

When Does Coordination Require Centralization?

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Motivation

- Coordination is a key task of organizations
- Adaptation-coordination trade-off
- Dispersed information & strategic communication
- Example: Multinational Enterprises

customize products \leftrightarrow realize scale economies

Motivation

- Is coordination best achieved in centralized or decentralized organizations?

“The Generalist Purchasing Committee, I believe, should define the characteristics of the structure that is most responsible for a unit function and activity such as management, and the profit that to the profit of the stockholders of the same time. Such a function of coordination is for the same reason, and in the same way, as the coordination of the operations of the same enterprise through increased productivity. They could not provide the administrative coordination that became the central function of the enterprise.”

Alfred Chandler (1977)

Motivation

- Key ingredients:
 - adaptation-coordination trade-off
 - dispersed information & strategic communication
 - the organization lacks commitment

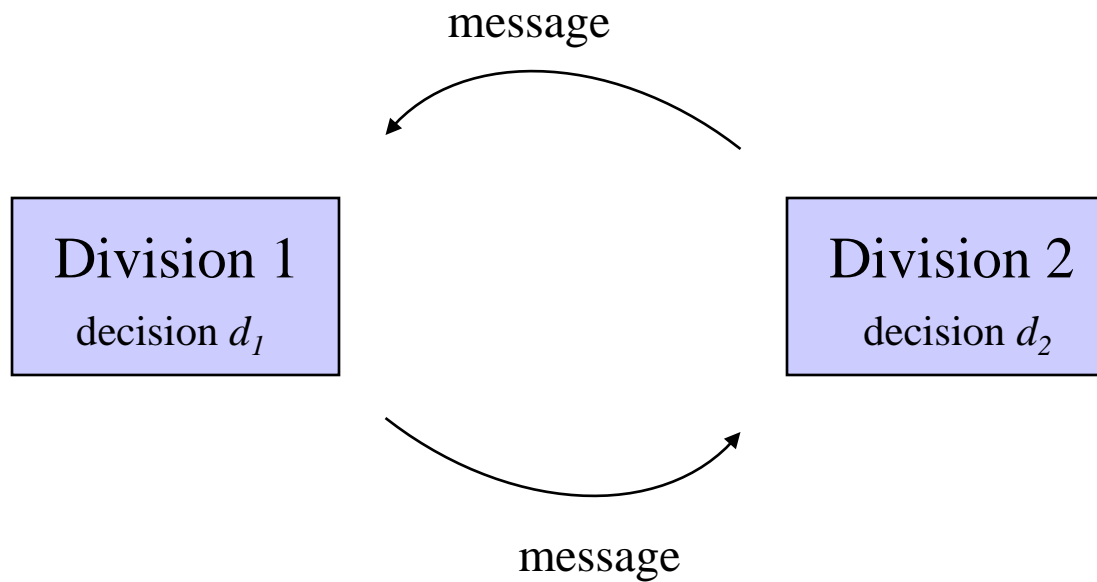
Result Preview

- Decentralized coordination can be optimal regardless of the importance of coordination
 - Need for coordination ↑
 - efficiency of vertical communication ↓
 - efficiency of horizontal communication ↑

