

- Dessein builds on Crawford and Sobel (1982)
- Communication is feasible, but quality depends on b
- Full communication, e.g. $m = \theta + b$, not possible:
  - P would choose $y = m - b$
  - But then A would communicate $m = \theta + 2b$
    $=>$ communication involves loss of information.

Communication (cheap talk) Equilibria

- Every communication equilibrium = *Partition Equilibrium*
  - fully characterized by partition of all possible states of nature.
  - A truthfully reveals to which partition element θ belongs.
  - If agent bias $b > 1/4$: communication is pure noise ("babbling")
- If $1/12 < b < 1/4$:
  - agent only reveals if state of nature θ is 'LOW' $\theta < \theta'$ or 'HIGH' $\theta > \theta'$ with $\theta' = 1/2 - 2b$
- More aligned preferences (smaller b)
  - more messages, less noise.
  - Communication becomes perfect as $b \longrightarrow 0$.

Delegation versus Communication

- b large: No delegation/ No communication
- b smaller: no obvious "winner":

  $\longrightarrow$ both "bias" (delegation) and loss of information (communication) decrease as b decreases and disappear in the limit

Delegation versus Communication

- **PROPOSITION 1**: No informative communication occurs in equilibrium
  - *If* $b < 1/4$ and A can reveal if θ is 'high' or 'low' $\Rightarrow$ P prefers not to communicate, but to delegate instead.

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- **PROPOSITION 2**: *P* delegates authority if and only if

$$b^2 \leq \sigma_\theta^2$$

Ally principle and Uncertainty principle: Delegate when incentive conflict of agent is small relative to his informational advantage!

Dessein 2002: Contribution

- Focus away from impact of authority on incentives for effort/investment (Aghion and Tirole, PRT)
  - Impact of allocation of authority on quality of decision-making' in organizations.
- Allow for communication in organizations and thereby avoid extremes:
  - No communication: too restrictive
  - Mechanism design: too powerfull

Management of large (multi-divisional) organizations

- Role of large multi-divisional firms:
  - Merging two businesses and placing someone at top can help resolve conflicts/achieve coordination that are hard to solve/achieve "horizontally" between the businesses.
  - Downside? What's the cost of merging two firms and intervening (from top) in their decisions if and only if there is some coordination benefit? (aka Williamson's (1985) "selective intervention puzzle")

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- Three recent models
  1. Stein (JF 2002)
  2. Alonso, Dessein and Matouschek (AER 2008)
  3. Dessein-Garicano-Gertner (AEJ 2010)

Stein (JF 2002)

- **Why multi-divisional firms?**
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  - Assumption: Headquarter manager (CEO) has superior information compared to external capital markets.

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- **Why multi-divisional firms?**
  - Allocation of capital to units with best opportunities.
  - Assumption: Headquarter manager (CEO) has superior information compared to external capital markets.
- Similar themes as Aghion and Tirole (1997)
  - Decentralization/Non-integration improves "initiative" and "information collection"
  - Novel: *role of hard versus soft information*, benefits of interdivisional competition.

Stein (JF 2002)

- Model: Two divisions, each with manager and two investment opportunities.
  - Each investment opportunity can receive $x \in \{0, 1, 2\}$ units of capital.
  - Each investment opportunity is either 'Good' or 'Bad'.
  - Each manager must acquire information about his investment projects.
- Decentralization: Each Division manager gets two units of capital, allocates among 2 projects.
- Centralization Headquarter managers gets 4 units of capital, allocates among 4 projects.
  - Simplification: Information of HQ exogously fixed.

Hierarchy with Soft Information

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- Incentives for info acquisition blunted under centralization.
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- **Possibility result:** Despite better ex post allocation of capital, "possible" that decentralization leads to a higher output (depends on shape $p(.)$).

