Econ 301: Microeconomic Analysis

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Asymmetric Information

Motivation

- So far, assumed easy to tell quality of goods bought
- This assumption not realistic in some markets. Examples?

- Todays lecture: what happens when one side of the transaction knows more than the other about the quality of the good

Adverse Selection and Moral Hazard

Example: The Market for Lemons

- Suppose there are 100 cars being sold: 50 “plums” and 50 “lemons”
- There are 100 buyers
- Seller’s lowest price willing to sell at:
  - $2000 for plums
  - $1000 for lemons
- Buyer’s highest price willing to buy at:
  - $2400 for plums
  - $1200 for lemons
- What happens if quality of cars is observable to buyers and sellers?

Adding Asymmetric Information

- Suppose now sellers know type of car they have but buyers cannot observe it
- What happens in market?
- What is the market failure here?
- Any solutions to this?

Hidden Quality: Umbrellas

- Let’s see another example where quality is unknown to buyers
- Consider competitive market for umbrellas
- Can be either low or high quality
- Consumers:
  - High quality worth $14, low quality worth $8
  - Cannot tell difference between high and low quality at time of purchase
- Sellers:
  - High quality sellers have fraction q of market
  - Both high and low quality cost $11.50 per umbrella to make
  - Seller cannot choose quality, only whether to produce or not
- How much are consumers willing to spend?

Umbrellas, con’t

- What happens if $q = 0$?
- What happens if $q = 1$?
- What happens if $q \in [0, 1]$?

Adverse Selection

- In examples with umbrellas and cars, the low-quality items have externality on high-quality items, causing high-quality items not to be sold
- This is because consumers are not getting an ideal or even random selection from quality of goods, but an *adverse selection*
- The classic example of adverse selection is the insurance market:
  - Insurance companies cannot tell risk of individual people, so insurance rates are based on average risk of individuals
  - For low-risk people, buying insurance at this price is not sensible
  - So only high-risk people buy insurance, but this drives up insurance rate
  - Again, market failure/inefficiency: insurance company willing to insure low-risk people if could tell who they were, but instead they get an *adverse selection* of customers

Getting Around Adverse Selection

- How can we structure insurance market to avoid this failure?
- One option: mandated insurance purchasing
  - Government can penalize anyone that does not buy insurance
  - This is done for car insurance and health insurance
- Another option: insurance pools
  - Instead of government mandating, firms can require employees to buy health insurance through group plan
  - Reduces rates because no longer have adverse selection of only high-risk consumers

Moral Hazard

- Insurance market has another potential inefficiency: once insured, consumer have less incentive to take care
  - Examples?
- This is called *moral hazard*: consumer's actions affect probability of a high-quality outcome
- What can we do to get around moral hazard?

Principal-Agent Problems

Moral Hazard Example: Setup

- Suppose landowner wants to hire someone to work the land for them
- If worker puts in effort x, land will produce output $y = f(x)$
- Landowner will pay them according to function $s(y)$
- Worker can choose instead to take *outside option*, worth $\bar{u}$ to them
- Effort costs $c(x)$ to worker
- Good y has price 1
- Utility functions:
  - Landowner: $y - s(y)$
  - Worker: $s((f(x)) - c(x)$
- In general, landowner is called *principal* and worker is called *agent*

The Principal's Problem

- Note that the principal must ensure that the agent actually wants to work for the principal and not take the outside option
  - This gives us the *participation constraint (PC)* of the agent:

$$s(f(x)) - c(x) \geq \bar{u}$$

- The principal would like to maximize profits, subject to this participation constraint:

$$\max_x f(x) - s(f(x)) \text{ s.t. } s(f(x)) - c(x) \geq \bar{u}$$

- Solution?

The Agent's Problem

- The principal want to ensure that the agent will choose effort level x^*
- Need this to be utility maximizing for the agent, ie need x^* to solve

$$\max_x s(f(x)) - c(x)$$

- Alternatively, can write this as

$$s(f(x^*)) - c(x^*) \geq s(f(x)) - c(x) \text{ for all } x$$

- This is known as *incentive compatability constraint (IC)*
- Note that there may be many possible $s(\cdot)$ functions (ie *contracts*) that principal can choose to use
- For contracts to work (ie achieve x^*), must satisfy both PC and IC

Example Contract: Rent

- Suppose agent must pay rent R to principal (independent) of output, and then keep the rest of output
- Contract function is $s(f(x)) =$
- Is IC satisfied?

- Is PC satisfied?

Example Contract: Wage Labor

- Suppose principal instead pays wage w and lump sum transfer K
- Contract function is $s(x) =$
- Is IC satisfied?
- Is PC satisfied?
- Note that in this case, PC determines lump sum K but IC determines wage rate w

Example Contract: Sharecropping

- Another possible contract: agent gets share $\alpha < 1$ of output, plus lump sum F
- Contract function is $s(x) =$
- Does IC hold?
- From principal's point of view, agent will provide less than optimal level of effort, ie $\hat{x} < x^*$. Why?
  - Sharecropper is not *residual claimant* of all of his effort
- So why would principal ever consider using sharecropping as contract?

Return of Asymmetric Information

- We're assuming that principal can directly observe effort because it is perfectly correlated with output, ie $y = f(x)$
- But in reality there is noise (good and back luck) that can determine output in addition to effort, ie $y = f(x) + \epsilon$
- Thus we are back to the case where one side of the market (agent) observes quality (effort) but the other side (principal) does not
- What does this do to different contracts?
  - Rent: agent bears risk, so will supply less effort than principal would want due to risk aversion
  - Wage: not feasible since need to observe effort x
    - Workaround in reality: pay for hours worked as proxy for effort
  - Sharecropping: both worker and landlord bear risk of bad luck, so their incentives are aligned