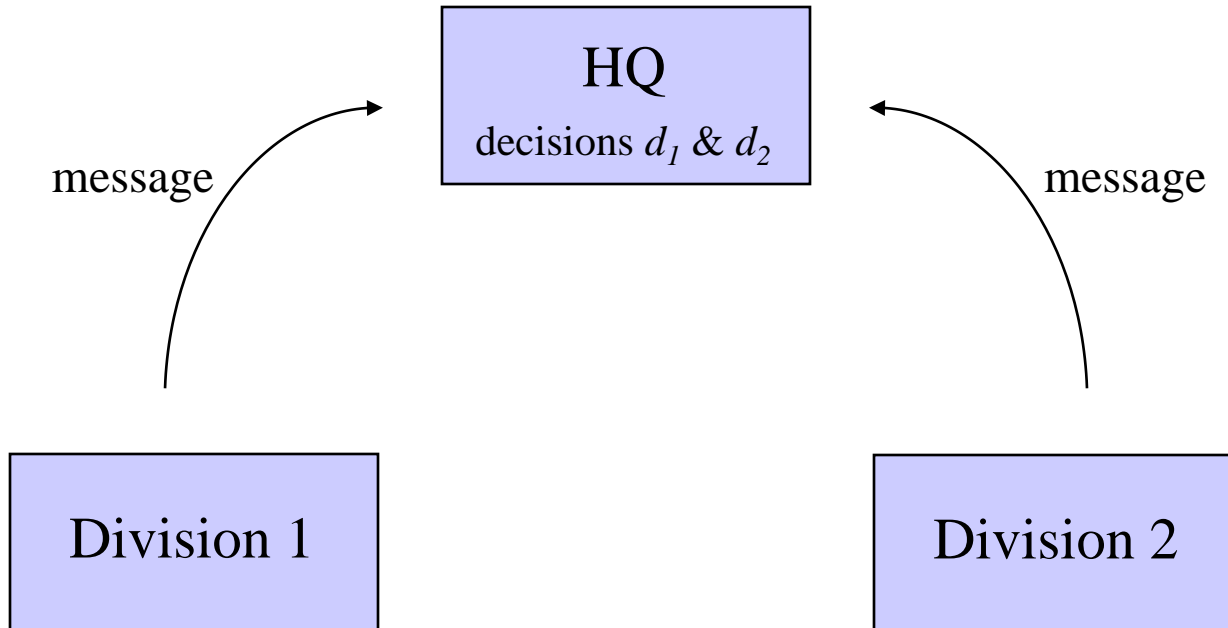
The Model

	Division 1	Division 2	HQ
Profits:	$\pi_1 = K_1$ $-(d_1 - \theta_1)^2$ $-\delta(d_1 - d_2)^2$	$\pi_2 = K_2$ $-(d_2 - \theta_2)^2$ $-\delta(d_1 - d_2)^2$	0
Managers:	$\lambda\pi_1 + (1 - \lambda)\pi_2$	$(1 - \lambda)\pi_1 + \lambda\pi_2$	$\pi_1 + \pi_2$
Information:	θ_1 $\theta_2 \sim U[0, \sigma_2^2]$	$\theta_1 \sim U[0, \sigma_1^2]$ θ_2	$\theta_1 \sim U[0, \sigma_1^2]$ $\theta_2 \sim U[0, \sigma_2^2]$

Decentralization



Centralization



Plan of Talk

- Decision Making
- Communication
- Organizational Performance
- Extensions
- Conclusions

Decision Making – Centralization

$$\max_{d_1, d_2} E(\pi_1 + \pi_2 | m_1, m_2)$$

$$\lim_{\delta \rightarrow \infty} d_1 = \frac{1+2\delta}{2+4\delta} E(\theta_1 | m_1) + \frac{1}{2} E(\theta_2 | m_2)$$

$$\lim_{\delta \rightarrow \infty} d_2 = \frac{1}{2} E(\theta_1 | m_1) + \frac{1+2\delta}{2+4\delta} E(\theta_2 | m_2)$$

Decision Making – Decentralization

$$\max_{d_1} E(\lambda\pi_1 + (1-\lambda)\pi_2 | \theta_1, m_1, m_2)$$

$$\max_{d_2} E((1-\lambda)\pi_1 + \lambda\pi_2 | \theta_2, m_1, m_2)$$

$$\lim_{\delta \rightarrow \infty} \mathbf{d}_1 = \frac{1}{2} \frac{\lambda}{\lambda + \delta} E(\theta_1 | m_1) + \frac{\delta}{\lambda + 2\delta} \left(\frac{\delta}{\lambda + 2\delta} E(\theta_1 | m_1) E(\theta_2 | m_2) + \frac{\lambda + \delta}{\lambda + 2\delta} E(\theta_2 | m_2) \right)$$

$$\lim_{\delta \rightarrow \infty} \mathbf{d}_2 = \frac{1}{2} \frac{\lambda}{\lambda + \delta} E(\theta_1 | m_1) + \frac{\delta}{\lambda + 2\delta} \left(\frac{\delta}{\lambda + 2\delta} E(\theta_2 | m_2) E(\theta_1 | m_1) + \frac{\lambda + \delta}{\lambda + 2\delta} E(\theta_1 | m_1) \right)$$

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Incentives to Misrepresent – Centralization

- Suppose Manager 1 can choose Manager HQ's posterior $\mu_1 \equiv E(\theta_1 | m_1)$

$$\max_{\mu_1} E_{\theta_2} (\lambda \pi_1 + (1 - \lambda) \pi_2) \quad s.t. \quad d_1 = d_1^C \quad \text{and} \quad d_2 = d_2^C$$

$$\mu_1^* = \left(1 + \underbrace{\frac{\delta(2\lambda - 1)}{\lambda + \delta}}_{b_C \geq 0} \right) \theta_1$$

Incentives to Misrepresent – Centralization

- Suppose $\theta_1 > 0$ and Manager 1 communicates truthfully
 - HQ Manager's choice of d_1 :

$$\frac{1}{2}(d_1 - \theta_1) + \delta(d_1 - d_2) = 0$$

- Manager 1's preferred choice of d_1 :

$$\lambda(d_1 - \theta_1) + \delta(d_1 - d_2) = 0$$

Incentives to Misrepresent – Decentralization

- Suppose Manager 1 can choose Manager 2's posterior $\mu_1 \equiv E(\theta_1|m_1)$

$$\max_{\mu_1} E_{\theta_2} (\lambda \pi_1 + (1-\lambda) \pi_2) \quad s.t. \quad d_2 = d_2^D$$

$$\mu_1^* = \left(1 + \underbrace{\frac{(\lambda + \delta)(2\lambda - 1)}{\lambda(1-\lambda) + \delta}}_{b_D \geq 0} \right) \theta_1$$

