Chapter 19

Asymmetric Information

Main topics

- problems due to asymmetric information
- response to adverse selection
- how ignorance about quality drives out high-quality goods
- price discrimination due to false beliefs about quality
- market power from price ignorance
- problems arising from ignorance when hiring

Problems due to asymmetric information

- if both parties to a transaction have limited info, neither has an advantage
- asymmetric info leads to *opportunism*, whereby informed person benefits at expense of those with less info

Types of opportunistic behavior

- *adverse selection*
- *moral hazard*

Adverse selection

- opportunism characterized by
  - an informed person's benefiting trading (contracting) with less informed person
  - who does not know about an *unobserved characteristic* of the informed person
- people who buy life insurance know more about their own health than does the insurance company

Adverse selection market failure

- reduces size of a market (possibly eliminating it)
- example: few older people regardless of their health buy term life insurance because rates are extremely high because of adverse selection

Moral hazard

- opportunism characterized by an informed person taking advantage of a less-informed person through an *unobserved action*
- example: employee shirks if not monitored by employer
- moral hazard is not necessarily harmful
  - pregnant women with health insurance make more prenatal doctor visits
  - extra cost bad for insurance firms, but society benefits from healthier women and babies

Responses to adverse selection

main methods for solving adverse selection problems are to

- restrict opportunistic behavior
- equalize information

Restrict opportunistic behavior

- universal coverage: provide insurance to all employees of a firm
- thus both healthy and unhealthy people are covered
- firm buys medical insurance at a lower cost per person than workers could obtain on their own (where relatively more unhealthy individuals buy insurance)

Means of equalizing information

- *screening*
  - action taken by an uninformed person to determine info possessed by informed people
  - buyer test drives many used cars
- *signaling*
  - action taken by an informed person to send information to a less-informed person
  - firm distributes a favorable report on its product by an independent testing agency to prove its quality is high

How ignorance about quality drives out high-quality goods

- buyer cannot judge a product's quality before purchasing it
- low-quality cars – lemons – may drive high quality products out of the market (Akerlof)
- owners of lemons are more likely to sell their cars, leading to adverse selection

Lemons market buyers

- many potential buyers for used cars
- all are willing to pay
  - $1,000 for a lemon
  - $2,000 for a good used car

Lemons market sellers

- owners willing to sell up to
  - 1,000 lemons
  - 1,000 good used cars
- reservation price of owners (lowest price at which they'll sell their cars)
  - $750 for lemons
  - $1,250 or $1,750 for good cars

Two possible equilibrium

- all cars sell at average price, $1,500 (sellers of good cars are implicitly subsidizing sellers of lemons)
- only lemons sell for a price equal to the value that buyers place on lemons (bad drives out good)

Value to sellers of good cars is $1,250

- sellers willing to sell their cars at average price ($1,500)
- equilibrium price $1,500 in both markets
  - lemons market equilibrium: *f,* intersection of S^L and D^*
  - good market equilibrium: *F,* intersection of S^1 and D^*
- asymmetric information does not cause an efficiency problem, but has equity implications

Figure 19.1a Markets for Lemons and Good Cars

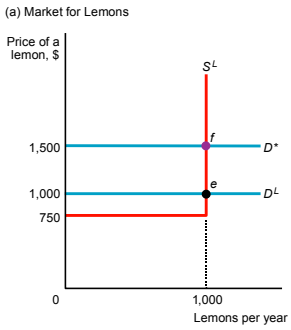

Figure 19.1b Markets for Lemons and Good Cars

Value to sellers of good cars is $1,750

- lemons drive good cars out of market
- buyers know that only cars they can buy at < $1,750 is a lemon
- lemons sell for $1,000: *e*, intersection of S^L and D^L
- equilibrium is inefficient: high quality cars remain in hands of people who value them < than do potential buyers

Lemons market with variable quality

- many firms can vary quality of their products
- if consumers cannot identify quality
  - all goods sell at same price
  - raising your quality raises average price of all firms
  - inadequate incentive to produce high quality
  - social value of raising the quality is greater than the private value

Variable quality example

- it costs $10 to produce low-quality book bag and $20 to produce high-quality bag
- consumers cannot distinguish quality before purchase and there are no repeat purchases
- consumers value bags at their cost of production
- 5 firms produce 100 bags each
- each firm produces only high- or low-quality bags

Equilibrium

- if all 5 firms make low-quality bag, price = $10/bag
- if only 1 makes high-quality bags
  - price = expected value per bag to consumers
    = $12 = ($10 × 4/5) + ($20 × 1/5)
  - all firms benefit: all bags sell for $12 instead of $10
  - high-quality firm's extra $2 doesn't cover its extra $10 cost – other $8 is shared by other firms
  - asymmetric information leads to inefficiency: firms do not produce high-quality goods even though consumers are willing to pay for extra quality

Limiting lemons

- laws to prevent opportunism
- consumer screening
- third-party comparisons
- standards and certification
  - *standard*: metric or scale for evaluating the quality of a particular product (e.g., R-value of insulation)
  - *certification*: report that a particular product meets or exceeds a given standard level
- signaling by firms
  - guarantees and warranties
  - brand name