Hierarchy with Hard Information

- Assume information about capital opportunities can be made **'verifiable'** (no more cheap talk!)
- Now centralization always optimal!
  - Centralization creates 'competition for resources' among divisions (~business stealing effect).
  - Incentives for information acquisition are larger under centralization than under decentralization.
- Trade-off centralized versus decentralized organizations depends on nature of information!
  - empirical applications: small business lending.

Alonso, Dessein and Matouschek (AER 2008)

- **Why multi-divisional firms?**
  - Exploiting synergies (economies of scale and scope) requires coordination.
  - Division managers do not (fully) internalize coordination externalities.
  - Headquarters as a conflict resolver/Superior coordinator.

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  - Headquarters as a conflict resolver/Superior coordinator.
- **Is coordination best achieved in centralized or decentralized organizations?**
  - Managers of business units are better informed about local circumstances.
  - Managers distort information when communicating to Headquarters, resulting in lack of responsiveness to local circumstances.

Model

- Organization with divisions 1 and 2, potentially HQ
- Each manager
  - learns local state of world $\theta_i \sim U[-s, s]$
  - makes decision $d_i \in \mathbb{R}$
- Profit of division 1:

$$\pi_1 = K_1 - (d_1 - \theta_1)^2 - \delta(d_1 - d_2)^2, \text{ where } \delta \in [0, \infty)$$

- Manager 1 maximizes $\lambda\pi_1 + (1 - \lambda)\pi_2$.
- HQ maximizes $\pi_1 + \pi_2$.

Key Ingredients

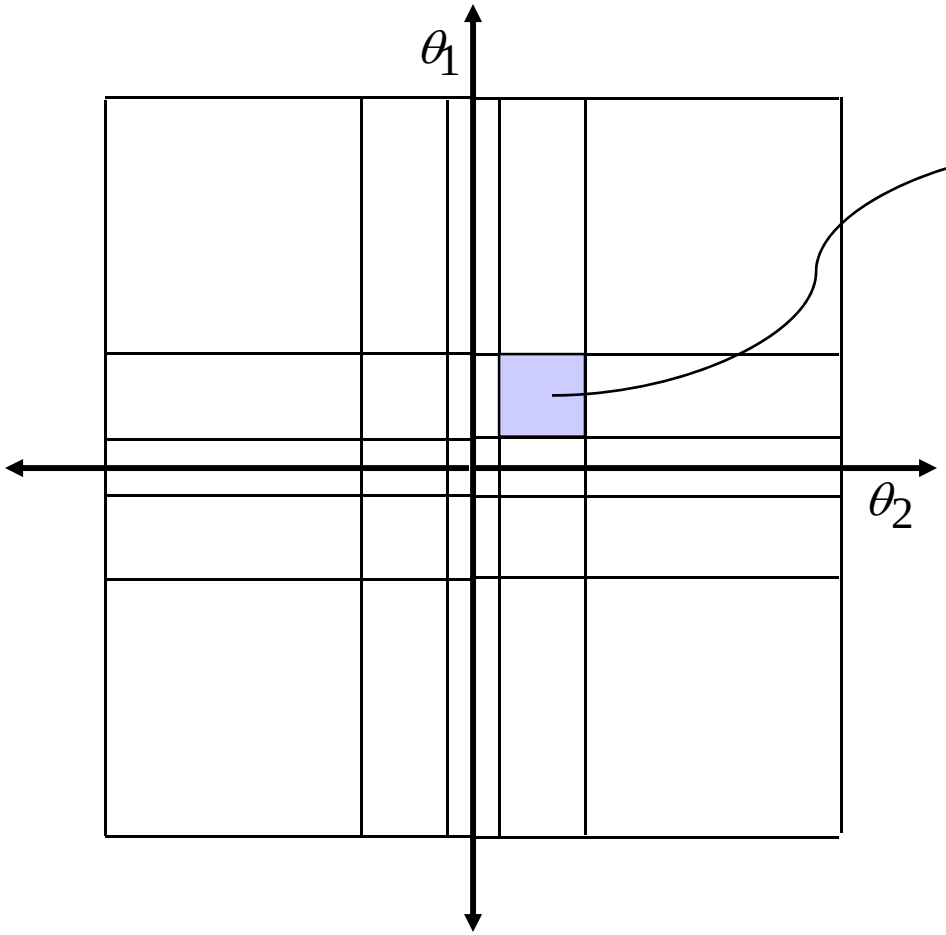
- **Adaptation-coordination trade-off**
  - Example: Multi-national enterprises.
    Customize products <–> realize scale economies
- **the organization lacks commitment**
- managers are privately informed and communicate strategically, both horizontally (between managers) and vertically (between managers and CEO).