Incentives to Misrepresent – Decentralization

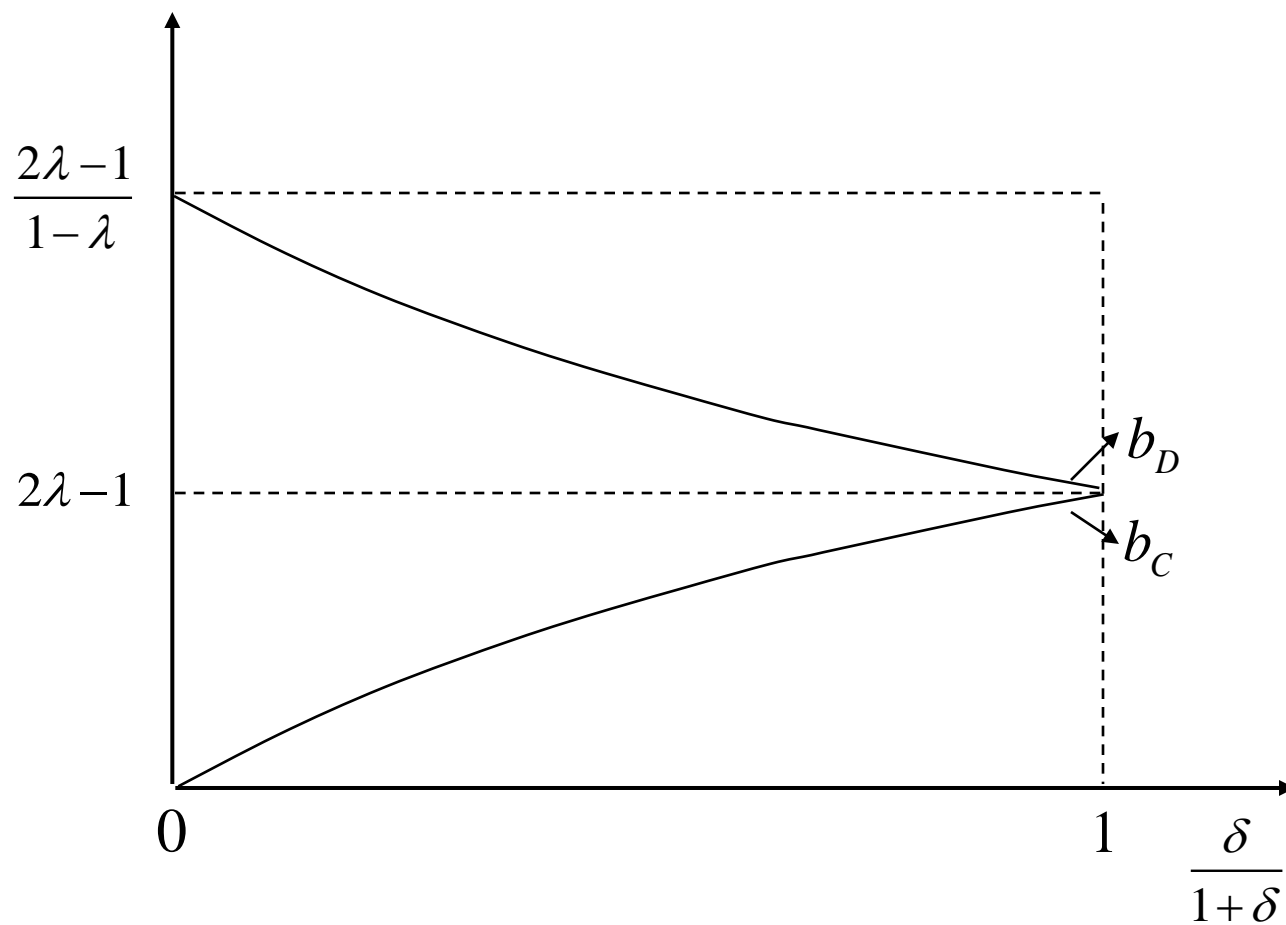
- Suppose $\theta_1 > 0$ and Manager 1 communicates truthfully
 - Manager 2's choice of d_2 :

$$\lambda(d_2 - \theta_2) + \delta(d_2 - d_1) = 0$$

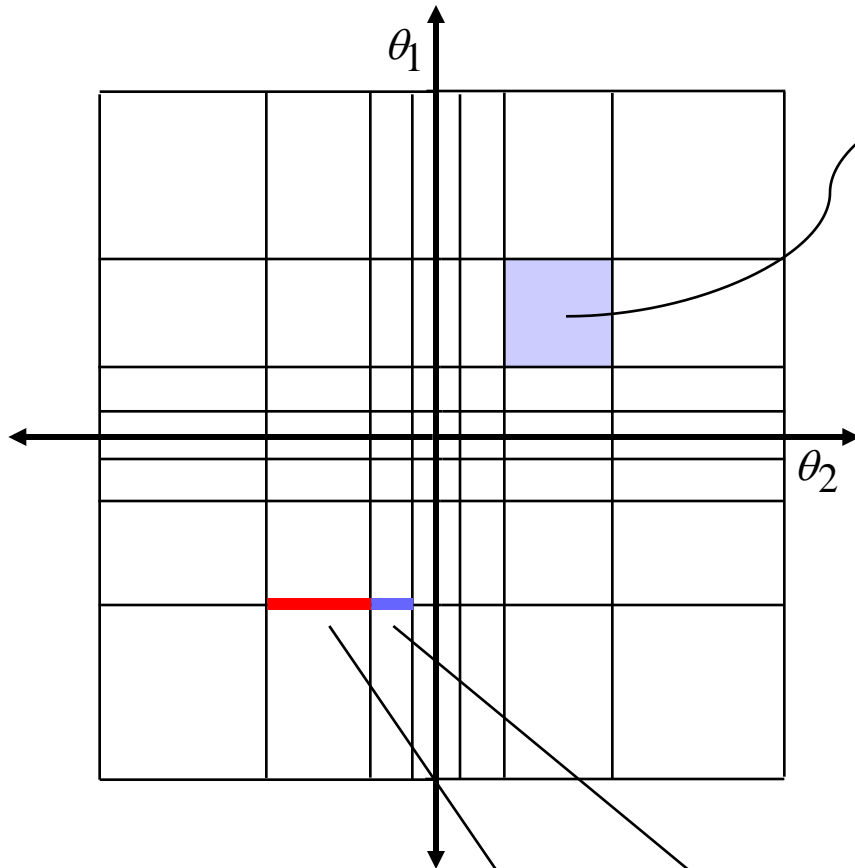
- Manager 1's preferred choice of d_2 :

