Incentives in Public Organizations

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December 2008

Motivation

- Economics began with Xenophon's Oeconomicus (c 360 BCE), in which Socrates interviews a model citizen who has two primary concerns. He goes out to his farm in the country to monitor and motivate his workers there. Then he goes back to the city, where his participation in various political institutions is essential for maintaining his rights to own this farm. Such concerns about agents' incentives and political institutions are also central in economic theory today.*

*Myerson (2008).

- In these set of lectures we look at incentives, organization design and contracting issues for provision of public goods & services

- Public organizations are wholly or partly involved with the production of public goods/services (e.g., schools, hospitals, environmental protection).

- This is to be distinguished from public sector organizations (i.e., government owned) or publicly traded companies (i.e., corporations).

- In contrast, private non-profits are public organizations by this definition.

- Key element

  – Non-excludability: as a result costs and/or benefits are not fully "priced in"

- If there were no transactions costs, then one would be able to reach full efficiency through
  - Lindahl pricing
  - Coasian bargaining
  - Pigouvian taxes/subsidies
- Our point of departure is modelling these transactions costs in the same way as for private goods in the theory of contracts/organizations
  - Informational asymmetry
  - Non-contractibility
- Overlap of theory of contracts/organizations and public economics

- Traditional public economics view equated public goods to government provision

- Benevolent government steps in, and uses
  - corrective taxes/subsidies
  - regulation
  - direct provision

- This view ignored
  - government failure
  - role of non-state non-market institutions such as voluntary organizations (non-profits, NGOs)
  - Earlier model assumed there are no agency problems within the public sector

– Does not mean we should mechanically apply the standard organization design of private goods provision (e.g., give high-powered incentives to all government employees)

- What is the key difference between a large corporation like Microsoft and a large government agency, for example, environmental protection

- Both have bureaucracies

- However, in the former case, in the end all the tasks have "money" prices associated with them (needs qualification)

- With public goods and services, there is an inherent element of the outcome that is non-priced ("quality" of health service)

- However, even for private goods quality may be non-contractible (e.g., "quality" of restaurants and plumbers)

- Some of the issues will be common

- After all, even for financial services the need for regulation and to monitor quality is abundantly clear at this very moment!

- However, for health, education, and the environment, the benefits

  - are realized much later

  - may not be fully recognized by the "consumers"

- Also, there is a public good element

- This calls for some degree of third party involvement (e.g., subsidization, oversight)

- Optimal organization design depends not on which sector (public/private) happens to provide it but on:

- distinguishing characteristics of public goods (e.g., benefits/costs not fully internalized in firm's profits)

- technology of production

- informational/contracting environment

Topic 1: Why Incentive Pay is Unlikely to be of Much Use in Public Organizations

- First we develop the benchmark principal-agent model for private organizations

- Next we go through what happens if this model is modified in a number of ways

Benchmark Principal-Agent Model

(based on Schmidt, 1997, Banerjee, Gertler, Ghatak, JPE 2002)

- A firm consists of a risk neutral principal & a risk neutral agent who is needed to carry out a project.

- The project's outcome is high $(Y = 1)$ or low$(Y = 0)$.

- When outcome is high, the principal receives a payoff of $\pi < 1$, otherwise receives 0.

- The agent does not directly care about project outcome.

- The probability of the high outcome is the effort supplied by the agent, e, at a cost $c(e) = e^2/2$.

- Effort $e \in [\underline{e}, \overline{e}]$ where $0 < \underline{e} < \overline{e} < 1$

- Unobservable and hence non-contractible.

- The agent has no wealth which can be used as a performance bond.

- Minimum consumption constraint of $\underline{w} \geq 0$ every period.

- The agent has a reservation payoff $\overline{u} \geq 0$

- The principal must earn a non-negative payoff.

First-best (effort contractible)

- Solve

$$\max_e \pi e - \frac{1}{2}e^2.$$

  - effort: $e = \pi$
  - expected joint surplus: $\pi^2 - \frac{1}{2}\pi^2 = \frac{1}{2}\pi^2.$

Second best (effort non-contractible)

- Two outcomes so a contract can be described by two components w (fixed wage) & b (bonus)

- Principal solves:

$$\max_{b,w} u^p = (\pi - b)\, e - w$$

  subject to:

- *limited liability constraint* (LLC):

$$b + w \geq \underline{w}, w \geq \underline{w}.$$

- *participation constraint* (PC):

$$u^a = eb + w - \frac{1}{2}e^2 \geq \overline{u}.$$

- *incentive-compatibility constraint* (ICC):

$$e = \arg\max_{e \in [0,1]} \left(eb + w - \frac{1}{2}e^2 \right) = b.$$

- Can achieve first-best by setting $b = \pi$ but that implies non-positive expected profits as $\underline{w} \geq 0$.

- Trade-off between efficiency (setting b high) and rent extraction (setting b low).

- If agent had wealth or limited liability constraint was absent, the principal could have "sold off" the firm to the agent by setting $b = \pi$ & $w = \overline{u} - \frac{1}{2}\pi^2 < 0$.

- So set w as low as possible (no risk-sharing issues), i.e., $w = \underline{w}$ and choose b to balance incentive provision & rent extraction.

- Case 1 (PC does not bind as $\overline{u}$ low)
  - Principal maximizes $(\pi - b)b - \underline{w}$
  - Bonus is $b^* = \frac{\pi}{2}$

- Case 2 (PC binds as $\overline{u}$ high)
  - Agent's binding PC: $\frac{1}{2}b^2 + \underline{w} = \overline{u}$.
  - Yields $b^* = \sqrt{2\left(\overline{u} - \underline{w}\right)}$

- Figure displays b and expected joint surplus (S) against reservation payoff.

- Bonus first flat (reservation payoff low, PC doesn't bind) and then increases with $\overline{u}$.

Advantages of this Model

- Payoffs are linear - gives you closed form solutions for contracts, efforts

- Since two outcomes are possible, the contract is the optimal mechanism - no ad hoc contracting assumption

- Generates the possibility of rents (PC not binding)

- Comparative statics with respect to u, π straightforward: richer agents need more incentive pay

Measurement Problems (Baker, JPE 1992)

- Often output or performance in the context of provision of public goods or services is very hard to measure.

- For private goods, however complex the product, there is always a “bottom line” in the form of sales or profits

- Not true for "experience goods": quality of some consumer goods can only be full realized well after the purchase

- Outcome measure is noisy: signal $\sigma \in \{0, 1\}$

- Let $\gamma(1)$ denote the probability that the signal is $\sigma = 1$ when the project is successful and let $\gamma(0)$ denote the probability that the signal is $\sigma = 1$ when the project is a failure.

- We assume that the signal is (weakly) informative in the sense that $\gamma(1) \geq \gamma(0)$.

- If $\gamma(1) = 1$ and $\gamma(0) = 0$, then output is perfectly observed.

- The first-best effort level is:

$$e^* = \arg\max_e \left\{ e\pi - \frac{c}{2}e^2 \right\} = \frac{\pi}{c}.$$

- We assume $\frac{\pi}{c} < 1$ to focus on interior solutions.

- A contract is a pair $\{b(\sigma)\}_{\sigma\in\{0,1\}}$. It is straightforward to solve for the optimal incentive scheme.

- Let $\Delta = \gamma(1) - \gamma(0)$.

- First, observe that the optimal effort level of the agent is:

$$\begin{aligned}\hat{e} &= \arg\max_e \{e\Delta[b(1)-b(0)] + \\ &\quad \left[\gamma(0)[b(1)-b(0)] + b(0) - \frac{c}{2}e^2\right]\} \\ &= \frac{\Delta[b(1)-b(0)]}{c}.\end{aligned}$$

- Plugging this into the principal's payoff function, she chooses the contract to maximize:

$$\frac{\Delta[b(1)-b(0)]}{c}[\pi - \Delta[b(1)-b(0)]] \\ -\gamma(0)b(1) - (1-\gamma(0))b(0).$$

- Then we have: the optimal contract sets $b(0) = 0$ and

$$b(1) = \max\left\{0, \frac{\pi\Delta - \gamma(0)c}{2\Delta^2}\right\}.$$

- The corresponding effort level is

$$e = \max\left\{0, \frac{b(1)\Delta}{c}\right\}.$$

- This result is intuitive. It is optimal to reduce $b(0)$ down to the minimum possible level (given limited liability), i.e., 0, as extra effort can be elicited while reducing the principal's cost. The interesting issue is whether it is worthwhile to offer a bonus when the verifiable signal $\sigma = 1$ is observed.

- Here, Proposition 1 says that, if the output is sufficiently well-measured, then there is positive incentive pay to elicit effort.

- Specifically, this will be the case if

$$\frac{\pi}{c} \geq \frac{\gamma(0)}{\Delta}.$$

- This is more likely to be satisfied the higher is $\gamma(1)$ and the lower is $\gamma(0)$. In particular, it will always hold when $\gamma(0)$ is close enough to zero.

- If this condition does not hold, it is not worthwhile for the principal to use any incentive pay at all.

Multi-Tasking (Holmstrom-Milgrom, 1991)

- If the agent performs several tasks, and the performance measures of these tasks are not equally good, then it may not be efficient to give explicit incentives

- For example, teachers can invest effort to improve the test scores of their students, but also to impart skills such as curiosity, values that are hard to measure but important nevertheless

- If you reward teachers only on exam performance measures of their students, they will cut down the second type of effort and overall the outcome may be less desirable than when they are paid a flat wage.

- Modify the basic model in the following way:

- two tasks, requires efforts e_1 & e_2
- the cost of effort for each task is

$$\begin{aligned} c(e_1) &= \frac{1}{2}\left(e_1^2 + \gamma e_1 e_2\right) \\ c(e_1) &= \frac{1}{2}\left(e_2^2 + \gamma e_1 e_2\right) \end{aligned}$$

- $\gamma > 0$ means the tasks are substitutes, $\gamma < 0$ means they are complements
- assume $|\gamma| < 1$.

* the bonuses for performance measure in each task is b_1 and b_2
* task two is noisy as in previous model
* $\gamma(1) = p$ and let $\gamma(0) = q$
* for simplicity $q = 1 - p$

- agent's IC for the two tasks

$$\max_{e_1,e_2} b_1 e_1 + b_2\{pe_2 + (1-p)(1-e_2)\} - \frac{1}{2}e_1^2 - \frac{1}{2}e_2^2 - \gamma e_1 e_2$$

$$\begin{aligned} b_1 &= e_1 + \gamma e_2 \\ b_2(2p-1) &= \gamma e_1 + e_2 \end{aligned}$$

- This yields

$$\begin{aligned} e_1 &= \{b_1 - \gamma(2p-1)b_2\}\tau \\ e_2 &= \{(2p-1)b_2 - \gamma b_1\}\tau \end{aligned}$$

where $\tau \equiv \frac{1}{1-\gamma^2}$

- the principal's problem:

$$\max_{b_1,b_2}(1-b_1)e_1 + e_2 - \{pe_2 + (1-p)(1-e_2)\}\, b_2$$

subject to the ICCs

- solving the first-order conditions yields

$$\begin{aligned} b_1 &= \frac{1}{2}\left[1 - \frac{\gamma(1-p)}{(2p-1)(1-\gamma^2)}\right] \\ b_2 &= \frac{1}{2}\frac{1}{2p-1}\left[1 - \frac{(1-p)}{(2p-1)(1-\gamma^2)}\right]. \end{aligned}$$

- If $p = 1$ then $b_i^* = \frac{1}{2}$

- Otherwise, noise in second task measure is making incentives in first task flatter so long as $\gamma > 0$

- That is, if tasks are substitutes, incentives are flatter.

- The intuition is: giving more incentives in one task, makes reduces effort in the other task and so do it at a lower level

- If tasks are complements, incentives are sharper and the result goes the other way.

- Why can't the tasks be unbundled?
  - With general skills separation is easier (typing vs photocopying), with specific skills separation is harder (teaching finance, doing research in finance)
  - Some outputs are inherently jointly produced (using a machine and taking care of it)
- Why can't agent be made full residual claimant?
  - Limited liability.
  - In H-M's original model (1991) if you set the risk aversion parameter $r = 0$ then get first-best

Multiple Principals

Dixit, 1996.

- Several principals are simultaneously trying to influence the actions of an agent

- For public goods, an agent's action affects several parties & these payoffs are not all aggregated through a net profit measure

- For example a school principal is accountable both to parent's bodies, the teacher's union, & to owners of the school

- Modify the basic model in the following way:

  – One agent undertakes two actions, e_1 and e_2

- all tasks are well measured
- The cost function of the agent is $\frac{1}{2}e_1^2 + \frac{1}{2}e_2^2 + \gamma e_1 e_2$ ($\gamma > 0$ means actions are substitutes, complements otherwise)
- Two principals, 1 & 2 who derive payoffs π_1 & π_2, offer bonuses b_1 & b_2

- Agent solves

$$\max_{e_1,e_2} b_1 e_1 + b_2 e_2 - \left(\frac{1}{2}e_1^2 + \frac{1}{2}e_2^2 + \gamma e_1 e_2\right)$$

- Yields (upon simplification)

$$\begin{aligned} e_1 &= (b_1 - \gamma b_2)\,\tau \\ e_2 &= (b_2 - \gamma b_1)\,\tau \end{aligned}$$

where $\tau \equiv \frac{1}{1-\gamma^2}$

- Principal 1 takes the bonus of principal 2 as given when choosing b_1, & likewise for principal 2.