Timing and organizational structures

1. Allocation of decision rights
2. Each manager M_i learns θ_i

- Decentralized:
  3. Each M_i sends message m_i to other manager
  4. M_i chooses d_i
- Centralized:
  3. Each M_i sends message m_i to HQ
  4. HQ chooses d_1, d_2 based on $m = (m_1, m_2)$

Communication Equilibria – HQ Control



Managers 1 & 2 send messages

↓

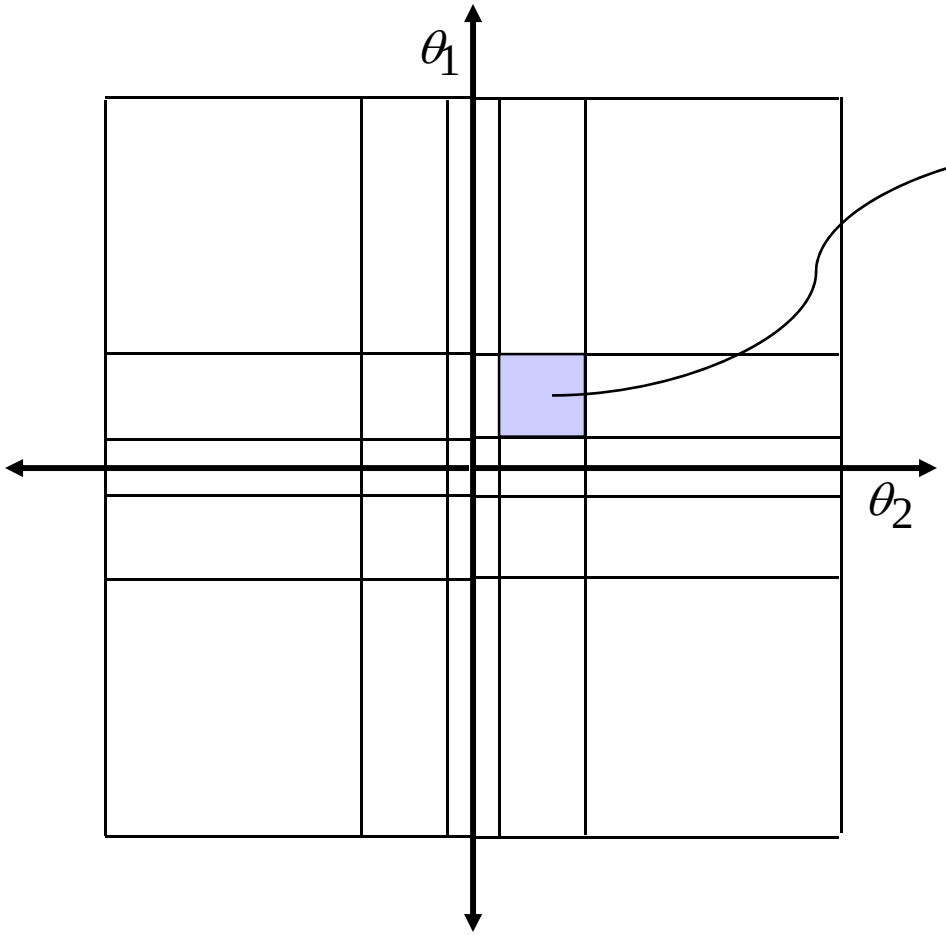
Manager HQ updates beliefs

↓

Manager HQ makes decisions

$$a_{1,i+1} - a_{1,i} = a_{1,i} - a_{1,i-1} + 4b_H a_{1,i}$$

Communication Equilibria – Decentralization



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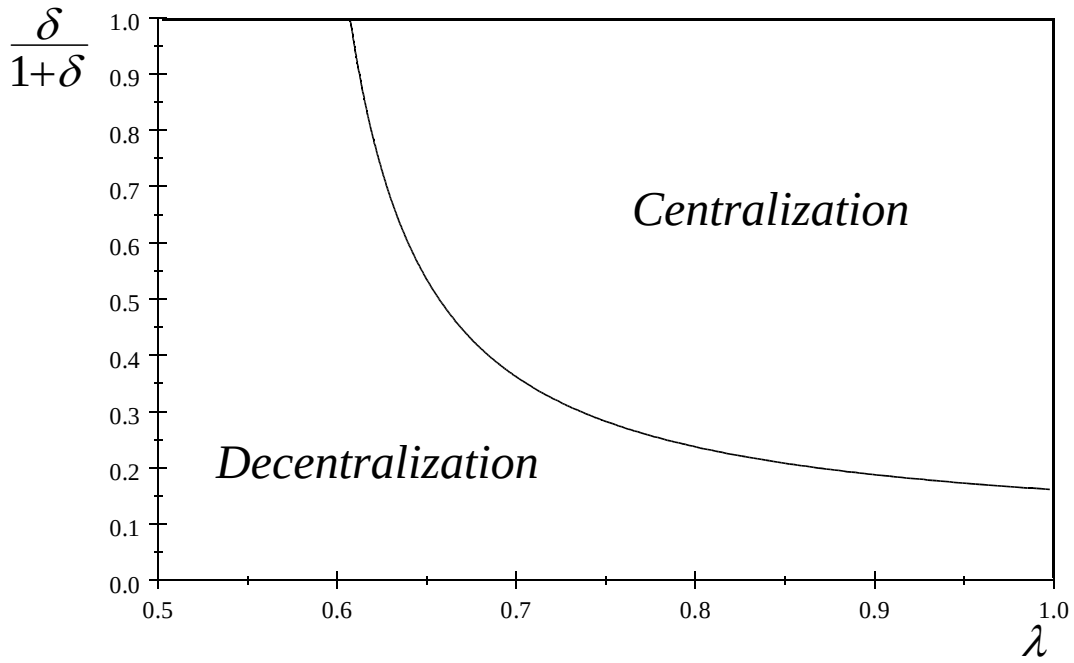
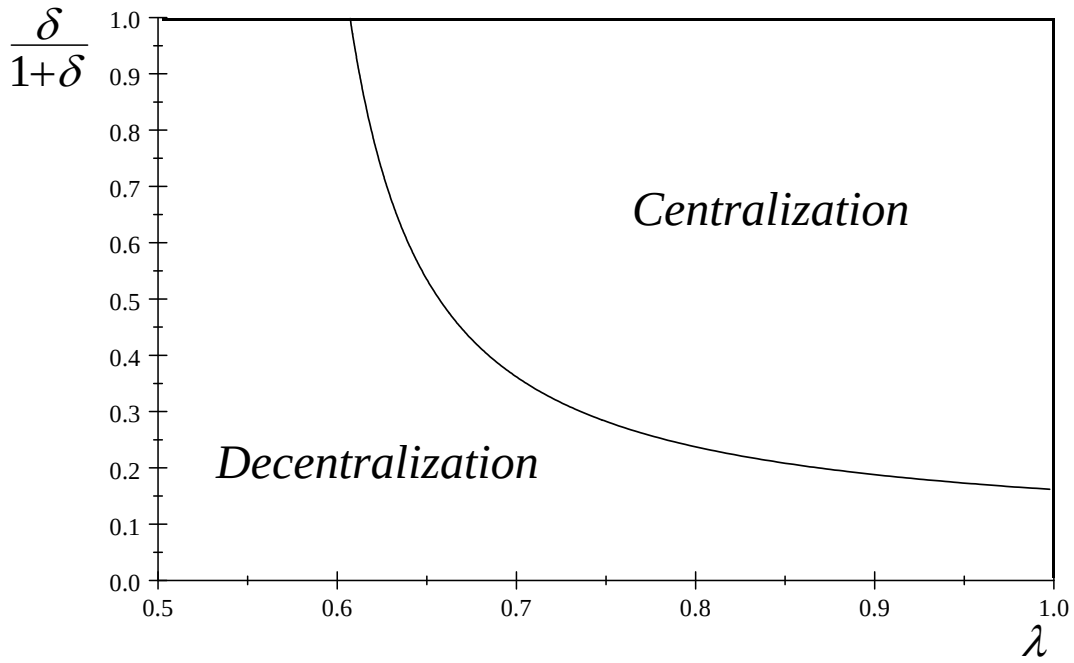
Centralization versus Decentralization