$$(1 - \lambda)(d_2 - \theta_2) + \delta(d_2 - d_1) = 0$$

Incentives to Misrepresent – Summary



Communication Equilibria



Managers 1 & 2
send messages



Decision makers
update beliefs



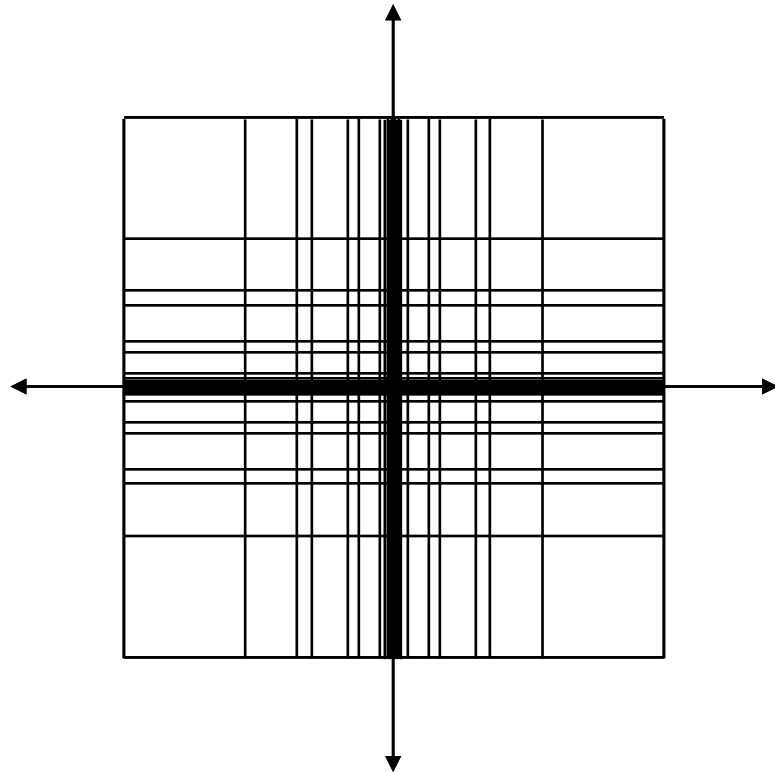
Decisions are made

Decentralization:

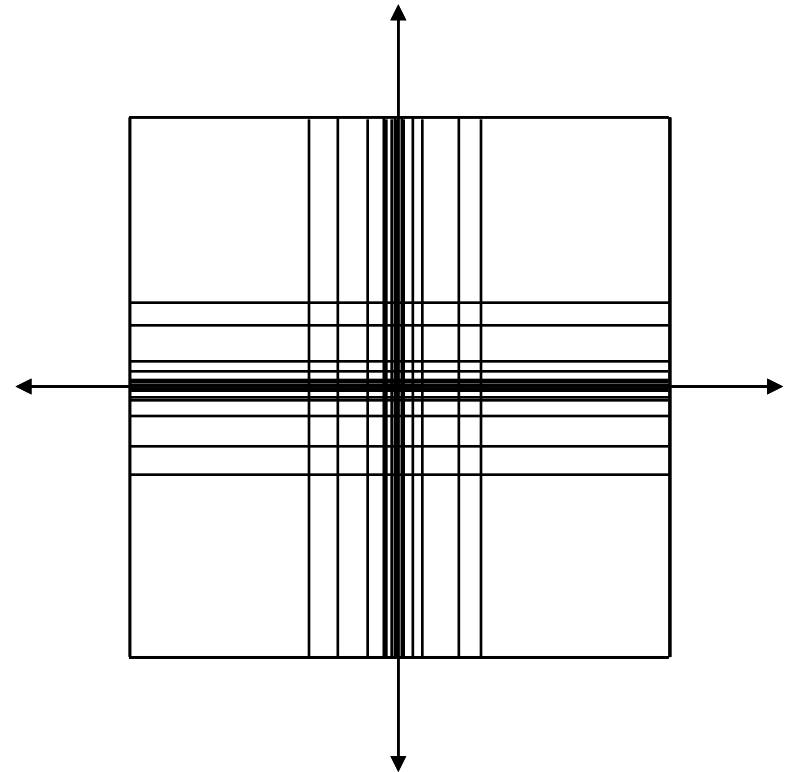
$$a_{i+1} - a_i = a_i - a_{i-1} + 4b_D a_i$$