- Principal i solves

$$\max_{b_i} (\pi_i - b_i)(b_i - \gamma b_j)\tau$$

- The first order conditions of the two principals are:

$$\begin{aligned} b_1 &= \frac{\pi_1 + \gamma b_2}{2} \\ b_2 &= \frac{\pi_2 + \gamma b_1}{2} \end{aligned}$$

- Simultaneously solving yields

$$\begin{aligned} b_1^* &= \frac{2\pi_1 + \gamma\pi_2}{4 - \gamma^2} . \\ b_2^* &= \frac{2\pi_2 + \gamma\pi_1}{4 - \gamma^2}. \end{aligned}$$

- Note that with $\gamma < 0$ (complements) bonus lower than if the tasks were independent, & for $\gamma > 0$ (substitutes) the opposite holds.

- Intuition: since tasks are complements, principal 1 knows agent will put in some e_1 for free due the incentive scheme in place for task 2. Free riding.

- This is opposite to what we saw in multi-tasking model: substitutes imply flatter incentives - useful to distinguish between the two models in empirical work

- However, if the two principal's maximized joint surplus we would get $b_1^* = \frac{\pi_1}{2}$ and $b_2^* = \frac{\pi_2}{2}$

Motivated Agents

Besley & Ghatak, AER 2005.

- Three key departures
  - Motivation: agents intrinsically care about project outcome (dedicated teachers, doctors)
  - Mission preferences: Principals & agents differ in terms of preferences over "how to run the project" (e.g., whether to have a religious component in education)
  - Matching: Endogenous matching of principals and agents - different notion of competition.
- Projects differ in terms of their missions.
- Mission: attributes of a project that make some principals & agents value its success over & above any monetary income they receive in the process.

- Could be based on:
  - what the organization does (charitable versus commercial)
  - how they do it (environment-friendly or not)
  - who is the principal (kind and caring versus strict profit-maximizer) etc.

- Mapping from effort to outcome is same for all projects

- Agents have the ability to work on any project

- Basic model: missions are exogenously given attributes of a project associated with a given principal.

- Three *types* of principals and agents labelled $i \in \{0, 1, 2\}$ and $j \in \{0, 1, 2\}$

- If project successful, a type i principal receives $\pi_i > 0$. If project fails, receives 0.

- For type 0 principals, payoff is entirely monetary

- For type 1 & 2 principals, payoff may have a non-monetary component. Assume $\pi_1 = \pi_2 \equiv \hat{\pi}$ to focus on horizontal sorting.

- Like principals, all agents are assumed to receive 0 if the project fails.

- Agents of type 0 have standard pecuniary incentives.

- An agent of type 1 (type 2) receives a non-pecuniary benefit of $\overline{\theta}$ from project success if he works for a principal of type 1 (type 2) & $\underline{\theta}$ if matched with a principal of type 2 (type 1), where $\overline{\theta} > \underline{\theta} \geq 0$. *Motivated* agents.

- The payoff of an agent of type j who is matched with a principal of type i when the project succeeds can be summarized as:

$$\theta_{ij} = \begin{cases} 0 & i = 0 \text{ and/or } j = 0 \\ \underline{\theta} & i \in \{1,2\}, j \in \{1,2\}, i \neq j \\ \overline{\theta} & i \in \{1,2\}, j \in \{1,2\}, i = j. \end{cases}$$

- Economy is divided into a *mission-oriented sector* ($i = 1, 2$) & a *profit-oriented sector* ($i = 0$). The latter is exactly like benchmark model.

Optimal Contracts

- Optimal contract (w_{ij}, b_{ij}) for an exogenously given match of a principal of type i & an agent of type j.

- Agent's reservation payoff $\overline{u}_j \geq 0$ is exogenously given (endogenize later)

- **First-best** (effort contractible). Solve

$$\max_{e_{ij}} \left(\pi_i + \theta_{ij}\right) e_{ij} - \frac{1}{2} e_{ij}^2.$$

  - effort: $\pi_i + \theta_{ij}$

  - expected joint surplus: $\frac{1}{2}(\pi_i + \theta_{ij})^2$.

- **Second best.** Solve:

$$\max_{\{b_{ij}, w_{ij}\}} u_{ij}^p = \left(\pi_i - b_{ij}\right) e_{ij} - w_{ij}$$

  subject to:

(i) *limited liability constraint* (LLC):

$$b_{ij} + w_{ij} \geq \underline{w}, w_{ij} \geq \underline{w}.$$

(ii) *participation constraint* (PC):

$$u^a_{ij} = e_{ij}\left(b_{ij} + \theta_{ij}\right) + w_{ij} - \frac{1}{2}e^2_{ij} \geq \overline{u}_j.$$

(iii) *incentive-compatibility constraint* (ICC):

$$\begin{aligned} e_{ij} &= \arg\max_{e_{ij}\in[0,1]} \left(e_{ij}\left(b_{ij} + \theta_{ij}\right) + w_{ij} - \frac{1}{2}e^2_{ij}\right) \\ &= b_{ij} + \theta_{ij} \end{aligned}$$

- **Effort** less than first-best level $\pi_i + \theta_{ij}$, otherwise principal earns negative expected payoff

- $\overline{v}_{ij} \equiv$ value of reservation payoff of an agent of type j s.t. a principal of type i gets zero expected profits under an optimal contract

- $\underline{v}_{ij} \equiv$ value of reservation payoff such that for $\overline{u}_j \geq \underline{v}_{ij}$ the agent's PC binds.

- For *a given reservation payoff* $\overline{u}_j \in \left[0, \bar{v}_{ij}\right]$ an optimal contract exists.

- Fixed wage is set at subsistence level $\underline{w}$ (no risk sharing issues, & has no effect on incentives). Anything else is paid as a bonus

- Due to limited liability in choosing b principal faces trade-off between providing incentives to agent (b higher) & transferring surplus from agent to himself (b lower).

- Accordingly, reservation payoff of agent plays an important role in determining b (higher it is, the higher is b)

- Agent motivation plays a role as well in the choice of b: for same level of b, an agent with greater motivation will supply higher effort.

- To principal b is a costly instrument of eliciting effort. As agent motivation is a perfect substitute motivated agents receive lower incentive pay.

- Case 1 (PC does not bind as $\overline{u}_j$ low)
  - Principal maximizes $(\pi_i - b)(b + \theta_{ij}) - \underline{w}$
  - Bonus is $b_{ij}^* = \max\left\{\frac{\pi_i - \theta_{ij}}{2}, 0\right\}$
  - Case 1a: Agent is more motivated than principal $(\theta_{ij} \geq \pi_i)$: $b_{ij}^* = 0$ (no incentive pay)
  - Case 1b: Principal is more motivated than agent $(\pi_i > \theta_{ij})$: $b_{ij}^* = \frac{1}{2}\left(\pi_i - \theta_{ij}\right)$ (decreasing in agent motivation)

- Case 2 (PC binds as $\overline{u}_j$ high) Agent's binding PC: $\frac{1}{2}\left(b_{ij} + \theta_{ij}\right)^2 + \underline{w} = \overline{u}_j$.
  - Yields $b_{ij}^* = \sqrt{2\left(\overline{u}_j - \underline{w}\right)} - \theta_{ij}$.
  - Bonus is set by the outside market with a discount depending on agent's motivation.

- Observations
  - Bonuses less than that in standard model
  - In case 1, the marginal cost of eliciting effort has gone down, so principal pays less bonus
  - In case 2, bonus is set by outside market, but principal gets a discount due to agent motivation
  - Effort is still less than the first-best
  - Negative correlation between effort and bonuses - surprise!
  - Not really, driven by selection: more motivated workers work harder, and are paid lower bonuses.

Topic 2: What to do when explicit incentives cannot be used much

- In the first topic we saw that explicit incentives are unlikely to be useful in public organizations for a variety of reasons.

- The question is, what are the other methods that these organizations can use?

- We will examine the roles of

  - A. Competition and matching (Besley and Ghatak, 2005, 2006)

- B. Hiring biased agents (Prendergast, 2007, 2008)

- C. Status Incentives (Besley and Ghatak, 2008)

- D. Worker Identity (Akerlof and Kranton, 2005 & 2008)

A. Competition and Matching (Besley and Ghatak, 2005, 2006)

- In general, two paradigms for competition

- Matching

  - There is heterogeneity in preferences

  - Value generated depends on quality of match

  - Competition is a process that leads to efficient matching in product & labour market

- Business stealing (goods are assumed to be substitutes)
  - Generates cost efficiency
  - Keeps prices low
  - Extreme form of business stealing - liquidation threats
- Corresponds to two different notions of markets or competition:
  - Horizontal: matching resources in an efficient way

- Vertical

  * "auctioning" off of a good to the highest bidder

  * all business goes to lowest cost seller through undercutting

- The first one is an ex post zero sum game, but the second one is not.

- In reality, we have a combination of both

- In the context of public goods, the first aspect is what draws political opposition

- The other aspect too can have an unequalizing effect (vertical sorting) but not always (horizontal sorting)

- Big debate in the context of public service provision.

- What is the effect of competition on productivity?

- Clear for private goods. Not clear for public goods.

- Does competition increase or reduce the role of incentive pay?

- Caroline Hoxby argues that school competition would cause public school administrators and teachers to minimize cost or raise quality if they are faced with the prospect of losing their students and funding

- Mixed evidence

  - Hoxby herself finds a positive effect ("Does Competition among Public Schools Benefit Students and Taxpayers?" American Economic Review, December 2000, 90(5), pp. 1209-38.)

  - However, this result has been questioned by Jesse Rothstein ("Does Competition Among Public Schools Benefit Students and Taxpayers? A Comment on Hoxby (2000)" forthcoming in the American Economic Review)

– Hsieh and Urquola study school competition through vouchers in Chile and find that there was no positive effect on average outcomes, although there was more sorting with private schools attracting the better students. (Forthcoming, Journal of Public Economics)

Competition As Matching: Effect on Incentives

- Based on Besley and Ghatak (2005)

- Do not model competitive process explicitly

- Focus on implications of stable matching: allocations that are immune to a deviation in which any principal & agent can negotiate a contract which makes at least one of them strictly better off without making the other worse off.

- Consider matching function μ that assigns each principal (agent) to at most one agent (principal) & allows for possibility that a principal (agent) remains unmatched, in which case he is described as "matched to himself"

- Let n_i^p & n_j^a denote no. of principals of type i & no. of agents of type j.

- Assume that $n_1^a = n_1^p$ & $n_2^a = n_2^p$ for simplicity.

- However, population of principals & agents of type 0 need not be balanced – we consider both unemployment ($n_0^a > n_0^p$) & full employment ($n_0^a < n_0^p$).

- A person on "long-side" of market gets none of the surplus. Pins down equilibrium reservation payoff of all types of agents.

- From previous analysis for a given value of $\overline{u}_j$ we can uniquely characterize optimal contracts.

- Result: Any stable matching must have agents matched with principals of the same type.

- Intuition

  - If all agents have same reservation payoff, an assortatively matched principal-agent pair can generate more surplus than one where principal & agent are of different types.

  - So if a type 1 principal wants to hire a type 2 agent, must be $\overline{u}_2 < \overline{u}_1$.

  - Given balanced population one poss. is that some type 2 principal wants to hire a type 1 agent. But that means $\overline{u}_2 > \overline{u}_1$, a contradiction.

- With full employment ($n_0^a < n_0^p$) agents receive all the surplus.

- As before, fixed wage is set at $\underline{w}$.

- Bonus payment is solved from principal's zero-profit constraint.

- In profit-oriented sector:

$$b_{00}^* = \frac{\pi_0 + \sqrt{\pi_0^2 - 4\underline{w}}}{2}.$$

- In mission-oriented sector, there will be assortative matching. Since $\pi_1 = \pi_2 = \hat{\pi}$, agents in both types of mission-oriented organizations ($i = 1, 2$) will receive the same bonus.

- Suppose π_0 is high so that the outside option of motivated agents to find a job in the profit-oriented sector binds. Then their bonuses will be:

$$b_{11}^* = b_{22}^* = \frac{\pi_0 + \sqrt{\pi_0^2 - 4\underline{w}}}{2} - \overline{\theta}$$

- As before, they work for a lower bonus due to their motivation.

- If π_0 is not high, then

$$b_{11}^* = b_{22}^* = \frac{\max\{\overline{\theta}, \hat{\pi}\} - \overline{\theta}}{2}$$

- Effort level: $e_{jj}^* = b_{jj}^* + \overline{\theta}$ for $j = 1, 2$ & $e_{00}^* = b_{00}^*$.

- Illustrates how competition & incentives interact. Two effects:

  - Matching

    - Reduces heterogeneity in contracts observed in mission-oriented sector relative to before

    - Ignoring effect of outside option bonuses are lower.

    - Raises organizational productivity

  - Outside option

- * Competition among principals pins down equilibrium value of outside option (highest poss. as agents are on short side)

- * If PC binding in mission oriented sector, bonuses go up.

- * Productivity goes up, but due to higher incentive pay.

- The result that incentives are more high powered in profit-oriented sector may not hold:

  - If PC binds level of incentive pay in mission-oriented sector is less than in private sector by an amount $\overline{\theta}$

– Otherwise:

* If $\overline{\theta} > \hat{\pi}$ $b^*_{11} = b^*_{22} = 0 < b^*_{00}$

* But if $\hat{\pi} > \overline{\theta}$ & the gap is high enough, possible to have $b^*_{11} = b^*_{22} > b^*_{00}$.