Endogenous communication quality

Centralization versus Decentralization



- Decentralization can dominate even when coordination is all important
- Decentralization dominates when own-division bias is small
- Decentralization dominates when coordination is unimportant

Contribution

- Rich framework for studying ability of centralized/ decentralized organizations to be adaptive and coordinated.
- Explanation for why decentralization may be optimal, despite option of HQ with "perfect preferences".
- If coordination is very important (δ large), then either
  - Centralize decision-making
  - Decentralize, but ensure incentives are sufficiently aligned (λ small),

Provision of incentives in multi-product firms.

Integration of **multi-task moral hazard** (Holmstrom-Milgrom) and **allocation of authority** (Alonso, Dessein and Matouschek)

- Pay division managers based on division profits, or corporate profits, or some mix?

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- But high-powered individual incentives undermine incentives to
  - help others
  - coordinate with others
  - exchange information with others

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- But high-powered individual incentives undermine incentives to
  - help others
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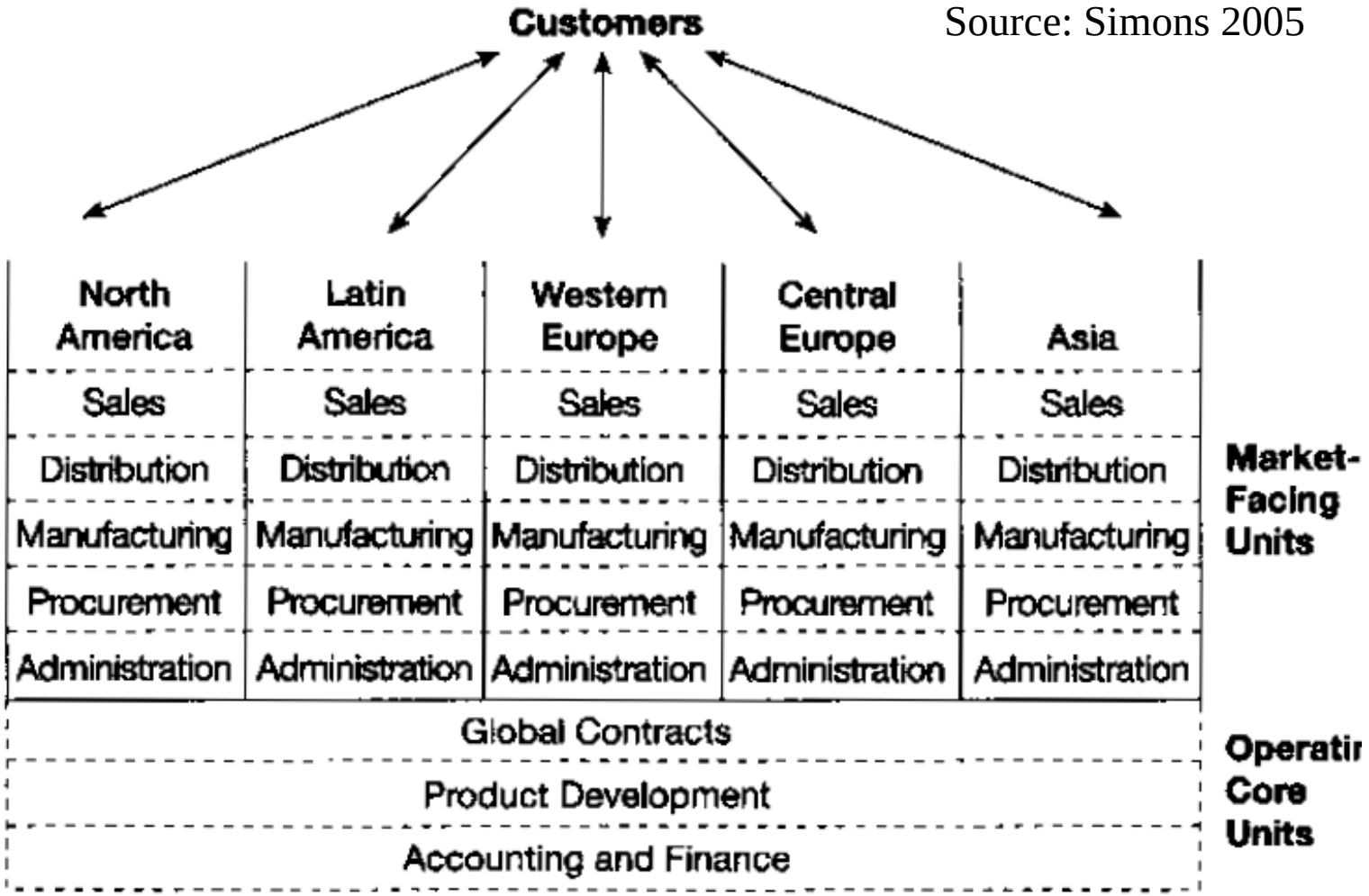
  - exchange information with others
- Conversely, "broad" incentives foster coordination but lead to diluted effort incentives

Dessein, Garicano, Gertner (AEJ 2010)

Dessein, Garicano, Gertner: 'Organizing for Synergies'

