BGPE Intensive Course: Contracts and Asymmetric Information

Introduction: Asymmetric Information and the Coase Theorem

Anke Kessler

Introduction

- standard neoclassical economic theory assume all agents have access to all information relevant to their decisions
  e.g., about characteristics of goods or about available technology
- in reality: lots of uncertainty and imperfect information
  e.g. labor productivity, consumer demand, goods quality
- this issue is addressed by **economics of information** and **contract theory**; questions:
  - what are market outcomes and the optimal contracts under asymmetric information?
  - can asymmetric information help to explain actual (institutional) arrangements?
  - what are the welfare implications of asymmetric information?
- information economics/contract theory have been extremely influential
  - very important practical implications (policy)
  - provide fundamental insights to all areas of economics

The Coase Theorem

An Example with Externalities

- two agents $i = A, P$
- agent A has project/decision $q \in \{1, 0\}$
- utilities

$$u_A(q, \theta, x) = \theta q + x \qquad \text{and} \qquad u_P(q, \sigma, x) = -cq + x$$

x = composite consumption good (money)

θ = net benefit of A,

c = negative external effect on P

- Pareto optimality requires: $q = 1 \Leftrightarrow \theta - c \geq 0$
- “market solution” is $q^M = 1 \Leftrightarrow \theta \geq 0$

$\rightarrow$ market solution is not efficient whenever $c \neq 0$

- Pigou: corrective tax on project $\tau = c$
- Coase: state intervention not necessary

The Coase Theorem

Theorem (Coase): If bargaining involves no transaction cost, and property rights are well defined and enforceable, then rational parties will agree to the efficient solution and enforce this solution through a private contract.

Corollary If preferences display no wealth effects, then the agreement reached will not depend on the initial assignment of property rights or on bargain power.

Proof.

- suppose 'property rights' over q belong to A and consider contract $\{q, t\}$ specifying decision q and compensation payment t from P to A
- utilities $u_A(q, t, \theta) = \theta q + \tilde{t}$, $u_P(q, t) = -cq - t$
- assuming A makes take-it-or-leave-it offer to P
  optimal contract is

$$q(\theta) = q^*(\theta) = 1 \quad \Leftrightarrow \theta + -c \geq 0 \quad \text{and} \quad t(\theta) = \sigma[q^*(\theta) - q^M(\theta)]$$

- analogous if B makes take-it-or-leave-it offer to A of if property rights belong to P

Failure of the Coase Theorem

- suppose θ = private information of A
- P only knows that $\theta \sim F(\theta)$ on $[\underline{\theta}, \bar{\theta}]$, $\underline{\theta} < 0 < \bar{\theta}$
- continue to assume that A makes take-it-or-leave-it offer $\{q, t\}$ to P
- let $q(\theta)$ and $t(\theta)$ be agreed upon decision and transfer if A is of type θ
- can efficient decision $q(\theta) = q^*(\theta)$ ever be part of agreement?
- suppose P has agreed to contract, for offer $\{t(\theta), q(\theta)\}$ to optimal for A, need in particular:

$$\forall \theta, \theta' \qquad U_A(\theta) = \theta q(\theta) + t(\theta) \geq \theta q(\theta') + t(\theta') \qquad (IC)$$

- for agreement to be mutually beneficial, need

$$u_A(\theta) = \theta q(\theta) + t(\theta) \geq \max(\theta, 0) \qquad (IR_A)$$

$$E[u_P] = E_{\{\theta|\cdot\}} \; [-cq(\theta) - t(\theta) \geq -cq^M(\theta)] \qquad (IR_P)$$

Failure of the Coase Theorem

- agreement involves efficient decision, $q(\theta) = q^*(\theta) = 1 \quad \Leftrightarrow \quad \theta - c \geq 0$
- assume $\bar{\theta} - c > 0$, implications of (IC) constraint

$$\begin{aligned} \theta, \theta' \geq c \quad (IC) \Rightarrow & \qquad t(\theta) = t(\theta') \equiv t_1 \\ \forall \theta, \theta' < c \quad (IC) \Rightarrow & \qquad t(\theta) = t(\theta') \equiv t_0 \\ \forall \theta < c \leq \theta' \quad (IC) \Rightarrow & \qquad t(\theta) = t(\theta') + c \quad \Rightarrow \quad t_0 = t_1 + c \end{aligned}$$

- implications of (IR_A) constraint

$$c \geq \theta > 0, \qquad t_0 = t_1 + c \geq \theta \quad \Rightarrow \quad t_1 \geq 0, t_0 \geq c$$

- implications of (IR_P) constraint if contract offer is $\{0, t_0\}$

$$-t_0 \geq -c \frac{F(c) - F(0)}{F(c)} \qquad \Leftrightarrow \qquad t_0 \leq c \, \frac{F(c) - F(0)}{F(c)} \qquad < c$$

$\Rightarrow$ efficient decision cannot be part of contract that is proposed by A and accepted by P if $\bar{\theta} - c \geq 0$

Conclusion

- if $\bar{\theta} \geq c$, and A is privately informed about θ, there does not exist a mutually acceptable contract that implements the efficient outcome

- this conclusion also holds more generally, e.g., for different bargaining games between A and P [see Klibanoff - Murdoch (1995, ReStud)]

- *Intuition.* Threat of opportunistic behavior of A (may overstate value of decision to increase compensation) makes it impossible to differentiate compensation payments based on θ
  Hence, P must pay the same (maximal) compensation amount in every state where the project is not realized.
  P is not be willing to that much because chances are A won't go ahead even without agreement.

A General Characterization of Agency Problems

- relationship between two (sometimes more) parties; one party's utility depends on the other party's information or action
- one party is – or will be – better informed about some state of nature that is relevant to the relationship than the other party; the informed party is the **agent** A and the uninformed party the **principal** P
- private information ex ante (pre-contractual opportunism)
  $\Rightarrow$ adverse selection (hidden information)
  Examples: Insurance Company – Car Owner, Employer – Employee, Plaintiff – Attorney, Seller – Buyer, Regulator – Regulated Firm
  - uninformed party moves first $\rightarrow$ screening
  - informed party moves first $\rightarrow$ signaling
- private information ex post (post-contractual opportunism)
  $\Rightarrow$ moral hazard (hidden action)
  Examples: Insurance Company – Car Owner, Employer – Employee, Plaintiff – Attorney, Homeowner – Contractor, Shareholder – Manager, Patient – Physician,