- With unemployment ($n_0^a > n_0^p$)
  - Principals in profit-oriented sector receive all the surplus
  - Some agents of type 0 are unemployed.
  - Outside option of agents of types 1 & 2 is 0 (so PC does not bind)
- Now

$$
\begin{aligned}
b_{00}^* &= \frac{\pi_0}{2} \\
b_{11}^* &= b_{22}^* = \frac{\max\{\overline{\theta}, \hat{\pi}\} - \overline{\theta}}{2}.
\end{aligned}
$$

- Competition works only through the matching effect.

- Unemployment unhinges incentives in mission-oriented & profit-oriented sectors.

Application to School Competition

- Based on Besley and Ghatak, JEEA, 2006.

- Same as above but allow for both horizontal and vertical matching

- Assumption 1: $\pi_{11} \geq \pi_{22}$ and $\theta_{11} \geq \theta_{22}$ and $\pi_{12} = \pi_{21} = \underline{\pi}$ and $\theta_{12} = \theta_{21} = \underline{\theta}$.

- To ensure an interior solution for effort we assume $\pi_{11} + \theta_{11} < 1$.

- We concentrate on the case of vertical matching where:

$$\begin{aligned} \pi_{11} &> \underline{\pi} > \pi_{22} \\ \theta_{11} &> \underline{\theta} > \theta_{22}. \end{aligned}$$

- This says that type 2 principals and agents are inferior in a well-defined sense.

- Moreover, these lower types would rather be matched with type 1's if they could.

- Here, the interpretation is in terms of good and bad schools/teachers.

- Vertical matching occurs where good teachers are more motivated when they teach good students.

- Let $Y_{ij} = \max\left\{\frac{\pi_{ij}+\theta_{ij}}{2}, \theta_{ij}\right\}$.

- Then the bonus payment is characterized by

$$b_{ij}^{*} = \begin{cases} \max\{0, \frac{\pi_{ij}-\theta_{ij}}{2}\} & \text{if } \overline{u}_j < \frac{1}{2}\left\{Y_{ij}\right\}^2 \\ \sqrt{2\overline{u}_j} - \theta_{ij} & \text{if } \frac{1}{8}\left\{Y_{ij}\right\}^2 \leq \overline{u}_j \leq \frac{(\pi_{ij}+\theta_{ij})^2}{2}. \end{cases}$$

- The optimal effort level is given by: $e_{ij}^{*} = b_{ij}^{*} + \theta_{ij}$.

- To study matching, we write down the payoff of the principal at the optimal contract.

- Then define as the surplus of a principal whose motivation is π_{ij} when he employs an agent whose motivation is θ_{ij} at reservation utility level z

$$S\left(\pi_{ij}, \theta_{ij}, z\right) =$$

$$\begin{aligned}
& \pi_{ij}\theta_{ij} \\
\text{for } \pi_{ij} &< \theta_{ij}, z < \frac{1}{2}\left\{Y_{ij}\right\}^2 \\
& \frac{\left(\pi_{ij} + \theta_{ij}\right)^2}{4} \\
\text{for } \pi_{ij} &\geq \theta_{ij}, z < \frac{1}{2}\left\{Y_{ij}\right\}^2 \\
& \sqrt{2z}(\pi_{ij} + \theta_{ij} - \sqrt{2z}) \\
\text{for } \frac{1}{8}\left\{Y_{ij}\right\}^2 &\leq z \leq \frac{\left(\pi_{ij} + \theta_{ij}\right)^2}{2}
\end{aligned}$$

- Observe first that $S(\pi, \theta, z)$ defined above is increasing in π and θ with $\partial^2 S / \partial\theta\partial\pi > 0$.

- More specifically, it satisfies the differentiable version of the generalized increasing differences condition of Legros and Newman (2003, Proposition 3).

- Specifically:

$$
\begin{aligned}
& \frac{\partial^2 S(\pi, \theta, S(\pi, \theta', z))}{\partial\pi\partial\theta} \\
& + \frac{\partial^2 S(\pi, \theta, S(\pi, \theta', z))}{\partial\pi\partial z} \cdot \frac{\partial S(\pi, \theta', z)}{\partial y} \\
\geq \; & 0 \text{ for } \theta' \leq \theta
\end{aligned}
$$

- This implies that all matches will be assortative.

- We will work with the following example: Assumption 2: (i) $n^a_j > n^p_j$ for $j \in \{1, 2\}$ (ii) $n^a_1 < n^p_1 + n^p_2$.

- This says that there is a surplus of agents of both kinds relative to principals, but there are less type 1 agents overall than there are principals.

- We will also focus on the case where the agents of all varieties are strongly motivated: Assumption 3: $\theta_{22} \geq \pi_{11}$

- Thus $\theta_{11} > \underline{\theta} > \theta_{22}$ and $\pi_{11} > \underline{\pi} > \pi_{22}$.

- We will refer to type 1 principals and agents as "good" and those of type 2 as "bad".

- Every school now wants to hire a good teacher.

- However, there are not enough such teachers to go around.

- The competition among bad schools for good teachers will bid up their utility.

- Since there is under-supply of effort in the model due to contractible effort, this will come in the form of higher bonuses paid to good teachers in bad schools.

- Good teachers (who are scarce overall) are the beneficiaries of this.

- The utility level of a good teacher in a bad school is given by solving:

$$S(\pi_{22}, \theta_{22}, 0) = S(\pi_{21}, \theta_{21}, \hat{u}).$$

- Using the expression for the principal's expected payoff we get:

$$\hat{u} = \frac{\left(\underline{\pi} + \underline{\theta} + \sqrt{(\underline{\pi} + \underline{\theta})^2 - 4\pi_{22}\theta_{22}}\right)^2}{8}.$$

- From Proposition 1, since bad teachers in bad schools face an outside option of zero we know that

$$b_{22} = 0$$

- Correspondingly, $e_{22} = \theta_{22}$.

- Proposition 1 also tells that the bonus pay of good teachers in bad schools will be:

$$b_{12} = \sqrt{2\hat{u}} - \theta_{12} > 0.$$

- Bonus pay here is used to clear the market for good teachers.

- However, given the underlying incentive problem, it also boosts effort which would not be the case in a standard competitive model where fixed wages are used to clear the market.

- Correspondingly $e_{12} = \sqrt{2\hat{u}} > \theta_{12} > \theta_{22}$.

- Therefore, the productivity gap between bad schools with bad teachers compared to bad schools with good teachers is now greater.

- The model allows us to think about the implications of different ways of allocating teachers to schools.

- Suppose that a bureaucrat were to randomly match teachers to schools and that there is no scope for rematching.

- A teacher can refuse to work for a school in which case her outside option is to be unemployed (i.e., $\overline{u}_j = 0$ for $j = 1, 2$).

- Because we focus on the case of strongly motivated agents all teachers get $w_{ij} = \underline{w}$ and $b_{ij} = 0$.

- Now consider what happens if we allow schools to recruit teachers freely and offer any compensation package (subject to voluntary participation).

- First, observe that this will not affect the pay or productivity of bad teachers in bad schools.

- Good teachers in bad schools will now get paid a bonus and the productivity of these schools will be higher than before.

- Also, keenness of bad schools to hire good teachers will result in good teachers in good schools getting paid a bonus and will raise productivity compared to the case with random matching.

- Under assortative matching average pay and productivity will be higher.

- However, free matching of teachers and schools will raise pay inequality among teachers compared to before.

- Also, inequality in terms of school productivity will go up.

- However, the productivity of bad schools with bad teachers will not change and so if one uses a maximin social welfare criterion, assortative matching will be preferable.

- Sorting will be horizontal if $\pi_{11} = \pi_{22}$ and $\theta_{11} = \theta_{22}$.

- In this case, the principal agent pairs are equally productive under efficient matching.

- With horizontal sorting the objectives of both efficiency and equity will be furthered relative to random matching.

B. Hiring Biased Agents (Prendergast, 2007, 2008)

- If performance is particularly noisy, it might make sense to hire very motivated agents

- In the earlier model this was costless

- But even if it is costly, it might be worthwhile

- In particular, motivated agents might be biased

- Preferences not fully aligned with the principal

- The principal might still want to hire such an agent

- Can balance this off by hiring another agent who is biased in the opposite direction

- Social work departments hire workers who are very motivated to provide benefits to clients but ignore cost-cutting

- The model below is based on Prendergast (2008).

- Organizations has two activities A and B (say research, and administration divisions)

- An agent performs two tasks, 1 and 2

- Effort exerted is e_1 and e_2

- Quadratic cost of effort: $\frac{1}{2}e_1^2 + \frac{1}{2}e_2^2$

- Task 1 effort benefits activity A only (e.g., pure research)

- Task 2 effort benefits activity A and B in proportion x and $1-x$ (e.g., running the lab efficiently)

- The output in the two divisions are, therefore:

$$
\begin{aligned}
y_A &= e_1 + x e_2 \\
y_B &= (1 - x) e_2.
\end{aligned}
$$

- Principal gives equal weight to both activities A and B

- Principal's payoff or surplus is

$$y = y_A + y_B = e_1 + e_2.$$

- The principal's desired effort levels are $\hat{e}_1 = \hat{e}_2 = 1$

- Suppose only a noisy measure of surplus is available

$$\tilde{y} = (1 + d)e_1 + (1 - d)e_2.$$

- d takes the value δ or $-\delta$ where $\delta > 0$ with equal probability

- This is an unbiased measure of surplus as $E(d) = E(-d) = 0$

- If $\delta = 0$ then no noise, and if δ is large then very noisy

- For example, when $\delta < 0$ and large, what this means is that the principal can primarily observe the consequence of e_2 (how well the lab is run)

- This is similar to standard multi-tasking model

- Suppose now agent is biased between activity A and B

- Suppose agent's preference is (ignoring incentive pay) $\mu_A y_A + \mu_B y_B$

- Notice that this means agents are motivated

- Assume μ_A and μ_B are observable (no adverse selection)

- Assume $\mu_A + \mu_B = M < 2$

- Otherwise, agent is very motivated and will choose effort levels that are desired by the principal

- Left to his own devices (no incentive pay) agent will choose $e_1 = \mu_A$ and $e_2 = x\mu_A + (1-x)\mu_B$

- Notice that the paper defines the first-best incorrectly: it should be maximize the sum of the principal and the agent's payoff

$$\begin{aligned} & (\mu_A + 1)\, y_A + (\mu_B + 1)\, y_B \\ = \; & (\mu_A + 1)\, e_1 + \{(\mu_A + 1)\, x + (\mu_B + 1)\,(1-x)\}\, e_2 \end{aligned}$$

- In particular, the first best is

$$\begin{aligned} e_1^{**} &= \mu_A + 1 \\ e_2^{**} &= (\mu_A + 1)\, x + (\mu_B + 1)\,(1-x). \end{aligned}$$

- Suppose offer linear incentive scheme with $\beta\tilde{y} + w$

- Ignore w : it is set by the participation constraint of the worker

- Worker chooses effort anticipating that there will be some noise in the measurement

- He gets to see what d is before choosing effort.

- Principal has to form expectations, however.

- Now the ICs (from the principal's point of view) are[†]:

$$\begin{aligned} e_1 &= \mu_A + (1+d)\beta \\ e_2 &= x\mu_A + (1-x)\mu_B + (1-d)\beta \end{aligned}$$

- Observe that effort is increasing in intrinsic motivation and incentive pay

- So subject to these two ICs the principal maximizes

$$E(e_1 + e_2 - \frac{1}{2}e_1^2 - \frac{1}{2}e_2^2)$$

- His instrument is β.

[†]There is a mistake in the paper here.

- From now, on $\mu_A = \frac{M}{2} + \varepsilon$ and $\mu_B = \frac{M}{2} - \varepsilon$

- Therefore, the ICs are

$$\begin{aligned} e_1 &= \frac{M}{2} + \varepsilon + (1+d)\beta \\ e_2 &= \frac{M}{2} + (2x-1)\varepsilon + (1-d)\beta. \end{aligned}$$

- Substituting and given the fact that $E(d) =$

0 :

$$
\begin{aligned}
\pi &= M + 2x\varepsilon + 2\beta \\
&\quad -\frac{1}{2}E\left(\frac{M}{2} + \varepsilon + (1+d)\beta\right)^2 \\
&\quad -\frac{1}{2}E\left(\frac{M}{2} + (2x-1)\varepsilon + (1+d)\beta\right)^2 \\
&= M + 2x\varepsilon + 2\beta \\
&\quad -\frac{1}{2}\left(\frac{M}{2} + \varepsilon\right)^2 - \left(\frac{M}{2} + \varepsilon\right)\beta \\
&\quad -\frac{1}{2}\left(\frac{M}{2} + (2x-1)\,\varepsilon\right)^2 \\
&\quad - \left(\frac{M}{2} + (2x-1)\,\varepsilon\right)\beta - \beta^2(1+\delta)^2.
\end{aligned}
$$

- (Using the fact that $E(1+d)^2 = (1+\delta)^2$)

- Differentiate with respect to β to get the first order condition:

$$\beta^* = \frac{1 - \frac{M}{2} - x\varepsilon}{1 + \delta^2}.$$

- Under this contract the optimal expected effort levels are

$$\begin{aligned} E(e_1) &= \frac{M}{2} + \varepsilon + \frac{1 - \frac{M}{2} - x\varepsilon}{1 + \delta^2}. \\ E(e_2) &= \frac{M}{2} + (2x - 1)\varepsilon + \frac{1 - \frac{M}{2} - x\varepsilon}{1 + \delta^2}. \end{aligned}$$

- Observations:
  - As δ^2 rises β falls for standard reasons

- As M rises β falls as in Besley-Ghatak (2005)

- As x rises, β falls since x being different from 1 is what causes bias

- As ε rises β falls as less need to give incentives to a biased agent

- The choice of ε will be positive for a range of x.

