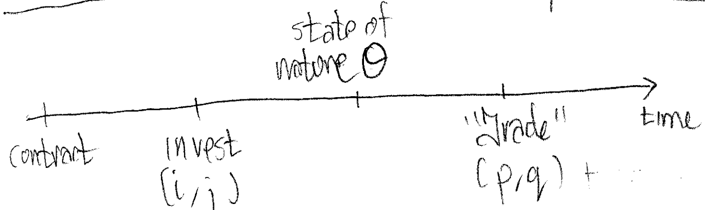
3 sessions on foundations
Is behavioral economics ready to take on contracts?
2 problem sets and a final

Foundations of Incomplete Contracts



- cannot contract on θ, even though it is observable
- q is contractible ex post
- in contracting phase, can only discuss property rights
- payoffs: $\begin{cases} v(q, \theta, j) - p - \varphi(i) \\ p - c(q, \theta, i) - \Psi(j) \end{cases}$
- ownership affects surplus and bargaining power
- Maskin-Tirole: why doesn't contracting stage also allow for messages?

Maskin $\underbrace{\text{'77}}_{\text{written}}$, $\underbrace{\text{'99}}_{\text{published}}$

Grossman-Hart '86: Noncontractibility of $\theta, \overbrace{i, j}^{\text{moral hazard in teams}}, q$.
- noncontractibility ex ante is the new assumption.
- need to be able to contract ex post on q.
- Maskin was concerned with "observable but not verifiable"

Maskin-Tirole add non-contractibility of q.

Maskin

- Goal: implement $f(\theta)$

- have both players announce θ. If disagree, big punishment. Truth-telling is NE. But:

1. There are many, many NE. (coordination on <u>any</u> θ, not just true θ).
2. Not renegotiation-proof
3. Not "realistic"

- Maskin just deals with 1. Maskin's theorem insists on unique NE.
- Mechanism $\rightarrow$ $g(\underset{\hat{M}^1}{m^1}, \ldots, \underset{\hat{M}^n}{m^n}) \in f(\theta) \subset \underbrace{Y}_{\text{set of outcomes}} \quad \forall \theta$
  - want <u>all</u> NE to be in $f(\theta)$
- Necessary condition: monotonicity of $f(\theta)$: $\forall \theta, \hat{\theta} \in \Theta$, $\forall y \in Y$ s.t. $y \in f(\theta)$, then $y \in f(\hat{\theta})$ whenever $\forall i, \forall z \in Y$ s.t. $y \gtrsim_i z$ under θ, then $y \gtrsim_i z$ under $\hat{\theta}$.

WNVP - "Weak No Veto Power": $\forall \theta$, $y \in f(\theta)$ if it is most preferred outcome in Y under θ for at least $n-1$ people.

<u>Maskin's Theorem:</u> (i) Nash implementation $\Rightarrow$ monotonicity

(ii) $n \geq 3$, monotonicity + WNVP $\Rightarrow$ Nash implementation

Survey by Moore.

<u>Proof</u>: (i) by contradiction. Assume $y \in f(\theta)$ but $y \notin f(\hat{\theta})$ but $\forall z \in Y$, does not "go down" in individual preference $\exists$ a mechanism M such that NE set includes y under θ. But then y is also in the NE set under $\hat{\theta}$. (since the NE strat. was preferred by everyone under θ, it also is in $\hat{\theta}$.)

- at first, monotonicity looks like a reasonable idea. (it is quite restrictive.)

(ii) Construction proof: Messages: $(\underbrace{\theta}_{\text{announcement about state of nature}}, \underbrace{y}_{\text{out come}}, \underbrace{N}_{\in \mathbb{N}})$ ($y \in Y$)

Outcomes:

(1) if all announcements agree on θ and y and $y \in f(\theta)$, then $g(\cdot) = y$

(2) if (1) is true except for individual i's announcement, which involves $\hat{\theta}$ and z, then $g(\cdot) = z$ if $y \succsim_i z$ under θ, otherwise $g(\cdot) = y$.

(3) in all other cases, $g(\cdot) = \tilde{y}$, which is the outcome of the agent with the highest N.
- ensures that there cannot be an equilibrium here. This kills multiplicity.

$\forall\, \theta,\ y \in f(\theta)$ is a NE. Can there be other equilibria

(a) all individuals announce $\hat{\theta}, \hat{y}$ s.t. $\hat{y} \in f(\hat{\theta})$, but $\hat{y} \notin f(\theta) \Rightarrow \exists z, \exists i$ s.t. $\hat{y} \succsim_i z$ but $\hat{y} \not\succsim_i z$ under θ. (2) destroys this.

(b) Non unanimity: at least $n-1$ individuals can deviate and impose their best outcome (under (3)) $\rightarrow$ by WNVP, cannot be an equilibrium: $y \notin f(\theta)$

(c) Same as (b) if unanimity on $\theta, y \notin f(\theta)$.
- everyone can deviate and get his/her most preferred outcome. Killed by (3).

Subgame Perfect Implementation

Public project problem: $u^1(y,\theta^1)+t^1 \equiv \theta^1 d + t^1$
$u^2(y,\theta^2)+t^2 \equiv \theta^2 d + t^2$, $d \in \{0,1\}$

- want efficiency: $y(\theta)=1$ iff $\theta^1+\theta^2 \geq 0$

Goal: Want $\{y(\theta), t^1(\theta), t^2(\theta)\}$. Can we implement any such vector. Big problem with monotonicity. Whenever $\text{sgn}(\theta^1+\theta^2)$ is not changed, there is no way to change the t^i's. Monotonicity will not conflict with efficiency, but will conflict with distributional preferences.

Stage 1: (i) 1 announces θ^1
(ii) 2 agrees ($\Rightarrow$ move to stage 2) or else challenges, announcing $\hat{\theta}^1 \neq \theta^1$. Then,
(iii) 1 chooses between 2 outcomes: (where Δt big)
$\{x, -t_x-\Delta t, t_x-\Delta t\}$
or $\{z, -t_z-\Delta t, t_z+\Delta t\}$ such that

$$\theta^1 x - t_x > \theta^1 z - t_z$$
$$\hat{\theta}^1 x - t_x < \hat{\theta}^1 z - t_z$$

Stage 2: Same as stage 1 but with roles reversed.

Remark:
- No challenges $\Rightarrow$ implement $y(\theta), t^1(\theta), t^2(\theta)$
- Ruthless exploitation of SPNE.