# Hierarchy and Internal Organization

- Huge literature going back to the 1960's
- People are interested in:
  a] Optimal size of firm
  b] Span of control - number of layers
  c] Who is senior to whom
  d] Wages vs. seniority
  e] size distribution of firms

Approaches: (in no particular order)

1] Optimal monitoring
- Calvo-Wellisz '79, Alchian-Demsetz
- Mirrlees '76
- Williamson (roughly)
- assumes that only people of the view are productive (but self-interested)
  - monitors and monitors of monitors

2] Information and team theory
- Marschak-Radner '72
- Radner '92 JEL
- Bolton-Dewatripont '94 QJE
- Information needs to be collected and processed
  - workers collect information
  - managers process it
- Suppose you have to add 40 numbers
  - 1 person ⇒ 40 units of time

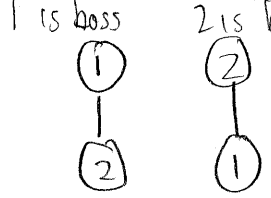
- 2 people ⇒ 21 units of time
- 3 people ⇒ 15 units of time
- Radner generalizes this. Don't necessarily just want to minimize time.
- The person who adds the subtotal is considered to be senior

3] Management by Exception
- Garicano, 2000 - this seems more a story of specialization
  - endogenous specialization
  - "nothing locks people in."
  - Organizations solve problems
    - some are harder than others
  - Higher-ups don't have any sort of decision rights here
- Of these three, only 1] is about incentives
- Radner - Hierarchy isn't only about control. There is also a communication aspect.
- "I think the glass is a little less half full than you do."

partial checklist
- [ ] Where are the firm boundaries?
- [ ] Is it a theory of the firm or the market?
- [ ] Where are prices?
- [ ] Is there authority around?
- [ ] Are there incentives?

Hart-Moore '05 JPE
- Builds upon Aghion-Tirole. If A has an idea, and B doesn't, A's gets implemented. Symmetrically as well. If A and B have ideas, the idea of whoever is in charge gets implemented

- Agents and assets. Access to assets determined hierarchically.
- Each asset represents a button or a decision
- Agents are engaged in task, defined wrt a subset of the assets
- A task leads with some probability to an "idea"
- To obtain significant value from an idea, need access to <u>all</u> assets corresponding to your task
  - Only one of us has access to an asset.
- People can be assigned the same task
- No effort costs, but still have incentives
- Hierarchy is chosen ex ante to maximize expected value.
- Two agents, one asset
  - Agent 1: prob $p_1$ of having idea w/private $v_1$
  - Agent 2: prob $p_2$ of having idea w/private $v_2$
  - Two hierarchical structures




  - 1 is boss: $V_A = p_1 v_1 + (1-p_1) p_2 v_2$
  - 2 is boss: $V_B = p_2 v_2 + (1-p_2) p_1 v_1$
    - $V_A \geq V_B \Leftrightarrow p_1 v_1 + p_2 v_2 - p_1 p_2 v_2 \geq p_2 v_2 + p_1 v_1 - p_1 p_2 v_1$
      $\Leftrightarrow v_1 \geq v_2$
    - hierarchy only matters when we both have ideas, in which case, want higher value idea to be implemented.
  - also 1 in charge $\Leftrightarrow p_1 \geq p_2$

- if $p_1 > p_2$ and $v_1 > v_2$. Then, both should be doing task 1. (2 should be reassigned to task 1)

- Suppose have two assets and three people. Symmetric
  - Two tasks: - thinking about both tasks (coordination)
    - thinking about just one task (specialist)
- Org. structures: (assume 1, 2 specialists, 3 coordinator)

| A | | B | |
|---|---|---|---|
| 3 | 3 | 1 | 2 |
| 1 | 2 | 3 | 3 |

B - specialists are boss
A - coordinator is boss

$$V_A = p_c v_c + (1-p_c)(p_s v_s + p_s v_s)$$
$$V_B = 2p_s v_s + (1-p_s)^2 p_c v_c$$

$$V_A \geq V_B \Leftrightarrow p_c v_c + 2p_s v_s - 2p_c p_s v_s \geq 2p_s v_s + (1-p_s)^2 p_c v_c$$
$$\Leftrightarrow p_c v_c \left(\underbrace{1-(1-p_s)^2}_{1-(1-2p_s+p_s^2)\;=\;2p_s-p_s^2}\right) \geq 2p_c p_s v_s$$
$$\Leftrightarrow v_c(2-p_s) \geq 2v_s$$

- if this holds, want coordinator to be senior
  - $v_c > 2v_s \Rightarrow$ coordinator in charge
  - $2v_s > v_c > v_s \Rightarrow$ depends on $p$
  - $v_s > v_c \Rightarrow$ specialist in charge
- surprising result is, that sometimes we want specialists in charge
- remember: tasks are endogenous. This will rule out structure B whenever $p_s > p_c$
  - when deciding who is senior, you only need to look at probabilities