- Suppose $x = 1$. Then agent's action only affects activity A and so choose a high μ_A person

- Consider $x = \frac{1}{2}$. Then you still want a biased agent.

- If $x = 0$ then the problem being symmetric, principal and agent preferences are aligned, and definitely choose an unbiased agent.

C. Status Incentives (Besley-Ghatak 2008)

- A principal employs a continuum of agents of size one, each of whom works independently on a project whose success depends on effort and is uncorrelated across the agents.

- The project yields an output π_0 in all states of the world.

- In addition, it generates $\pi > 0$ for the principal if is successful.

- The agent's effort e determines the probability of success.

- We assume $e \in [0, 1]$ and the cost of effort is $\frac{c}{2}e^2$.

- The agent has an outside option of u which we set at zero.

- We assume there is limited liability.

- Outcome measure is noisy: signal $\sigma \in \{0, 1\}$

- Let $\gamma(1)$ denote the probability that the signal is $\sigma = 1$ when the project is successful and let $\gamma(0)$ denote the probability that the signal is $\sigma = 1$ when the project is a failure.

- We assume that the signal is (weakly) informative in the sense that $\gamma(1) \geq \gamma(0)$.

- If $\gamma(1) = 1$ and $\gamma(0) = 0$, then output is perfectly observed.

- The first-best effort level is:
$$e^* = \arg\max_e \left\{ e\pi - \frac{c}{2}e^2 \right\} = \frac{\pi}{c}.$$

- A contract is a pair $\{b(\sigma)\}_{\sigma \in \{0,1\}}$.

- Let $\Delta = \gamma(1) - \gamma(0)$.

- Recall that IC is

$$\hat{e} = \frac{\Delta\left[b(1) - b(0)\right]}{c}.$$

- Then we have: the optimal contract sets $b(0) = 0$ and

$$b(1) = \max\left\{0, \frac{\pi\Delta - \gamma(0)\,c}{2\Delta^2}\right\}.$$

- The corresponding effort level is

$$e = \max\left\{0, \frac{b(1)\Delta}{c}\right\}.$$

- This result is intuitive. It is optimal to reduce $b(0)$ down to the minimum possible level (given limited liability), i.e., 0, as extra effort can be elicited while reducing the principal's cost. The interesting issue is whether it is worthwhile to offer a bonus when the verifiable signal $\sigma = 1$ is observed.

- Here, Proposition 1 says that, if the output is sufficiently well-measured, then there is positive incentive pay to elicit effort.

- Specifically, this will be the case if

$$\frac{\pi}{c} \geq \frac{\gamma(0)}{\Delta}.$$

- This is more likely to be satisfied the higher is $\gamma(1)$ and the lower is $\gamma(0)$. In particular, it will always hold when $\gamma(0)$ is close enough to zero.

- If this condition does not hold, it is not worthwhile for the principal to use any incentive pay at all.

- We now allow the principal to introduce a purely nominal reward

- A pure positional good to the agent in the event that he produces high output for the principal.

- This could be a job title change (promotion from Associate to Full Professor), granting some agents interior offices rather than open-plan desks or calling some employees "employee of the week".

- We focus on the case where this good is completely free from the principal's point of view.

- We denote the award of a discrete positional good by $\eta \in \{0, 1\}$ and suppose that this good generates utility of $h(\hat{e})$ where $\hat{e}$ is the fraction of workers in the organization who are awarded the positional good.

- Assume that $h'(\hat{e}) < 0$ and $h(\hat{e}) = 0$ for $\hat{e} \geq \overline{e}$ where $\overline{e} \leq 1$.

- This says that there is a crowding effect – if everyone gets the positional good then its value goes to zero.

- We now consider how awarding positional goods to all agents who produce π affects the choice of monetary incentives.

- To get a simple closed form solution suppose that:

$$h(\hat{e}) = \begin{cases} \theta - \lambda \hat{e} & \text{if } \hat{e} \leq \theta/\lambda \\ 0 & \text{otherwise.} \end{cases}$$

- Thus, $\bar{e} = \theta/\lambda$ is the fraction of agents producing high effort above which the value of status goes to zero.

- In this case organizational effort (in a Nash equilibrium) will be:

$$\hat{e} = \frac{\theta + \Delta\left[b(1) - b(0)\right]}{c + \lambda}$$

which we assume is less than θ/λ.

- The optimal contract sets

$$b(0) = 0 \; \& \; b(1) = \max\left\{0, \frac{(\pi - \theta)\Delta - \gamma(0)(c + \lambda)}{2\Delta^2}\right\}.$$

- The corresponding effort level is

$$e = \frac{\theta + \Delta b(1)}{c + \lambda}.$$

- It is clear upon inspection that $b(1)$ is lower and e is higher compared to the previous case.

- This result gives a clear idea of how adding status incentives has an impact on the choice of monetary compensation.

- They relax monetary incentives in two distinct ways.

  – First, there is a direct effect due to the fact that status incentives create motivated agents

  – Second, there is an indirect effect due to crowding whereby increasing monetary rewards reduce the value of status and hence reduce the principal's use of monetary incentives.

- We will now see a bonus being offered if $\sigma = 1$ if and only if:

$$\frac{\pi - \theta}{c + \lambda} \geq \frac{\gamma\left(0\right)}{\Delta}.$$

- The condition for the use of incentive pay to be optimal for the principal is more stringent than in the absence of status incentives. Intuitively, incentive pay is costly while status is costless from the principal's point of view.

- What is the incentive of the firm to use status incentives?

- We show that firms that use status incentives will have higher payoffs, other things being equal.

- The expected payoff of the principal from a single agent, in the case of an interior solution, is:

$$\Pi = \pi_0 + e\pi - \Delta e b(1) - \gamma(0) b(1).$$

- As $b(1) = \frac{(c+\lambda)e-\theta}{\Delta}$ this can be viewed as a function of e.

- Since the principal can be viewed as "choosing" e via $b(1)$ by the envelope theorem, only the direct effect of θ needs to be considered.

- This turns out to be:

$$\frac{\partial \Pi}{\partial \theta} = e + \frac{\gamma(0)}{\Delta} > 0.$$

- That is, the principal always benefits from having a status-motivated agent and since creating status incentives is costless in our framework, will always do so.

- The intuition is simple: anything that raises effort for "free" will raise expected profits.

- Our model has implications for the balance of monetary and status incentives that we are likely to see an organization using.

- Even though an organization faces no variable cost in creating status incentives, suppose that it bears a fixed cost in setting up such a system of rewards.

- Differentiating the above condition we get:

$$\frac{\partial^2 \Pi}{\partial \theta \partial \pi} = \frac{1}{2(c+\lambda)} > 0.$$

- Hence firms with higher returns from high output will tend to benefit most from introducing status incentives.

- To see this, observe that how much expected profits go up when θ increases depends on e which is increasing in π.

- The model also predicts that the case for status incentives is higher, the more severe is the problem of measuring π.

- To see this most clearly, we normalize $\gamma(1)+\gamma(0)=1$ and let $q\equiv\gamma(0)=1-\gamma(1)$.

- The higher is q, the less informative is σ as a measure of high output.

- Now it is straightforward to show that

$$\frac{\partial^2 \Pi}{\partial \theta \partial q} = \frac{1}{2(1-2q)^2} > 0.$$

- To understand this, note that an increase in θ raises expected profits via two channels.

  - First, it raises effort for a given bonus level.

  - Second, it enables the firm to reduce the bonus.

- Bonuses are a costly and inefficient instrument to elicit effort when the signal of output is noisy.

- As a result, if q goes up, even though the first source of the gain is smaller, the second source of the gain is large and the net effect is to raise the marginal gain from having motivated workers.

- All firms gain from using status incentives but the gains are higher for firms where output is harder to verify and the return to higher output is greater.

- Status incentives work by creating social divisions.

- So far, we have assumed that they raise the utility of the winner while having no impact on the utility of those who are not awarded them.

- If this not the case incentives could be introduced even in situations where the welfare of agents goes down.

D. Identity and Incentives (Akerlof-Kranton, 2008)

- Workers can identify with the firm and fellow workers.

- This depends on how they are treated.

- If they are supervised, they feel like outsiders

- Otherwise they feel like insiders.

- Add the term $-t_c\,(\alpha e^* - \beta e)^2$ to their payoff

- e^* is the ideal effort level of other workers under identity c

- When $\alpha = 0$ this is similar to Besley-Ghatak (2005) sense of motivation under the correct mission

- Akerlof and Kranton set $\alpha = \beta = 1$.

- If workers are supervised then their participation constraint tightens

- Also the incentive constraints of workers are affected: doing the right thing is cheaper under the right identity

Topic 3: How to motivate the manager when performance cannot be measured?

- Earlier we argued

  - motivated agents are a key component of production of collective goods

  - but there we did not study incentives for the principals who design the mission

- Clarification: whoever is subject to an incentive problem is an agent given the terminology of principal-agent models

- What we mean here is that we study the incentive problem of the bosses or employers

- Their agency problem is vis a vis workers, donors, society at large

- Study the choice between for-profit and non-profit production in this framework.

- Non-profits are an important part of the economy: 10% of US GDP in 2003

- Very active in health, education, social services, arts

- Key feature: Non Distribution Constraint (Hansmann, 1980, 1987)

  - Cannot distribute residual earnings to individuals who exercise control over the firm (officers, directors, members)

  - Can earn profits: so long as they are used for future services or given to non-controlling persons

- Cooperatives or mutual insurance companies or banks can distribute profits to members

Key theories

- Public goods provision (Weisbrod)
  - Private sector will not provide
  - Donative non-profits such as National Cancer Society
  - Problems
    * Non-profits provide private goods too (commercial non-profits such as hospitals)

      * Why not for profits to provide public goods?

- Contract failure
  - Quality unobservable
  - So for-profit firm may skimp on quality
  - Cost-quality trade-off
- Consumer control
  - Some mutual non-profits such as social clubs

– Quality is perfectly observable

– The main problem is potential monopolistic exploitation of consumers by owners

– Source of monopoly power is the specificity of the social network of the members

Cost-Quality Trade Off Theory of Non-Profits (Glaeser-Shleifer)

- Suppose quality q is very noisy
- There is a firm which is run by a manager
- His outside option is $\overline{u}$
- Consumer buys product from him
- Quality non-contractible: so no incentive contract possible

- Consumers can offer fixed price p

- The benefit to principal (consumer) is $b(q)$

- The cost to firm is $c(q)$

- Naturally, the firm will set $q = \underline{q}$

- Suppose firm is non-profit

- Now cannot take home any profits

- Then will provide q^* (defined by $b'(q) = c'(q)$) so long as given wage $c(q^*) + \overline{u}$

- This is a variant of the multi-tasking argument

- That is another way of modeling it.

- Cost is measurable and is affected by one type of effort (e_1)

- Quality is non-measurable and is affected by another type of effort (e_2)

- Under for-profits (full residual claimancy), firm has an incentive to cut quality

- Under non-profits (zero or partial residual claimancy), firm will have less incentive to cut costs, but also less incentives to cut quality

- Can directly apply our model from Topic 1.

Mission integrity problem in public organizations

- Consider the more general problem of firms whose activity generates some pecuniary component (profit) and some non-pecuniary component which is not captured in profit (quality, positive externality)

- For example, consider a firm which is thinking of adopting an environment friendly technology which is bad for profits but good for society

- In some circumstances this may be the right thing to do: namely, the social gains are bigger the private losses

- In others, this may not be the right thing to do: the social gains do not justify the costs

- If there is no informational problem, then this rule is what the society and the firm should contract on

- The problem is, often the firm is the only one who can judge what the circumstances are

- They may have an incentive to sacrifice the social values in order to gain profits

- How to deal with this problem?

- More formally stated, this is a state-contingent cost-quality trade off problem

- Sometimes profit opportunities should be sacrificed for social reasons, sometimes its the opposite

- Only manager has the information on the basis of which this decision can be taken

- The key modeling feature is to study two kinds of moral hazard problem:

  - action moral hazard (mission integrity)

    * commercial actions generate profit at the expense of social returns

    * social actions do the opposite

  – effort moral hazard - more effort good for both social/profit reasons

- Everyone is risk-neutral and there are no limited-liability like constraints

- Similar to multi-tasking with two types of effort

- Cost may be easy to observe, and quality hard to observe

- Then for-profit status is like giving sharp incentives to cut costs

- However, this may be at the expense of quality

- Normally, residual claimancy can solve this problem (even for the multi-tasking model)

- If there is no limited liability constraint, then residual claimancy achieves the first-best (check this using Topic 1 model)

- Sell the school to the teacher, and he/she will choose the right levels of e_1 and e_2

- Below we develop a model where there is no limited liability constraint, and yet the first-best cannot be achieved.

- There is a fundamental trade-off between effort moral hazard and action moral hazard

- To get action choice right, have to offer flat incentives - this will be at the expense of effort

- To get effort incentives, have to abandon the goal of getting the action choice right.

- The model

- looks at the factors that shape the trade-off between non-profit and for-profit organizations

- explains why residual claimancy may often not the answer in public organizations

Basic Theoretical Ideas

- Public service delivery has two kinds of tasks:
  - mission oriented
    * beneficiary selection in targeted programs
    * curriculum design in schools
  - efficiency oriented
    * how to deliver the service at low cost

* how hard to work (e.g. teacher absence)

- Organizations for the delivery of public services have to pay attention to both tasks

- The most interesting case is where the tasks are bundled.