Communication Equilibria

Centralization



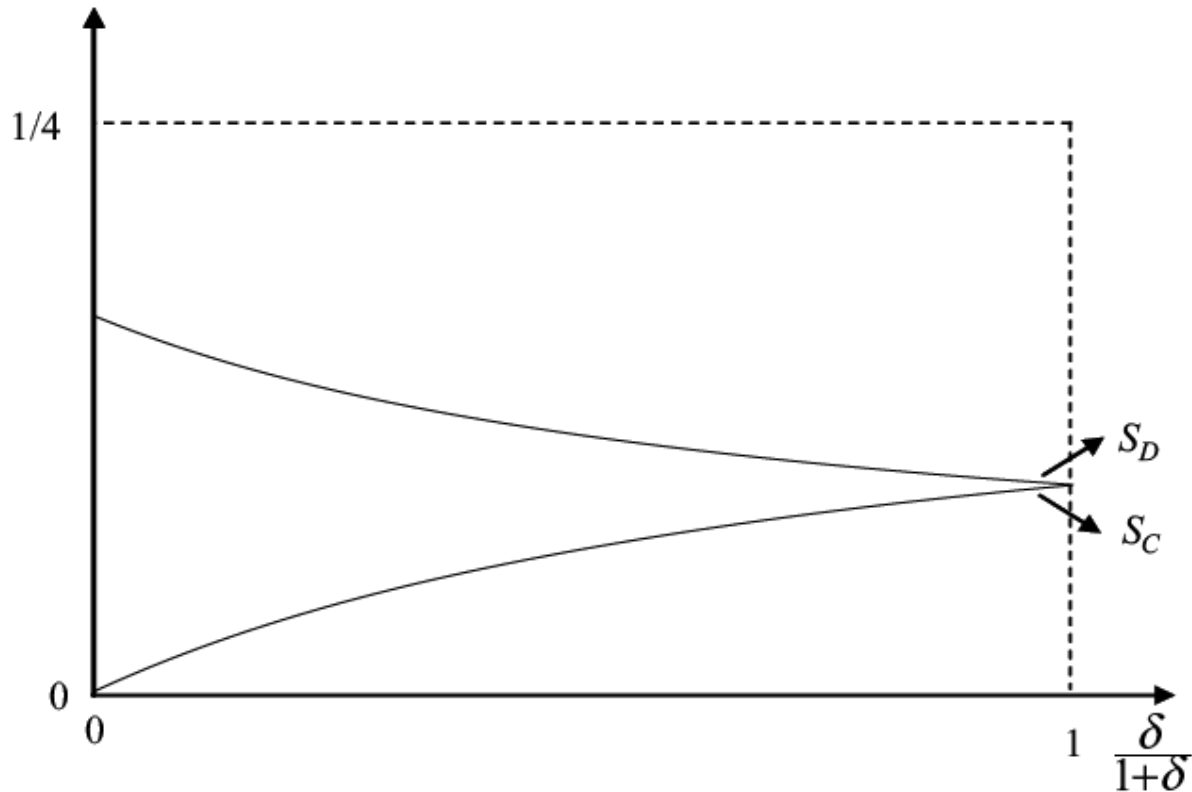
Decentralization



$$\lambda = 2/3 \text{ and } \delta = 4/4$$

Efficiency of Communication

- Residual variance: $E\left[\left(\theta_i - E\left[\theta_i | m_i\right]\right)^2\right] = \frac{b_0}{3+4b_0} \sigma_i^2 \equiv S_0 \sigma_i^2$



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Centralization versus Decentralization

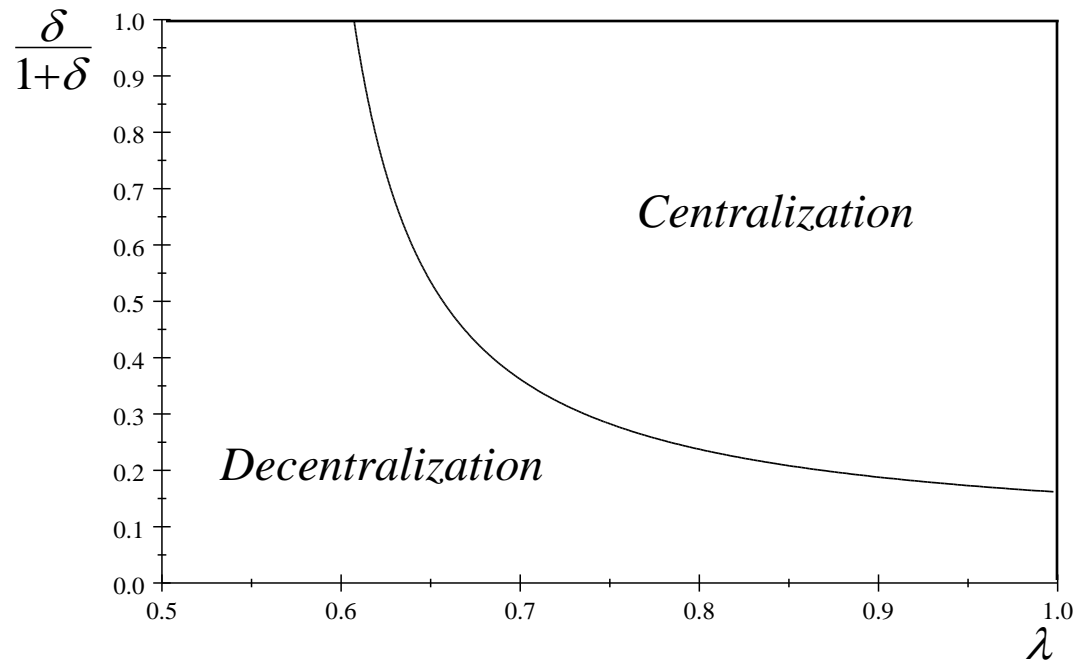
- Decentralization's **Adaptation Advantage**:

$$AL_C \geq AL_D$$

- Centralization's **Coordination Advantage**:

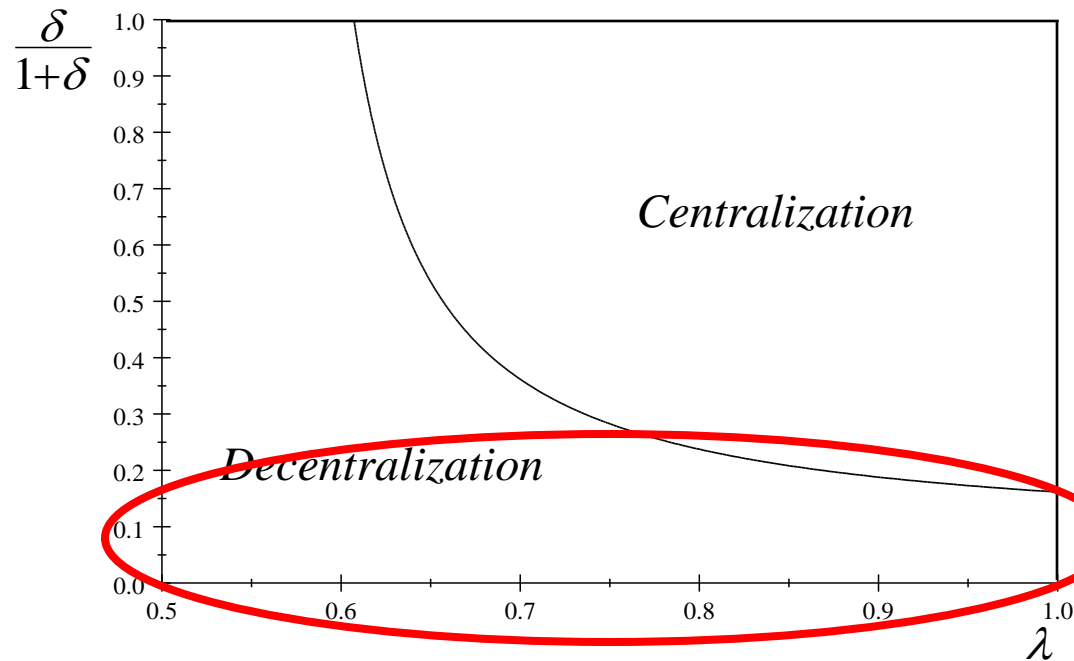
$$CL_C \leq CL_D$$

Centralization versus Decentralization



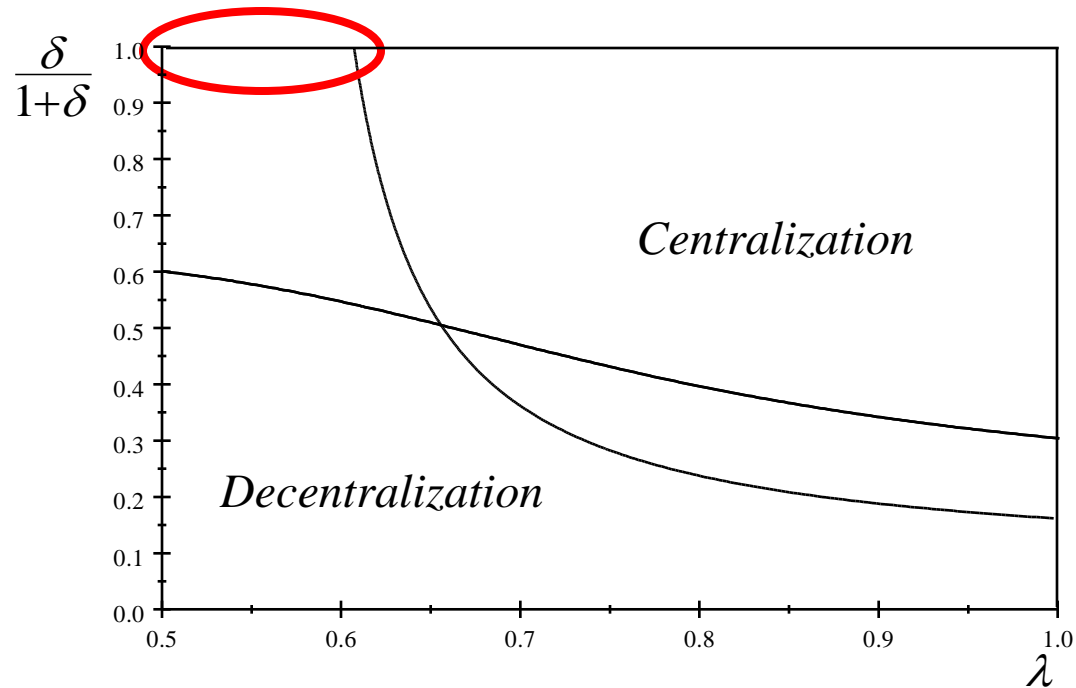
- Decentralization can dominate even when coordination is all important
- Decentralization dominates when own-division bias is small
- Decentralization dominates when coordination is unimportant