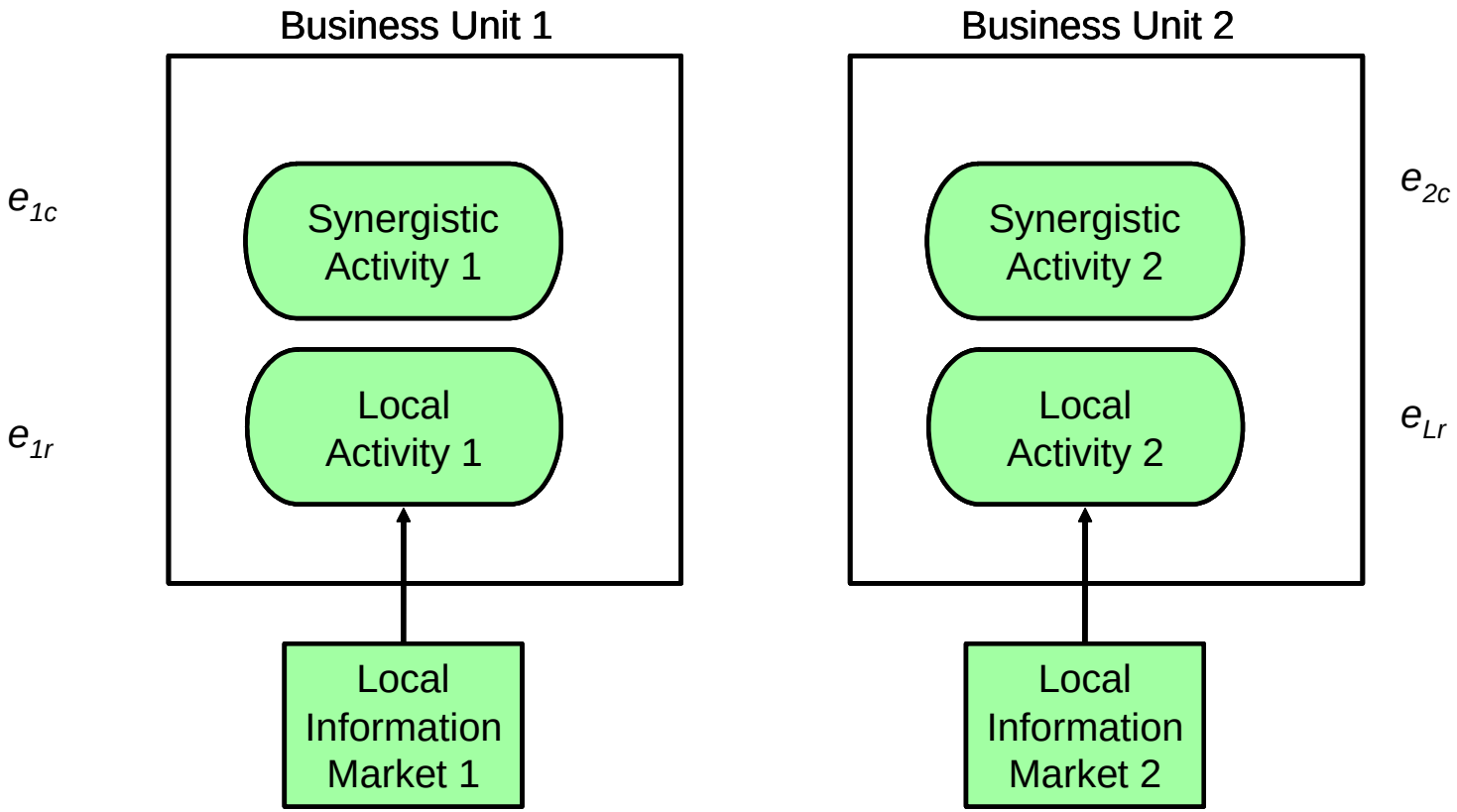
- Motivation: large (global) firms face pressure to
  - be close to product markets $\Rightarrow$ divisional structure
  - realize functional scale economies $\Rightarrow$ functional structure
- Many large firms choose "hybrid" organization: both divisions and centralized functions
- Focus of paper: adaptation to markets vs. standardization to achieve productive efficiency.