- But there is the possibility of mission orientation and task assignment being performed by separate parties.

  - a politician picks a mission in a way that is responsive to voters.

  - a bureaucrat is charged with task delivery.

- But often the person charged with task delivery has an information advantage.

Residual Claimancy?

- In many classes of agency problems, we try to structure problems so that the agent is a residual claimant on the principle that provides the best incentive to commit effort.

- For-profit, private provision is one possibility

  – But this is a problem when mission choice is also at stake.

- Concerns about corruption have a parallel with for-profit provision since this will tend to make service providers behave more like residual claimants.

- There are a variety of institutions for public service delivery – government and NGOs that deliberately delegate authority without residual claimancy.

“Bringing in the top brass of supermarkets into running of foundation hospitals is completely inappropriate. Are these people really best qualified to identify local health needs and match them with services or is this just about helping foundation trusts to grab more income and drop unprofitable activities?” Alex Nunns, Keep our NHS Public. (reported in The Times, 07/06/06, page 22).

The Approach

- Two features:
  - there is a need for flexible provision – providers have private information about the true payoffs/costs which affect some of the decisions made by the organization
    - * we will refer to this as mission design.
  - some potential providers are motivated, i.e. have pro-social goals.
    - * creates a role for selection as well as incentives in delivering public services.

Overview

- What is the optimal structure of provision?
  - show the sense in which it is better to have motivated agents providing services
  - also show that it is necessary for them to have appropriate incentives
- Look at the conditions under which market provision can deliver optimal public services with motivated agents
  - social entrepreneurs will be donors as well as service providers.

- Existing literature
  - non-profits (Hansmann, 1996, Francois, 2000, Glaeser and Shleifer, 2002)
  - motivated agents (Holmstrom-Milgrom, 1998, Besley-Ghatak 2005)
  - regulation and procurement (Laffont-Tirole, 1986)
- We focus on cost-quality trade off like the first literature. Our focus is:
  - Flexibility: state contingent cost-quality trade off

– How this interacts with selection when some producers are motivated

Structure

- Begin by studying the planner's problem when information is perfect.

- Optimal contractual problem when there issues of incentives and selection.

- Discuss how to decentralize the optimum

- Explore some additional issues.

Model

- There is a good which has public and private elements (e.g. health intervention)

- There is a single (representative) consumer who gets a private benefit of $b \geq 0$ from consuming a good.

  - it is easy to extend the analysis to many consumers.

- There is a numeraire good of which they have an endowment and utility is linear in this good.

- There is also a benefit to non-consumers from consumption of the good which we denote by θ

- The manager chooses an action x: whether to put more weight on social or financial bottom line

- $x = 0$ means more weight is given on social returns (the mission)

- $x = 1$ means more weight is given on financial returns (cost-reduction)

- The state of the world that creates social payoffs/costs is private information.

- It is uncertain ex ante whether the commercial or social action is optimal.

- The mission integrity problem: do the right thing

- Let $s \in \{0, 1\}$ denote the state of the world

- Let q be the probability of state 0.

- The state and action together affect the external benefit $\theta(x, s)$ and the cost of production $c(x, s)$ (but not private benefit b)

- The social payoff $\theta(x, s)$ satisfies

$$\begin{aligned} \theta(1,1) &= \theta(1,0) = 0 \\ &\text{and} \\ \theta(0,0) &= \bar{\theta} > \theta(0,1) = \underline{\theta} > 0. \end{aligned}$$

- The cost of production satisfies:

$$\begin{aligned} c(1,1) &= c(1,0) = \underline{c} \\ &\text{and} \\ c(0,1) &= c(0,0) = \bar{c}. \end{aligned}$$

- Key features
  - There is a single task
  - Two outcomes: social and private
  - One outcome is easy to measure (c) but not the other (θ)
- Can view this as cost-quality trade off
- Our focus is flexibility: in different states, this trade off should be resolved differently

- How would one achieve it when s is private information?

- Other than θ being non-contractible, and s being private information, no other informational/contractual frictions

- b, c, and x are observable and contractible

- No limited liability or risk aversion

Producers

- The social payoff θ reflects aggregate social valuation

- There are individual producers who can provide this service

- They may be unmotivated/neutral or motivated

- If they are neutral they only care about their monetary returns

- If they are motivated, on top of monetary returns, they internalize to some degree the social payoff

- In particular they receive $\lambda\theta$ where $0 \leq \lambda < 1$

- Each provider can earn $\bar{u}$ in some other activity.

The Nature of Motivation

- One interpretation of $\lambda\theta(x, s)$ is pure ego rent.

  - happy do-gooders (warm glow)

- But $\lambda\theta(x, s)$ could also be a pure public good preference

  - this creates the potential for free-rider problems among potential social entrepreneurs

The First Best

- In both states, if $x = 1$ is chosen social surplus is

$$b - \underline{c}$$

- In state 0 if action 0 is chosen, social surplus is

$$b + \bar{\theta} - \bar{c}$$

- In state 1 if action 0 is chosen, social surplus is

$$b + \underline{\theta} - \bar{c}.$$

- Let

$$\Delta c \equiv \bar{c} - \underline{c}.$$

- Three cases

– Case 1

$$\Delta c > \bar{\theta}$$

– Always choose $x = 1$.

– Case 2

$$\Delta c < \underline{\theta}.$$

– Always choose $x = 0$

– Case 3

$$\underline{\theta} \leq \Delta c \leq \bar{\theta}$$

– Now it is efficient to choose $x = 0$ when $s = 0$ and $x = 1$ when $s = 1$.

- This justifies referring to state 0 as the "social state" in which it is worthwhile to produce the "expensive" action $x = 0$ since it generates social benefits.

- Similarly, we can call state 1 as the commercial state in which it is better to produce the action $x = 1$.

- The first best can be implemented by a social planner if he can observe the state $s \in \{0, 1\}$.

- Alternatively, if θ is contractible, social residual claimancy will solve the problem

- "Sell off the project" to the producer by making his pay contingent on both c and θ

The Second Best

- How to ensure mission integrity when s is private information and θ is not contractible?

- There are two contractible variables: c and x (remember, b is a constant)

  - Since they are perfectly correlated it is sufficient to focus on one, say c

- As c takes two values, it is sufficient to consider a cost share α of the entrepreneur and a fixed payment w (positive or negative)

- In this interpretation, he pays a fraction α of the cost out of his pocket.

- Should doctors' or teachers' pay should be made sensitive to costs?

- Take a given producer with motivation $\lambda \geq 0$ (look at selection in the next section)

- In case 1, a for-profit is sufficient to achieve the first-best ($\alpha = 1, w = 0$): no need for intervention

- So long as price $p \leq b$ (exogenous for now) is such that they earn at least $\overline{u}$

- Alternatively, just have a rigid mission: always choose $x = 1$

- In case 2, a non-profit (or fixed wage earning government bureaucrat) is sufficient to achieve the first best ($\alpha = 0, w = \overline{u}$)

- Left to their own devices, a for-profit will choose $x = 1$ in $s = 0$ unless they are sufficiently motivated:

$$p + \lambda\bar{\theta} - \overline{c} \geq p - \underline{c}$$

or

$$\lambda \geq \frac{\Delta c}{\bar{\theta}}$$

- Once again, can also achieve this with rigid mission: $x = 0$ always

- This is the cost-quality trade-off

- Curbing the profit-motive is good

- However, with sufficiently motivated agents, even for-profits will work (social enterprise)

- Now turn to flexible cost-quality trade off

- The mission integrity problem

- Want to balance off two types of errors (like Type 1 and Type 2 errors in statistics)

- Choosing $x = 1$ when $s = 0$ (being too hard/pro-cost error)

- Choosing $x = 0$ when $s = 1$ (being too soft)/pro-mission error)

- In state 0 we want an entrepreneur with motivation λ to prefer choosing $x = 0$ (the high cost action)

$$w(\lambda) + \lambda\overline{\theta} - \alpha(\lambda)\bar{c} \geq w(\lambda) - \alpha(\lambda)\underline{c}$$

or

$$\frac{\lambda\overline{\theta}}{\Delta c} \geq \alpha(\lambda)$$

- In state 1 we want entrepreneur with motivation λ_j to prefer choosing $x = 1$:

$$w(\lambda) - \alpha(\lambda)\underline{c} \geq w(\lambda) + \lambda\underline{\theta} - \alpha(\lambda)\bar{c}$$

or,

$$\alpha(\lambda) \geq \frac{\lambda\underline{\theta}}{\Delta c}.$$

- As $\overline{\theta} > \underline{\theta}$ these can be combined as

$$\frac{\lambda\overline{\theta}}{\Delta c} \geq \alpha(\lambda) \geq \frac{\lambda\underline{\theta}}{\Delta c}.$$

- An interval of incentive-compatible cost shares

1. If λ is high enough (super-motivated manager) $\frac{\lambda\overline{\theta}}{\Delta c} > 1$ and so $\alpha(\lambda) = 1$ is fine

2. Otherwise $0 < \alpha(\lambda) < 1$

3. As $\lambda \to 0, \alpha(\lambda) \to 0$

- Non-profits or flat wages are optimal for unmotivated managers

- With motivated managers some financial incentives are needed (bonuses, partial residual claimancy, social enterprise)

- This is consistent with an arrangement in which there is partial assignment of varying revenue streams by government to the social enterprise based on cost

$$p(x, s) = \left(1 - \frac{\bar{\lambda}\underline{\theta}}{\Delta c}\right) c(x, s).$$

- The social enterprise needs to donations to survive, i.e. to cofinance the provision of the good.

- With agents motivation implies less need for incentives (Besley-Ghatak, 2005)

- With managers, motivation enhances the need for some incentive pay

Comparative Statics & Cross-Sectional Implications

- Recall that the set of incentive-compatible cost-shares are given by

$$\frac{\lambda\overline{\theta}}{\Delta c} \geq \alpha(\lambda) \geq \frac{\lambda\underline{\theta}}{\Delta c}.$$

- As $\underline{\theta} \to 0$, non-profits are fine

- As $\overline{\theta}$ goes up (for any $\lambda > 0$), for-profits are fine (except for $\lambda = 0$)

- To sum up, full residual claimancy is optimal if

- $\Delta c > \overline{\theta}$ (quality considerations not important)

- agents are supermotivated ($\lambda \geq \widehat{\lambda}$ where $\widehat{\lambda} \equiv \frac{\Delta c}{\overline{\theta}}$ so that $\frac{\lambda\overline{\theta}}{\Delta c} \geq 1$)

- agents are motivated ($\lambda > 0$) but $\overline{\theta}$ is sufficiently large so pro-cost error is unlikely

- Flat incentives are optimal if

  - $\Delta c < \underline{\theta}$ (cost-cutting considerations not important)

  - agents are unmotivated

– agents are motivated ($\lambda > 0$) but $\underline{\theta}$ is sufficiently small so pro-quality error is unlikely

Selection and Incentives

- Suppose there are several producers who vary in terms of λ

- This is private information

- To take the simplest case, $\lambda \in \{0, \overline{\lambda}\}$

- Non-profits or fixed wage contracts meant for neutral managers are attractive for motivated managers

- But this violates cost efficiency (they will choose $x = 0$ when $s = 1$)

- On the other hand, partial/full residual claimancy meant for motivated managers will attract in neutral managers

- But this violates mission integrity

- We show that there does not exist a separating pair of contracts that will cause them to self-select

- Let (α_m, w_m) and $(0, w_n)$ be such that $\alpha_m \in [\min(1, \frac{\lambda\overline{\theta}}{\Delta c}), \frac{\lambda\underline{\theta}}{\Delta c}]$

- To discourage motivated managers from selecting flat-incentives

$$\begin{aligned} & w_m + q\left(\overline{\lambda\theta} - \alpha_m \overline{c}\right) + (1-q)(-\alpha_m \underline{c}) \\ \geq \; & w_n + q\overline{\lambda\theta} + (1-q)\overline{\lambda}\underline{\theta} \end{aligned}$$

or

$$w_m - w_n \geq (1-q)\overline{\lambda}\underline{\theta} + \alpha_m\{q\overline{c} + (1-q)\underline{c}\} \quad (1)$$

- To discourage unmotivated managers from selecting partial/full residual claimancy

$$w_n \geq w_m + q\left(-\alpha_m \underline{c}\right) + (1-q)(-\alpha_m \underline{c})$$

or

$$w_m - w_n \leq \alpha_m \underline{c}. \quad (2)$$

- Both (1) and (2) cannot hold simultaneously.

- Intuitively, motivated managers like non-profits as they get utility out of choosing $x = 0$

- Unmotivated managers like social enterprise as they make money by always choosing $x = 1$

- The flat wage differential cannot solve both selection problems.

What is to be done?

- Two solutions
  - Screen out neutral managers offer a contract only a motivated manager will accept
  - Allow pooling: offer a contract meant for neutral managers, and then accept the chance a motivated manager might take it who always chooses $x = 0$

Solution 1

- Suppose (α_m, w_m) is such that, for $\varepsilon > 0$

$$w_m - \alpha_m \underline{c} = \overline{u} - \varepsilon$$

- The payoff to a motivated manager is

$$w_m + q\overline{\lambda\theta} - \alpha_m\{q\overline{c} + (1-q)\underline{c}\}.$$

- Substituting the value for w_m from above

$$\overline{u} - \varepsilon + \alpha_m \underline{c} + q\overline{\lambda\theta} - \alpha_m\{q\overline{c} + (1-q)\underline{c}\}$$

- This simplifies to

$$\overline{u} - \varepsilon + q\overline{\lambda\theta} - \alpha_m q \Delta c.$$

- At $\alpha_m = \frac{\lambda\overline{\theta}}{\Delta c}$ this is negative but at $\alpha_m = \frac{\lambda\underline{\theta}}{\Delta c}$ it is positive.

