

# Module 14: Adverse Selection

Information Economics (Ec 515) · George Georgiadis

- Agents have private information - their “type”  $\theta_i$ .
- Examples:
  - Selling stuff: consumer knows his preference; seller knows quality of product.
  - Regulation natural monopolies: firms know their production cost.
  - Taxing and redistributing income: worker knows productivity or disutility from labor.
  - Credit markets: entrepreneur knows risk of project.
  - Insurance: Insuree knows idiosyncratic risk.
- Asymmetric information can cause inefficiencies:
  - Akerlof: market collapse (“Market for Lemmons”)
  - Monopoly pricing: Deadweight loss.
- Mechanism design approach:
  - Principal (usually uninformed) proposes a mechanism (*i.e.*, game form & outcome function).
  - Agent accepts / rejects mechanism.
  - Agents play the game and outcomes are determined.
- Alternative approach: Signaling
  - Informed party proposes contract.
  - In equilibrium, contract proposal signals type.
- Plan of attack:

- Single-agent Problem
- Multi-agent Problem
- Dynamics

## Market for Lemmons

- A consumer seeks to buy a used car.
  - Used cars have quality  $\theta \in [0, 1]$ .
  - We say that  $\theta$  is the “type” of the car.
- If a seller owns a car of type  $\theta$ , then his utility from ownership is  $\theta$ .
  - *i.e.*, he will not sell it for any less than  $\theta$ .
- A buyer is willing to pay  $\frac{3}{2}\theta$  for a car of type  $\theta$ .
- This implies that it is efficient to sell the car.
  - *i.e.*, buyers get more value from it than sellers.

### Benchmark #1: Quality $\theta$ is observable to both parties.

- Let  $p(\theta)$  be the price of a car with quality  $\theta$ .
- In equilibrium,  $p(\theta) \in [\theta, \frac{3}{2}\theta]$ .
  - At any such price, both parties are happy to trade.
- All cars will be traded, and the market outcome is efficient.

### Benchmark #2: Quality $\theta$ is not observable to either party.

- Suppose that  $\theta \sim U[0, 1]$ . Then  $\Pr\{\theta \leq \bar{\theta}\} = \bar{\theta}$ .
- In this case, there can only be one price.
  - Price cannot depend on the car’s type, since it is unobservable.
- The expected quality of a car is  $\mathbb{E}[\theta] = \frac{1}{2}$ .

- If the seller keeps his car, his expected utility is:  $\mathbb{E}[\theta] = \frac{1}{2}$ .
- If the buyer purchases the car, his expected utility is  $\mathbb{E}\left[\frac{3}{2}\theta\right] = \frac{3}{4} > \frac{1}{2}$ .
- In equilibrium, the price will be  $p \in \left[\frac{1}{2}, \frac{3}{4}\right]$ .
  - At any such price, both parties are happy to trade.
- Again, all cars will be traded, and the market outcome is efficient.

### Adverse Selection (Asymmetric Information)

- Only the seller knows the quality of his own car  $\theta$ .
- The buyer cannot observe the car's quality.
  - Buyers believe that  $\theta \sim [0, 1]$ .
- Because all cars look the same to the buyers, there will again be only one price  $p$ .
- Given this price, a seller with a car of quality  $\theta \in [0, 1]$  will sell if and only if  $p \geq \theta$ .
- Given price  $p$ , we know that the cars for sale will have quality  $\theta \leq p$ .
  - Quality was uniformly distributed on  $[0, 1]$ .
  - So the quality of cars for sale will be uniformly distributed on  $[0, p]$ .
- *Adverse Selection*: the distribution of cars for sale is worse than the original distribution!
  - Only those sellers with a car with quality below  $p$  are willing to sell!
  - Sellers with a better car prefer to keep it.
- Because buyers are rational, they will take this into account when deciding the price they are willing to pay.
- What is the equilibrium price  $p$ ?
  - Fix any  $p > 0$ .
  - Then, the expected quality of cars for sale is  $\mathbb{E}[\theta | \theta \leq p] = \frac{1}{2}p$ .
  - If a buyer purchases at this price, his expected utility will be

$$\mathbb{E}\left[\frac{3}{2}\theta | \theta \leq p\right] - p = \frac{3}{4}p - p < 0.$$

- No buyer will be willing to buy at any  $p > 0$
- Only equilibrium:  $p = 0$ , and no cars are sold.
  - Market breaks down completely!

## References

Akerlof G.A., (1970), “The Market for Lemons: Quality Uncertainty and the Market Mechanism”, *Quarterly Journal of Economics*.

Board S., (2011), Lecture Notes.

Ortner J., (2013), Lecture Notes.