Centralization versus Decentralization



$$\frac{d\Pi_l}{d\delta} = \frac{\partial\Pi_l}{\partial\delta} + \frac{\partial\Pi_l}{\partial S_l} \frac{dS_l}{d\delta} \quad l = C, D$$

Centralization versus Decentralization



$\delta \rightarrow \infty$



decision making converges

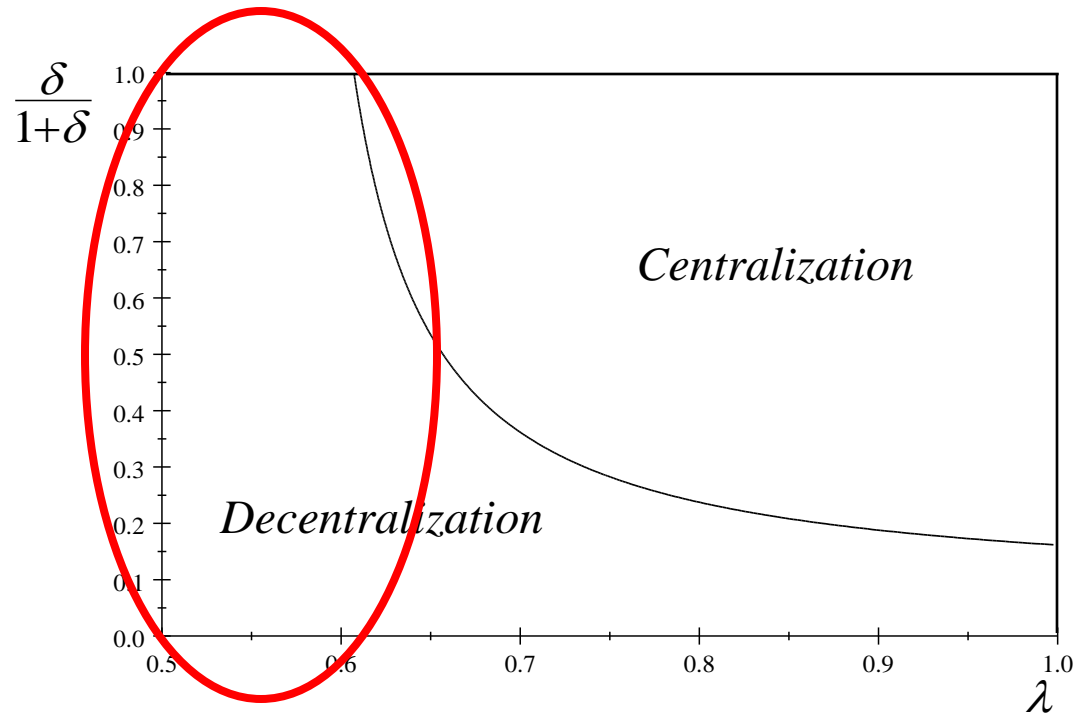


$\Pi_C \approx \Pi_D$



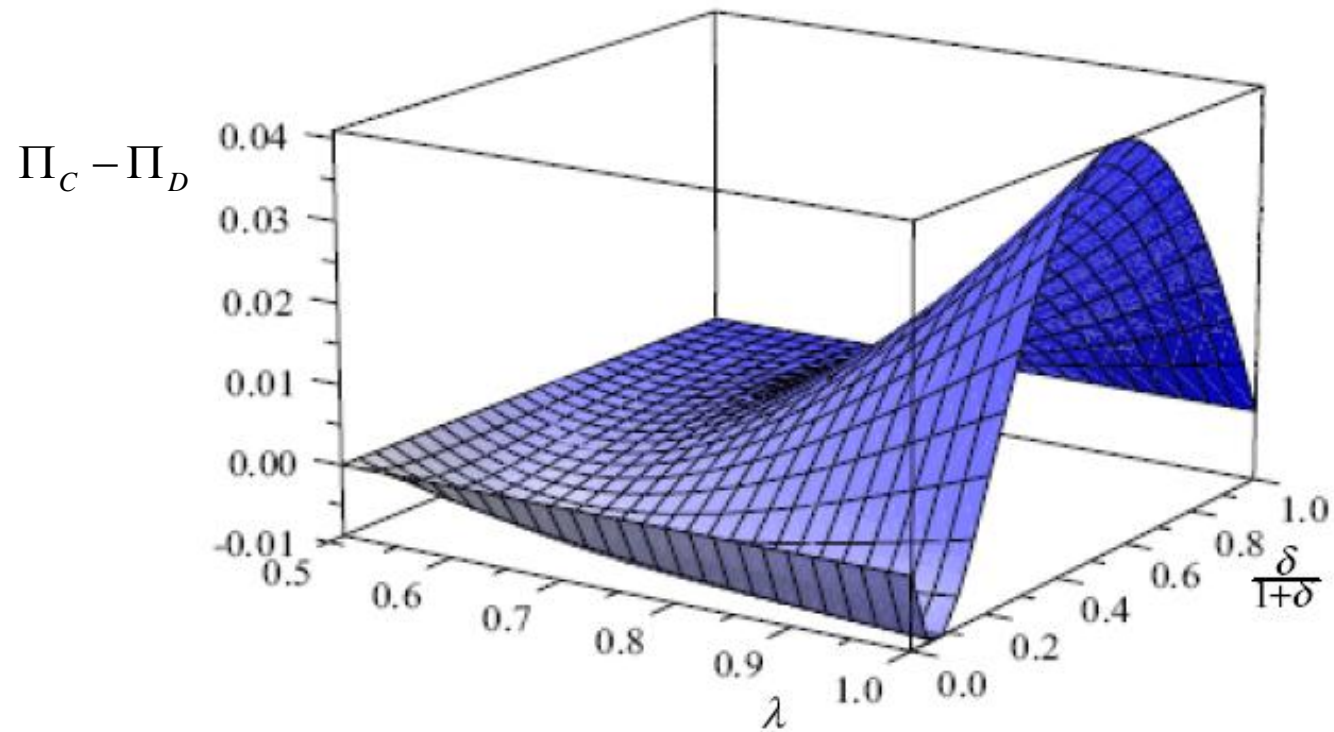
~~communication converges~~

Centralization versus Decentralization



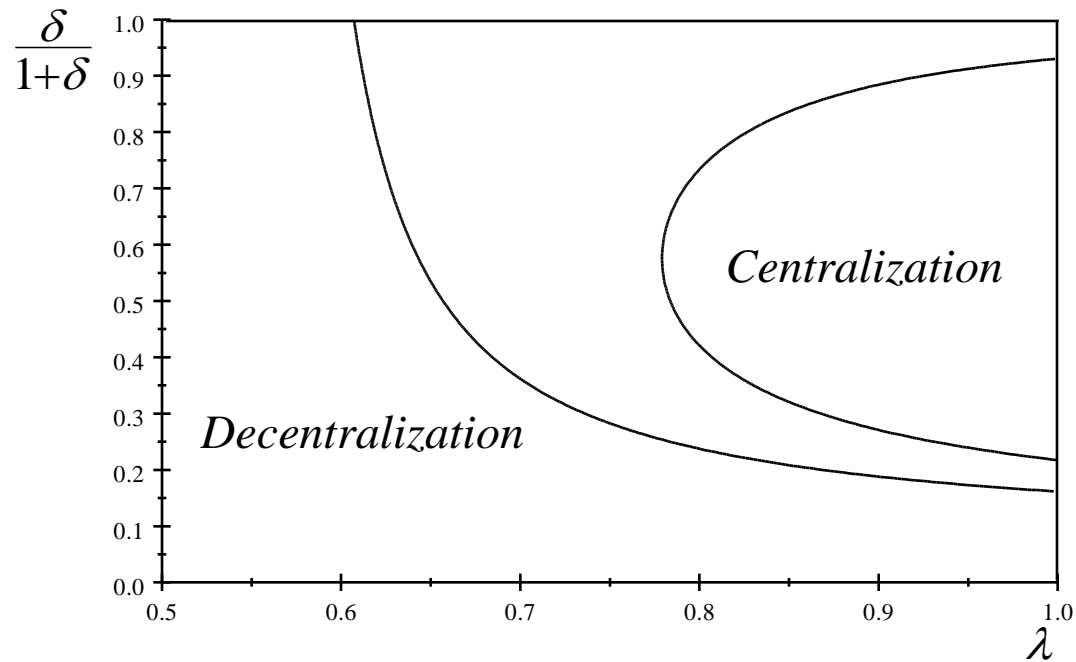
$$\frac{d\Pi_l}{d\lambda} = \frac{\partial\Pi_l}{\partial\lambda} + \frac{\partial\Pi_l}{\partial S_l} \frac{dS_l}{d\lambda} \quad l = C, D$$

Centralization with Resource Costs



Centralization with Resource Costs

- Decentralization versus Centralization ~~with resource costs~~



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Extensions

- Asymmetric organizations:
 - sequential decision making
 - differences in the need for coordination (Rantakari 2006)
 - differences in division sizes
- Asymmetries favor Centralization
- But still: Decentralization is optimal for any δ if
 - incentives sufficiently aligned
 - divisional differences not too big

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Conclusions

- Other organizational theories of centralization & decentralization:
 - mechanism design
 - ‘new’ incomplete contracting
 - team theory
- Insights:
 - decentralized coordination can be optimal regardless of the importance of coordination
 - centralized coordination destroys value if:
 - sufficient incentive alignment
 - need for coordination limited