- Under this, so long there are some motivated managers, we get the first-best social surplus

$$\overline{S} = b + q\overline{\theta} - \{q\overline{c} + (1 - q)\underline{c}\} - \overline{u}.$$

Solution 2

- Set up non-profit.

- If a motivated manager selects in, then social surplus is

$$\overline{S}' = b + q\overline{\theta} + (1-q)\underline{\theta} - \overline{c} - \overline{u}.$$

- This is less than $\overline{S}$ as $\Delta c > \underline{\theta}$

Choice between the two options

- Suppose there is some uncertainty about the distribution of motivated producers.

- Let μ be the probability that a producer is motivated

- Then under solution 1, $\mu\overline{S}$ is the expected surplus

- Under solution 2, $(1-\mu)\,\overline{S}+\mu\overline{S}'$ is the expected social surplus

- If either $\mu = 0$ or $\mu = 1$ there is no selection problem and get the first-best

- But for intermediate ranges of μ, the higher is μ the more attractive is solution

- This simplifies to

$$\overline{u} - \varepsilon + q\overline{\lambda\theta} - \alpha_m q \boldsymbol{\Delta} c.$$

- At $\alpha_m = \frac{\lambda\overline{\theta}}{\boldsymbol{\Delta} c}$ this is negative but at $\alpha_m = \frac{\lambda\underline{\theta}}{\boldsymbol{\Delta} c}$ it is positive.

Market provision

- Having offered a contractual arrangement to solve the incentive and selection problems, we can now try to generate an insight into the nature of market failure in the delivery of public services in this context.

- We will develop a model of market competition among the N potential providers who compete to provide the service by offering prices Bertrand style.

Market Equilibrium

- Consider first the case where $\lambda < \hat{\lambda}$ (no supermotivated agents) and assume that $b > \underline{c}$

- Then we have

Suppose that $\lambda < \hat{\lambda}$, then the market equilibrium has $p(x, s) = \underline{c}$ and $x = 1$ for $s \in \{0, 1\}$.

- The market equilibrium has zero profits – and in a conventional sense competition works.

- However, the market cannot deliver the socially optimal mission even if some entrepreneurs are somewhat motivated.

- The contract that we have proposed fixes the market failure in this case by attenuating the profit motive suitably.

- But, as we saw, in general some market incentives is needed if agents are motivated.

  – There is needs to a be legal (contractual) structure beyond the standard notion of residual claimancy

  – It is clear why a market equilibrium that generates zero profits is different from a non-profit firm in this context.

- Now suppose that $\bar{\lambda} > \hat{\lambda}$.

- We now have

Suppose that $\bar{\lambda} \geq \hat{\lambda}$. Then a competitive (Bertrand) provision with a social entrepreneur exists and achieves the first best: $p(x, s) = \underline{c}$ and $x = s$ for $s \in \{0, 1\}$.

- The market equilibrium price of the good is unchanged.

- However, the social entrepreneurs are willing to give up profits to take the correct action in the social state.

- So with sufficient motivation, the first best can apparently be achieved without government intervention

- This kind of model seems to fit football entrepreneurs who are willing to subsidize football clubs with their own money.

- Competition now only increases the amount of private wealth that is needed.

Free-riding in Market Equilibrium

- Free-riding is now a potential issue in the case of this market equilibrium with social entrepreneurs.

- Observe: the result is stated as there exists a Nash equilibrium where a single social entrepreneur with $\lambda_j > \hat{\lambda}$ provides the good.

  - But an inefficient (mixed strategy) Nash equilibrium also exists where there is no efficient provision with some probability.

  - Our proposed contract provides coordination away from that equilibrium.

- The government is serving the Coasian role of creating a property right and then auctioning off provision.

- Unlike our previous work on motivated agents, this paper has shown that in the mission alignment dimension, there is typically a need for incentives only for motivated agents and not for standard (greedy agents).

  – This is because we have focused on a different aspect of the problem (mission alignment rather than effort provision).

- Under fairly strong assumptions – wealth endowed social entrepreneurs can achieve first best provision

  – but the circumstances as brought out here are quite specific.

Alternative Theory: does for-profit status crowd out intrinsic motivation by worker? (Francois, 2000, and Ghatak-Mueller, 2008)

- So far, looked at incentive problem of manager only

- Now consider a model where there is a manager and a worker

- Two players: Manager (M) and Worker (W)

- The worker moves first and chooses whether to work ($e_W = 1$) or shirk ($e_W = 0$) in the production of first stage output, $y_1 = e_W$.

- Effort cost for worker is 1 if $e_W = 1$ and 0 otherwise

- The intermediate output, y_1, is observed by the manager but not by any third party.

- The manager then decides whether he wants to allocate additional resources $e_M \in \{1, 0\}$ in the production of the second stage output, $y_2 = e_M$.

- The cost of this recourse allocation by the manager is $c \geq 1$.

- The manager chooses whether to run a for-profit (FP) or not-for-profit (NP) firm .

- Following Glaeser and Shleifer we will speak of a not-for-profit firm if $\alpha < 1$ and a for-profit firm if $\alpha = 1$ where α is the manager's share of profits

- Figure 1 summarizes the resulting game tree.

- Regarding the wage we assume that intermediate output is not verifiable and so the manager can only pay a fixed wage, w.

- However, he can motivate the worker by threatening to fire her in case she is caught shirking.

- Let β be the worker's discount factor

- The worker is caught shirking and fired with certainty if $e_W = 0$ and never fired if $e_W = 1$.

- The managers problem is

$$\max_{\alpha,w} EU(e_W^*, e_M^*) = e_W^* (\alpha\pi + \theta_M) - w + (1 - e_W^*) e_M^* (\alpha\pi + \theta_M) - e_M^* c$$

- – subject to a worker participation constraint (PC)

$$\max (e_W^*, e_M^*) \theta_W - e_W^* + w \geq \bar{u}_W$$

  – a manager PC

$$EU(e_W^*, e_M^*) \geq \bar{u}_M$$

– incentive compatibility constraint (ICC)

$$e_M^*(\alpha, \pi, c, \theta_M) = \begin{cases} 1 \quad if \quad \alpha\pi + \theta_M \geq c \\ 0 \qquad\qquad otherwise \end{cases} \tag{3}$$

– the worker ICC

$$e_W^*(w, e_M^*, \theta_W, \beta) = \begin{cases} 1 \quad if \quad \begin{array}{c} \frac{\theta_W + w - 1}{1-\beta} \geq w \\ + \frac{e_M^* \theta_W}{1-\beta} \end{array} \\ 0 \qquad\qquad otherwise \end{cases} . \tag{4}$$

- The manager's outside option to the contract (α, w) is

$$\bar{u}_M = e_M^*(\pi + \theta_M - c).$$

- The worker's outside option (given public goods preferences) is

$$\bar{u}_W = e^*_M \theta_W.$$

- The first best: for the second stage this implies that the manager should exert effort ($e_M = 1$) if $y_1 = 0$ and

$$A0 : \pi + \theta_W + \theta_M - c \geq 0$$

and $e_M = 0$ otherwise.

- Note that we assume weakly lower effort costs for the worker, $c \geq 1$.

- It is therefore sufficient to assume $A0$ to ensure that the first-best is $e_W^{FB} = 1$ and $e_M^{FB} = 1$ given $y_1 = 0$.

- If $A0$ is satisfied and $c > 1$, first-best is achieved already if the worker exerts effort because that guarantees that the manager never has to step in.

- Worker employment is therefore a strong indicator of first-best provision in this model.

- The key to understanding the role of not-for-profits lies in the manager ICC, equation (1).

- It shows that reducing the profit share α reduces the incentives of the manager to bail out a failing project because it reduces his financial benefit from project success.

- If α is sufficiently low in the not-for-profit, the worker knows that her effort will be crucial for project success.

- A necessary condition for a choice of not-for-profit status is

$$A1 : 1 \geq \frac{c - \theta_M}{\pi} \geq 0.$$

- The manager can then commit to let the project fail by adopting not-for-profit status. Formally, commitment is reached if the profit share is

$$\alpha \leq \alpha^* \text{ where } \alpha^* \equiv \frac{c - \theta_M}{\pi}. \quad (5)$$

- The threshold α^* follows immediately from the manager's ICC.

- Assumption $A1$ is given by the bounds of $\alpha \in [0, 1]$.

- If $A1$ is violated the manager is either always committed to no effort or never.

- Since reducing α can never increase expected utility, non-profits will not be chosen.

- Assume $A1$ holds. Then not-for-profits with $\alpha \leq \alpha^*$ have to pay a smaller wage to workers to motivate worker effort because they commit the manager to inactivity.

- To see this, note that by equation (2) the minimum wage needed for worker effort is given by

$$w(e_M^*) = \frac{1 - \left(1 - e_M^*\right)\theta_W}{\beta} \qquad (6)$$

- This is increasing with manager effort.

- The intuition is simple.

- If the manager is very motivated, $e_M^* = 1$ the worker receives θ_W regardless of her effort level.

- She is then tempted to free-ride on the public good provision by the manager and a higher efficiency wage is needed to motivate effort.

- In the not-for-profit the manager can reduce the profit share to α^* and commit to $e_M^* = 0$.

- This increases effort incentives for the worker because the worker now knows that without her effort the project will fail.

- Assume for now that the worker participation constraint is not binding.

- The for- and not-for-profit setting can then be captured in the following table.

Table 1: Optimal Wages and Profit Shares

	optimal w	optimal α
for-profit	$w^{FP}=\frac{1}{\beta}$	$\alpha^{FP}=1$
not-for-profit	$w^{NP}=\frac{1-\theta_W}{\beta}$	$\alpha^{*}=\frac{c-\theta_M}{\pi}$

- When will non-profits be chosen over for-profits?

- Manager IC satisfied under non-profit:

$$\alpha^* \pi + \theta_M - w^{NP} \geq \pi + \theta_M - c$$

- Manager IC violated under for-profit

$$\pi + \theta_M - w^{FP} < \pi + \theta_M - c$$

- Both can hold if

$$\alpha^* \pi + \theta_M - w^{NP} > \pi + \theta_M - w^{FP}.$$

- By inserting α^* and the minimum wages we get to a statement that sets a lower bound for worker intrinsic motivation

$$\frac{\theta_W}{\beta} > \pi + \theta_M - c.$$

- The maximum wage payment that is still compatible with the manager's PC in the not-for-profit setting

$$\begin{aligned} w &= \alpha^{*}\pi + \theta_M - (\pi + \theta_M - c) \\ &= 2c - \pi - \theta_M \end{aligned}$$

- This satisfies the worker PC if

$$\begin{aligned} \theta_W + (2c - \pi - \theta_M) - 1 &\geq \theta_W \\ \text{or, } 2c - \pi - \theta_M &\geq 1 \end{aligned}$$

- If c is sufficiently high this is compatible with:

$$\frac{\theta_W}{\beta} > \pi + \theta_M - c.$$

- This is a statement about industries that are not attractive for for-profit provision (high c and θ_M).

- More generally, it is possible that the not-for-profit is preferred by the manager even if the for-profit is feasible

- If the for-profit is feasible

$$\pi + \theta_M - w^{FP} \geq \pi + \theta_M - c$$

- The manager prefers the not-for-profit to the for-profit if his financial and intrinsic benefits from the project are low and the worker is sufficiently motivated.

- The manager prefers the not-for-profit if and only if

$$\frac{\theta_W}{\beta} \geq \pi + \theta_M - c. \tag{7}$$

- However, workers never prefer the not-for-profit to a for-profit because the not-for-profit wage is lower.

- This implies that in tight labour markets, workers will never choose non-profits.

Topic 4: Ownership of Public Goods

- Government provision vs. privatization or contracting out (Hart, Shleifer & Vishny, QJE 1997 and Besley & Ghatak, QJE 2001)

- Basic question: granted that government should subsidize provision of certain goods and services, should it provide these in-house or should it contract it out to a for-profit or non-profit firm?