Examples: Procter & Gamble

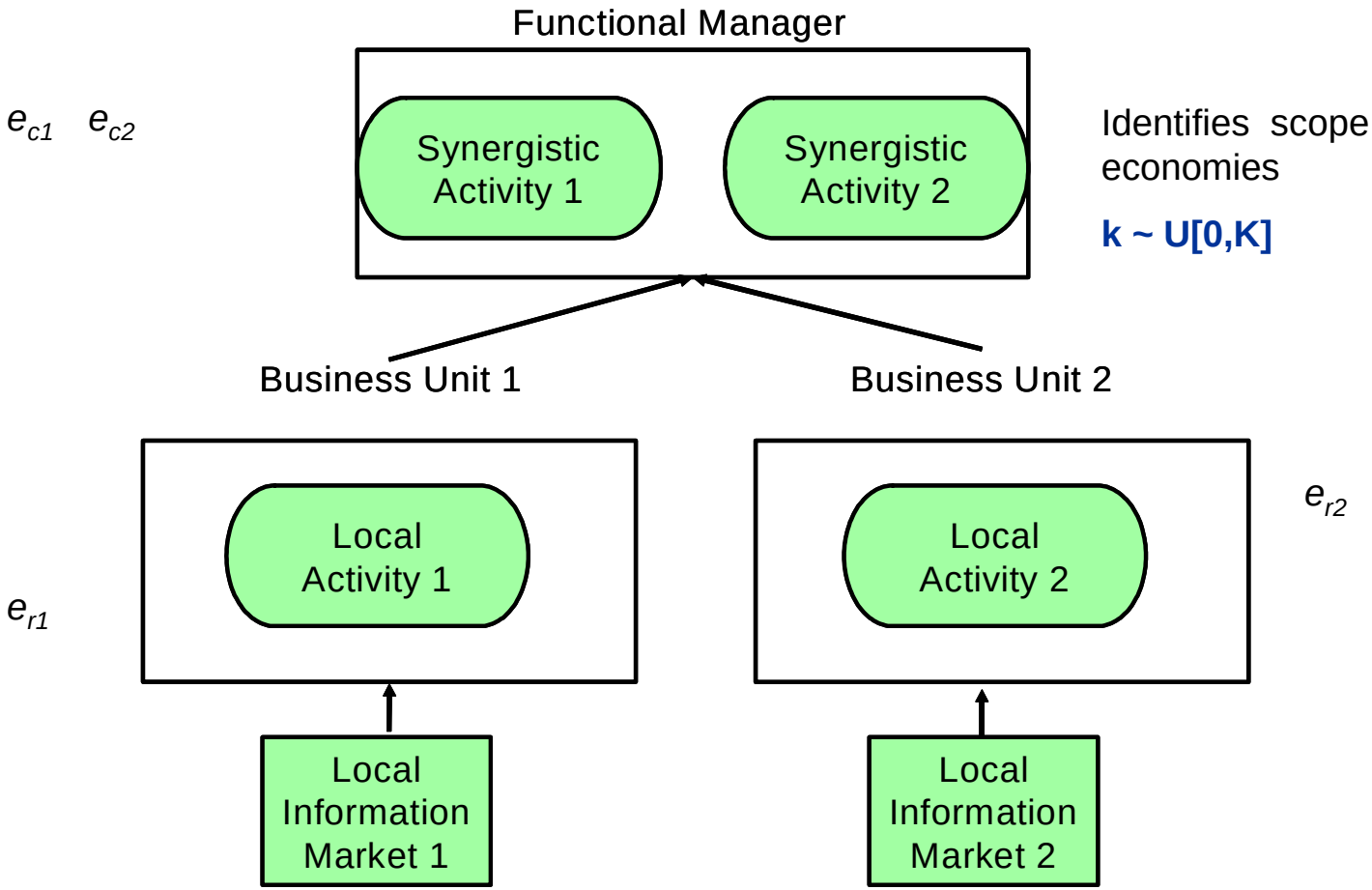


Source: Simons 2005

Non-Integrated Structure: Effort



Integration: Extracting synergies – effort



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Dessein, Garicano, Gertner: 'Organizing for Synergies'

- Problem 1: How to design incentives for HQ-Managers in charge of centralized functions (e.g. centralized manufacturing or purchasing manager) to
  - To reduce costs (provide cost-reducing effort)
  - Make efficient standardization ('synergy") decisions.
- Problem 2: When is it optimal to centralize a function.

Dessein, Garicano, Gertner (AEJ 2010)

Double cost of integration (of 'Organizing for Synergies'):

- Excess standardization
  - Second-best incentives are such that HQ manager is inefficiently biased towards to much standardization.
  - Hence, lack of adaptation to need of individual business units.
- Low-powered incentives
  - Second-best incentives for effort are muted compared to non-integration.
  - Lower effort when function is centralized than not-centralized.

Wait! There is more!

- Friebel and Raith (AEJ 2010): Resource Allocation and Organization Form
- Efficient resource allocation requires truthful communication by division managers to headquarters.
  - Division managers must be partially compensated on firm-wide profits.
  - Results in low-powered incentives.
  - Sometimes optimal to decentralize, give up on efficient resource allocation.
- Model nicely combines elements of Dessein (2002), Stein (2002) and Dessein-Garicano-Gertner (2010)

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