- Boundaries of government

- Analogous to the issue of boundaries of a private firm: should you vertically integrate or buy from the market

- Framework to think about it: "property rights" theory of Williamson-Hart-Grossman-Moore

- Clearly without any contracting problems, ownership does not have allocative implications

- Ownership is different from residual claimancy of profit: it is residual control rights

- Even if you rent out your firm to someone so that he has residual claimancy, you can threaten not to renew the lease

- This affects investment incentives (e.g., those that will improve quality and/or reduce costs)

- Second best: choose ownership structure that gives you the best overall investment incentives

- Trade off: if party A is owner, he will have more incentives but party B will now have less (and vice versa)

Ownership of Private Goods

- Consider an upstream firm A and a downstream firm B

- A can invest x and B can invest y

- This boosts the value of trade $b(x, y) = ax + by$

- Cost of investment $\frac{1}{2}x^2$ and $\frac{1}{2}y^2$

- First-best

$$\begin{aligned} x^* &= a \\ y^* &= b. \end{aligned}$$

- Surplus:

$$S^* = \frac{1}{2}(a^2 + b^2).$$

- Assume x and y are non-contractible

- $b(x, y)$ is observable ex post

- Parties bargain over surplus

- Suppose A is owner

- Then at bargaining stage can fire B

- Outside options are

$$\begin{aligned} \overline{u}_A^A &= ax + \lambda by \\ \overline{u}_B^A &= 0. \end{aligned}$$

- Nash bargaining

- A gets share

$$\begin{aligned} & \frac{ax + by}{2} + \frac{\overline{u}_A^A - \overline{u}_B^A}{2} \\ = \; & ax + \frac{1}{2}(1 + \lambda)by \end{aligned}$$

- B gets share

$$\begin{aligned} & \frac{ax+by}{2} + \frac{\overline{u}_B^A - \overline{u}_A^A}{2} \\ = \ & \frac{1}{2}(1-\lambda)by \end{aligned}$$

- Ex ante investments will maximize the above s.t. the costs x and y

$$\begin{aligned} \hat{x} &= a \\ \hat{y} &= \frac{1}{2}b(1-\lambda) \end{aligned}$$

- Total surplus

$$\hat{S}_A = \frac{a^2}{2} + \frac{1}{2}b^2(1-\lambda)\{1 - \frac{1}{4}(1-\lambda)\}$$

- Clearly less than first-best surplus S^*.

- Also, decreasing in λ.[‡]

- Naturally, the higher is λ the greater is the extent which B will be held-up

[‡] $(1-\lambda)\{1-\frac{1}{4}(1-\lambda)\}$ is increasing in $1-\lambda$ for all $\lambda \in [0,1]$ as its slope with respect to $1-\lambda$ is $1-\frac{1-\lambda}{2}=\frac{1+\lambda}{2}>0$ for all $\lambda \in [0,1]$.

- Suppose B is owner

- Then at bargaining stage can fire A

- Outside options are

$$\begin{aligned} \overline{u}_A^B &= 0 \\ \overline{u}_B^B &= \mu a x + b y. \end{aligned}$$

- Nash bargaining

- A gets share

$$\frac{ax + by}{2} + \frac{\overline{u}_A^B - \overline{u}_B^B}{2}$$

- B gets share

$$\frac{ax + by}{2} + \frac{\overline{u}_B^B - \overline{u}_A^B}{2}$$

- Investments will be (analogous to previous case)

$$\hat{x} = \frac{1}{2}a(1-\mu)$$
$$\hat{y} = b$$

- Total surplus

$$\hat{S}_B = \frac{a^2}{2}(1-\mu)\{1-\frac{1}{4}(1-\mu)\} + \frac{1}{2}b^2$$

- As before, it is always less than S^*

- Also, it is decreasing in μ.

- Which form of ownership is better?

- Depends on a, b, λ, μ

- Higher is a relative to b, $\hat{S}_A$ will dominate $\hat{S}_B$

- Vice versa higher is b relative to a

- Higher is λ relative to μ, $\hat{S}_B$ will dominate $\hat{S}_A$

- Vice versa higher is μ relative to λ

- Intuition

  – The more important is the investor's marginal contribution (a or b) the more efficient he/she is owner

– The more scope for opportunism (high λ or μ) the more important is the hold up problem, and so the other party should be owner

– If there is only investing party (say $a = 0$ or $b = 0$) then that party should be owner.

Ownership of Public Goods

- Now suppose this is a public project.

- Let θ_A and θ_B be the respective valuations of A and B.

- The first-best maximizes

$$\max_{x,y} (\theta_A + \theta_B)(ax + by) - \frac{1}{2}x^2 - \frac{1}{2}y^2$$

- This yields

$$\begin{aligned} x^* &= a(\theta_A + \theta_B) \\ y^* &= b(\theta_A + \theta_B). \end{aligned}$$

- Now consider the hold-up problem.

- A key difference now is in the disagreement payoffs.

- Even if A is the owner and B is fired, B continues to value the outcome of the project

- Therefore, under A ownership, the disagreement payoffs are

$$\begin{aligned} \overline{u}_A^A &= \theta_A (ax + \lambda by) \\ \overline{u}_B^A &= \theta_B (ax + \lambda by) . \end{aligned}$$

- As a result, under Nash bargaining:

$$\begin{aligned} A \text{ gets} &: \frac{(\theta_A + \theta_B)(ax + by)}{2} + \frac{\overline{u}_A^A - \overline{u}_B^A}{2} \\ &= \theta_A ax + \left\{ \theta_A \frac{(1 + \lambda)}{2} + \theta_B \frac{(1 - \lambda)}{2} \right\} by \end{aligned}$$

- Similarly,

$$\begin{aligned} B \text{ gets} &: \frac{(\theta_A + \theta_B)(ax + by)}{2} + \frac{\overline{u}_B^A - \overline{u}_A^A}{2} \\ &= \theta_B ax + \left\{ \theta_A \frac{(1 - \lambda)}{2} + \theta_B \frac{(1 + \lambda)}{2} \right\} by \end{aligned}$$

- Accordingly,

$$\begin{aligned}\hat{x}^A &= \theta_A a \\ \hat{y}^A &= \left\{\theta_A \frac{(1-\lambda)}{2} + \theta_B \frac{(1+\lambda)}{2}\right\} b.\end{aligned}$$

- Under B ownership, the disagreement payoffs are

$$\begin{aligned}\overline{u}_A^B &= \theta_A (\mu a x + b y) \\ \overline{u}_B^B &= \theta_B (\mu a x + b y).\end{aligned}$$

- Carrying out an analogous exercise we get:

$$\begin{aligned}\hat{x}^B &= \left\{\theta_A \frac{(1+\mu)}{2} + \theta_B \frac{(1-\mu)}{2}\right\} a \\ \hat{y}^B &= \theta_B b\end{aligned}$$

- The predictions in terms of a, b, λ and μ are similar.

- The most interesting departure from the standard model is regarding the roles of θ_A and θ_B

- If θ_A is high relative to θ_B, A-ownership is optimal.

- This is true even if $a = 0$, that is, A undertakes no investment!

- In that case, $\hat{x}$ is 0 under both forms of ownership, but $\hat{y}^A > \hat{y}^B$ so long as λ is not too high

- Ownership commits the owner not to free ride.

- With B-ownership, A enjoys the fruit of B's investment, but does not have to pay for it

- Under A-ownership B can extract some of A's valuation in the ex post bargaining game.

Contracting Out vs. Government Provision: The Cost-Quality Model Revisited

- Suppose one specific person or firm has the capacity to provide the service

- Do you hire this person as a government employee or make the firm as part of the ministry of education

- Do you let them provide the service, and pay them a fee

- Suppose there is one investing party, called the manager

- Can either own a facility (a school, hospital) or work for the government

- Investment leads to reduction in cost, but also affects quality of the service

- In particular, if the manager invests an amount e.
  - the cost of the project is $C(e) = C_0 - c(e)$
  - the quality of the project is $B(e) = B_0 - b(e)$
  - manager's cost of investing effort $c(e) = e$

- That is, cutting costs leads to some sacrifice of quality

- Suppose the government's puts a welfare weight of $\theta_g > 0$ on the benefit from the project

- If e was contractible then the value of e chosen to maximize joint-surplus is given by

$$\max_e \theta_g B(e) - C(e) - e$$

- This yields

$$c'(e) - \theta_g b'(e) = 1.$$

- We assume $c(e)$ is concave and $b(e)$ is convex

- This is the first-best effort level

- Suppose e is observable *ex post*, but non-contractible *ex ante*

- However, C_0 and B_0 are contractible, and the parties can negotiate an initial price of P_0

- Since you cannot write contracts on e, parties will renegotiate after e is sunk & observed

- Assume parties follow the Nash bargaining solution

- Divide the surplus equally, but make an adjustment for the relative bargaining powers of the parties

- In particular, G and M will get

$$\frac{c(e) - \theta_g b(e)}{2} + \frac{\overline{u}_g - \overline{u}_m}{2}$$
$$\frac{c(e) - \theta_g b(e)}{2} + \frac{\overline{u}_m - \overline{u}_g}{2}.$$

- What organizational form is chosen matters for what these disagreement payoffs are

- If the government is the owner, it can fire the manager if they have a bargaining dispute, but then only a fraction λ of the results of the manager's investment stays on the project.

- Hence the disagreement payoffs of the government and the manager are

$$\begin{aligned} \overline{u}_g^g &= \lambda \{c(e) - \theta_g b(e)\} \\ \overline{u}_m^g &= 0. \end{aligned}$$

- In this case, the manager anticipates this *ex ante* and chooses e to:

$$\max_e \frac{c(e) - \theta_g b(e)}{2} - \frac{\lambda \{c(e) - \theta_g b(e)\}}{2} - e$$

- This yields

$$\frac{1-\lambda}{2} \left\{ c'(e) - \theta_g b'(e) \right\} = 1$$

- e is lower than the first-best (why? because it is as if there is a "tax" of $\frac{1-\lambda}{2}$ on the objective function)

- If the manager is the owner, then the disagreement payoffs are

$$\begin{aligned} \overline{u}_g^m &= -\theta_g b(e) \\ \overline{u}_m^m &= c(e) \end{aligned}$$

- In this case, the manager chooses e *ex ante* to:

$$\max_e \frac{c(e) - \theta_g b(e)}{2} + \frac{c(e) + \theta_g b(e)}{2} - e$$

- This yields

$$c'(e) = 1$$

- Naturally, e is higher than the first-best (why? no weight on $b(e)$ which is a cost term)

- Therefore, we have demonstrated that under private ownership e is too high & under public ownership e is too low.

- However, we cannot say anything more than this.

- One form will be better than the other depending on how much is the loss of surplus with respect to first-best

- Suppose we plot surplus $S(e)$ against e

- Think about first-best as the globally tallest mountain peak

- What we have shown is government ownership will have lower e than this, and private ownership higher e than this

- We also know that these mountain peaks are lower than the first-best

- But we don't know which one is lower than the other

- Depending on how important is the $b(.)$ function (quality cutting) relative to the $c(.)$ function (cost cutting)

Extensions

- What if there is no cost-quality trade off?
  - Set $b(e) = 0$.
  - Then we can immediately see that privatization achieves the first-best
  - Give property rights to the person who undertakes the investment
  - Bargaining power to other parties just diminishes investment incentives
- In general, the more important is cost reduction, & the less important is loss of quality this holds (garbage collection)
- On the other hand, the more important is loss of quality & the less important is cost reduction, government ownership is better (army, legal system)

- What if government does not care?

  - Set $\theta_g = 0$

  - Privatization achieves the first-best

- Otherwise get the interesting result that government ownership may be optimal even if "government" does not invest (different from private goods)

- What about joint ownership or public private partnership (PPP)

- One way to interpret this is both parties have veto power

- Both needs to agree if the project is to go ahead.

- But then $\overline{u}_g^{ppp} = \overline{u}_m^{ppp} = 0$

- Then manager will choose

$$\max_e \frac{c(e) - \theta_g b(e)}{2} - e$$

- This yields

$$\frac{1}{2}\left\{c'(e) - \theta_g b'(e)\right\} = 1$$

- Clearly, better than government ownership (e closer to first-best).

- Suppose that the private provider cares about quality (motivated agent)
  - Now manager's non-pecuniary payoff is $\theta_m B(e)$
  - First best: $c'(e) - (\theta_g + \theta_m)\, b'(e) = 1$.
  - Under government ownership disagreement payoffs are

$$\begin{aligned} \overline{u}_g^g &= \lambda \{c(e) - \theta_g b(e)\} \\ \overline{u}_m^g &= -\lambda \theta_m b(e). \end{aligned}$$

  - First order condition for effort choice

$$\frac{1-\lambda}{2} c'(e) - \left[\frac{1-\lambda}{2}\theta_g + \frac{1+\lambda}{2}\theta_m\right] b'(e) = 1$$

  - Under private ownership disagreement payoffs are

$$\begin{aligned} \overline{u}_g^m &= -\theta_g b(e) \\ \overline{u}_m^m &= c(e) - \theta_m b(e) \end{aligned}$$

  - First order condition for effort choice

$$c'(e) - \theta_m b'(e) = 1$$

– Clearly, the privatization/contracting out option leads to lower level of e than before (but still greater than first-best)

– Government provision leads to lower level of e than before as well (and further lower than first-best)

– Contracting out to non-profits dominates contracting out to for-profits or privatization

– More interestingly, if $\theta_m > \theta_g$ then non-profit ownership dominates government ownership

  * same weight on cost term as in first-best

  * higher weight on benefit term compared to government $\frac{1-\lambda}{2}\theta_g + \frac{1+\lambda}{2}\theta_m < \theta_m$ as $\frac{1-\lambda}{2} + \frac{1+\lambda}{2} = 1$.

- What could be potential problem with non-profits: they may not be as efficient in cutting costs

- Indeed, NGOs are mostly praised for their commitment to the cause even though in terms of efficiency it might be dominated by a for-profit firm or even the government with more resources in its disposal

- For social service delivery (health, education) NGOs are preferred

- Here non-contractible quality matters, and so the commitment of NGOs is important

- For management of infrastructure for-profit contractors are preferred as cost efficiency is more important (road maintenance, water supply)

Appendix

Appendix 1. Alternative version of multi-tasking model based on some intrinsic motivation on the part of the agent

- In the previous version, suppose p is such that $b_2 = 0$

- This will be true if $p \leq \frac{2-\gamma^2}{3-2\gamma^2}$ which is the solution to $1 = \frac{(1-p)}{(2p-1)(1-\gamma^2)}$

- Notice that $\frac{2-\gamma^2}{3-2\gamma^2} > \frac{2}{3}$.

- If $b_2 = 0$ then from the ICs (using the fact that $e_2 \geq 0$) we see that $e_2 = 0$, in which case $b_1 = \frac{1}{2} = e_1$

- The principal does not even try to elicit any effort from the agent in task 2.

- In the original H-M paper, even in this case, the agent does supply some effort in both tasks

- The way they get it is by assuming the agent has some intrinsic motivation

- Suppose outcome of task 2 is very hard to measure, and so set $b_2 = 0$.

- Offer bonus b_1 for success in task 1 which has a good performance measure

- Agent cares about success in both tasks to some degree: θ

- Agent solves

$$\max_{e_1,e_2} (\theta + b_1)\, e_1 + \theta e_2 - (\frac{1}{2}e_1^2 + \frac{1}{2}e_2^2 + \gamma e_1 e_2)$$

- First order conditions

$$\begin{aligned} \theta + b_1 &= e_1 + \gamma e_2 \\ \theta &= e_2 + \gamma e_1 \end{aligned}$$

- Solving simultaneously:

$$\begin{aligned} e_1 &= \frac{1}{1-\gamma^2} \{\theta(1-\gamma) + b\} \\ e_2 &= \frac{1}{1-\gamma^2} \{\theta(1-\gamma) - \gamma b)\} \end{aligned}$$

- Assume $\gamma < 1$

- Implication: if $\gamma > 0$, then a high bonus in task 1 reduces e_2

- Also, unless agent has some intrinsic motivation ($\theta > 0$), $e_2 = 0$ (as before)

- Principal solves

$$u^p = \max_{b_1} (\pi_1 - b_1)\, e_1 + \pi_2 e_2.$$

- Use the incentive-compatibility constraints to express this in terms of b_1

$$\frac{1}{1-\gamma^2} \max_{b_1} (\pi_1 - b_1) \{\theta(1-\gamma) + b_1\} + \pi_2\{\theta(1-\gamma) - \gamma b_1\}$$

- Solving first-order condition w.r.t. b_1 :

$$b_1^* = \max\left\{\frac{\pi_1 - \gamma\pi_2 - \theta(1-\gamma)}{2}, 0\right\}$$

- If principal does not care very much about task 2 (π_2 low) or cares a lot about task 1 (π_1 high) then b_1^* more likely to be positive

- If agent is not highly motivated (θ low) then more likely to use bonus.

Appendix 2. Competition and Incentives in Private Sector (Schmidt, 1997)

- Not much known about role of competition on incentives in general, even in the context of the private sector

- Useful to know this, so that we have a benchmark vis a vis competition and incentives in public organizations

- Klaus Schmidt: "Managerial Incentives and Product Market Competition", Review of Economic Studies, 1997.

- Principal: firm owner

- Agent: manager

- Agent undertakes unobservable effort to reduce cost

- If successful, profits are π_H otherwise π_L

- Let $\pi \equiv \pi_H - \pi_L$

- There is a cost of liquidating the firm to the manager L which could happen with some probability l if cost is high

- Let $\lambda \equiv lL$

- Otherwise same as our benchmark model.

- Therefore, $e = b + \lambda$

- Given this (we focus on case where the PC does not bind), owner chooses $b = \frac{\pi - \lambda}{2}$

- Assume $\pi > L$ so b always positive

- Equilibrium effort $e = \frac{\pi + \lambda}{2}$

- Therefore, effort is increasing in liquidation cost.

- Principal better off, agent may or may not be as λ goes up (Exercise: prove it.)

- Effect of competition.
  - Could affect liquidation costs.
  - Also, likely to reduce revenue, and hence π_H and π_L
- The question is, does it affect π?
- Therefore, two effects of competition
  - To the extent it increases liquidation costs, incentive pay goes down and effort goes up

  - To the extent it increases π, same thing.

- But possible to reduce π too.

Start with Monopoly

- Let $\pi_L = 0$ and so $\pi_H = \pi$

- Suppose the cost reductions are "drastic": even monopoly price with low cost is lower than competitive price with high cost

- Even if cost reduction does not take place, monopoly is not liquidated so $l = 1$

- Therefore, initially

$$b = \frac{\pi - L}{2} \text{ and } e = \frac{\pi + L}{2}$$

Now consider duopoly

- Let e' be the probability of success of rival firm

- Positive profits only if you succeed and the other firm fails (probability $e(1-e')$)

- If both succeeds or both fails then both earn zero profits

- If you fail and the other firm succeeds, your firm is liquidated (Probability $(1-e)e'$)

- As before, focus on case where PC does not bind.

- Agent's choice of e :

$$\max_{e}\left\{e(1-e')b-(1-e)e'L-\frac{1}{2}e^{2}\right\}$$

  which yields

$$e=(1-e')b+e'L.$$

- Principal maximizes

$$\max_{b} e(1-e')(\pi-b)$$

  subject to the ICC

- This yields

$$b=\frac{\pi}{2}-\frac{1}{1-e'}\frac{e'L}{2}.$$

- Substituting back in ICC effort choice is given by equation

$$2e = (1 - e')\pi + e'L$$

- In a symmetric Nash equilibrium

$$e = e' = \frac{\pi}{2 + \pi - L} .$$

- Clearly, bonuses have gone down: this is the rent reduction effect.

- Has effort gone up?

- Depends on the condition

$$\frac{\pi}{2 + \pi - L} > \frac{\pi + L}{2}$$

- This simplifies to

$$2 > \frac{\pi + L}{\pi} (2 + \pi - L) .$$

- As we assume $\pi - L > 0$ this cannot hold.

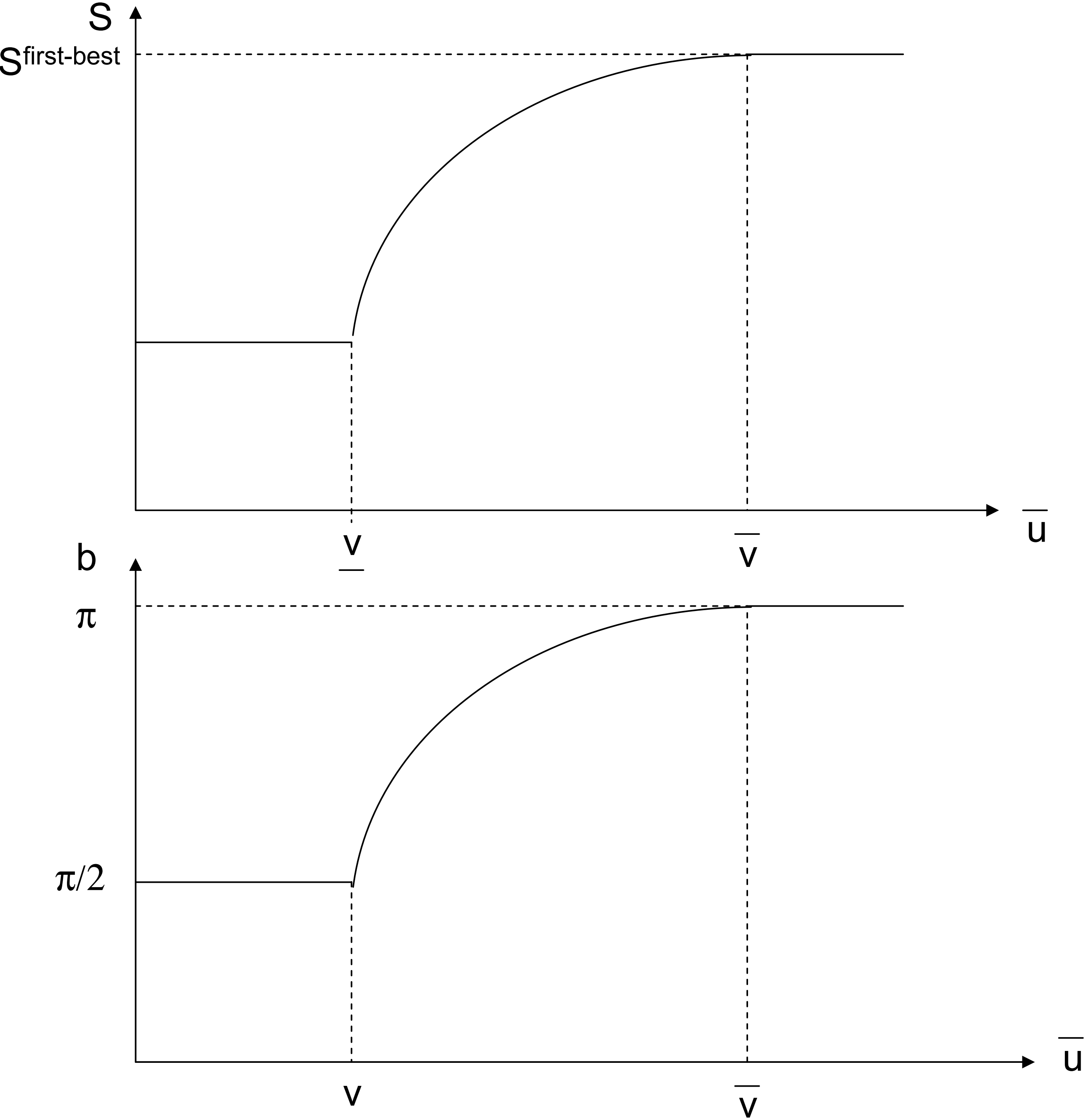
S
$S^{first\text{-}best}$
$\bar{u}$
$\underline{v}$
$\bar{v}$
b
π
π/2
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Figure 1: Game Tree

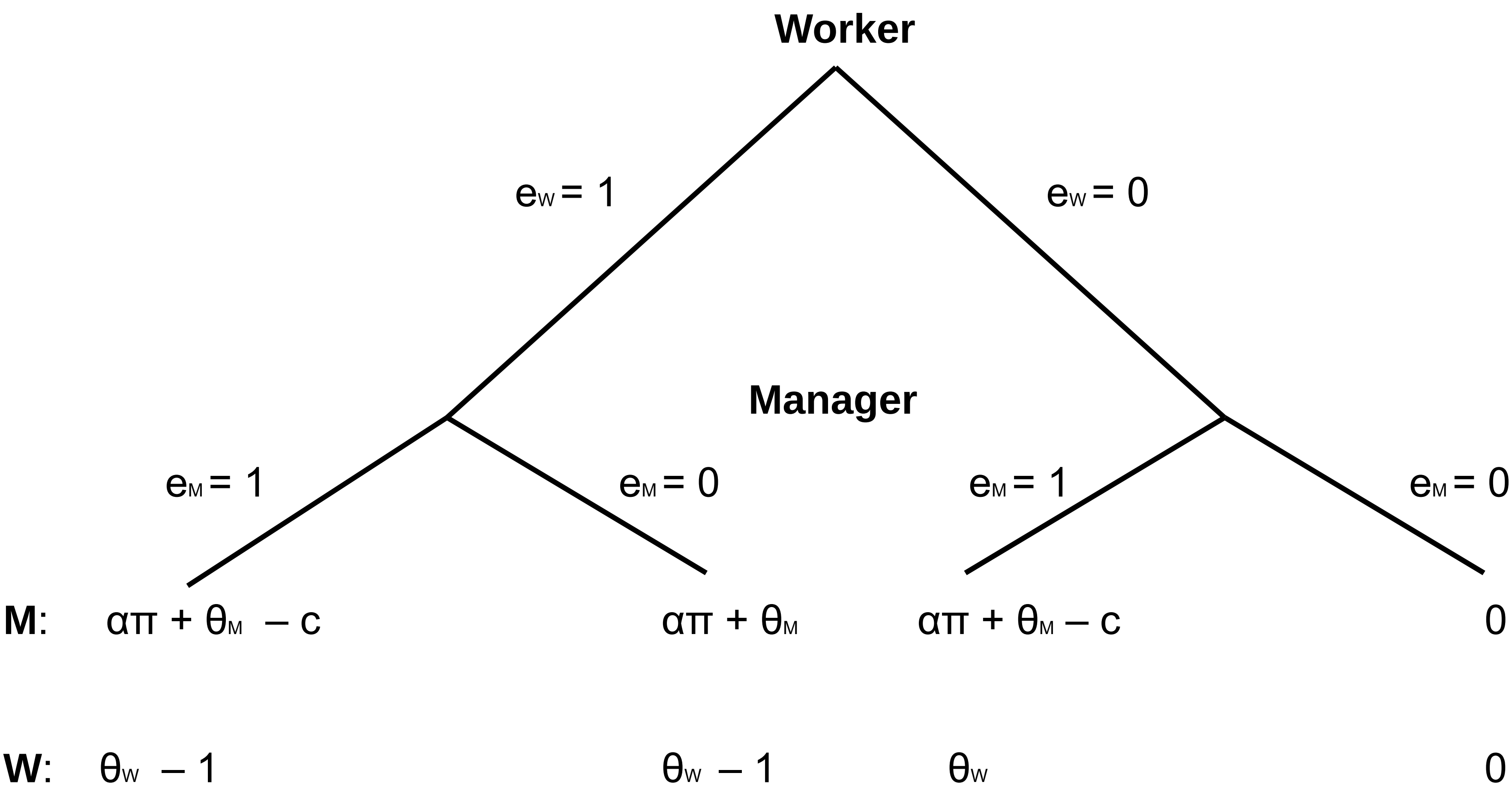

Figure 2: Not-for-Profit Sector Without For-Profit Competition