Price discrimination due to false beliefs about quality

- noisy monopoly
- multiple brand names
  - refrigerators
    - Amana and Kenmore
    - Whirlpool and Kenmore
  - cars
    - Ford Taurus & Mercury Sable
    - Toyota Camry & Lexus ES 300
    - Dodge Colt, Mitsubishi Mirage, Plymouth Colt, & Eagle Summit
    - Bentley Brookland ($152,400) & Rolls-Royce Silver Spur III ($178,200)

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Price ignorance ⇒ market power

- limited information about price leads to market power
- consumers who do not know that a product can be bought for less elsewhere buy from high-price stores

Tourist-trap model

- many souvenir shops
- guidebook tells distribution of prices
- costs tourist c in time and expenses to visit a shop and check price or buy
- if price = p, costs
  - $p + c$ if tourist buys from first store

  $p + 2c$ if tourist buys from second store

Is a competitive price charged?

- suppose all stores charge full-information competitive price, p^*
- this price is equilibrium price only if no seller wants to charge a different price
  - no firm wants to sell for less: p^* = marginal cost
  - suppose one firm charges $p_1 = p^* + \varepsilon$, where ε = small positive number
  - if $\varepsilon = p_1 - p^* < c$, a consumer still buys from it, so store makes a higher profit
- thus, competitive price cannot be equilibrium price

Monopoly price

- is p_1 an equilibrium price?
  - no (repeat previous argument)
  - a firm wants to charge $p_2 = p_1 + \varepsilon = p^* + 2\varepsilon$
- repeating argument: only possible single-price equilibrium is monopoly price
  - no firm wants to charge more
  - if it does not pay for a firm to cut price, monopoly price is an equilibrium price

Advertising and price

- Federal Trade Commission (FTC) opposes groups wanting to forbid price advertising
- price of eyeglasses 28% higher in states that forbade advertising than in those that permitted it (Benham 1972)

Problems arising from ignorance when hiring

- asymmetric information creates problems in labor markets
- worker signaling and firm screening may reduce problems

Information about employment risks

- firms have more info than workers about job safety
- may result in less than optimal levels of safety (Viscusi 1979)
- workers know which industries are risky (U.S. Bureau of Labor Statistics) – but not which firms
- people will work in risky industries only if paid a premium

Firms' decisions

- firms must decide how safe to make their job sites
- safety is expensive
- if firm makes its site safer, it reduces incidence of accidents
- lower reported industry accident rate lowers industry wage
- *each firm bears full cost of its safety investment but derives only some of the benefit (lower wage), so it underinvests in safety*

Prisoner's dilemma game

- suppose there are only 2 firms in an industry
- in Nash equilibrium (upper left), neither firm invests and each earns $200
  - an investment by only one firm raises safety at its plant
  - workers only learn that its safer to work in the industry
  - loss from safety investment > wage savings
  - rival would gain from such an investment
- both firms would benefit if both forced to invest

Table 19.1 Safety Investment Game

		Firm 2: No Investment	Firm 2: Investment
Firm 1	No Investment	$200, $200	$250, $100
	Investment	$100, $250	$225, $225

Problem solved if

- government provides
  - information by firm
  - sets high safety standards (force both firms to invest)
- workers (union) forces both firms to invest

Cheap talk

- *cheap talk:* unsubstantiated claims or statements
- people use cheap talk to distinguish themselves or their attributes at low cost

Truth telling

- people lie when it suits them, but telling the truth may be in everyone's interest:
- "Honesty is the best policy – when there is money in it." – Mark Twain
- I can take out an ad for a chimpanzee for sale, but it doesn't help me sell by DVD player

Labor example

- cheap talk is an inexpensive way to signal
- firm plans to hire Cyndi to do 1 of 2 jobs
  - demanding job requires worker with high ability
  - undemanding can be better done by someone with low ability
  - Cyndi (unlike firm) knows her own ability
    - if she has high ability, she enjoys demanding job
    - if she has low ability, demanding job is too stressful but she can handle undemanding job
    - payoff greater to firm if she's properly matched

Two-stage game

- stage 1: Cyndi announces her ability level
- stage 2: firm assigns her to an appropriate job

Cheap talk works

- if Cyndi and firm want same thing, game has an equilibrium in which
- Cyndi tells truth and firm, believing her, assigns her to appropriate job
- if firm reacts this way, she has no incentive to lie
- (see panel a)

Cheap talk doesn't work

- if Cyndi and firm do not want the same outcome,
  - Cyndi may have an incentive to lie
  - so firm views her statements about her ability as meaningless babble
- in panel b, firm's expected payoff:
  - undemanding job: (½ × 2) + (½ × 4) = 2.5
  - demanding job: (½ × 2) + (½ × 1) = 1.5
- given firm's asymmetric info, get an inefficient outcome if Cyndi has high ability

Table 19.2 Employee-Employer Payoffs

(a) *When Cheap Talk Works*

Cyndi's Ability	*Job That the Firm Gives to Cyndi: Demanding*	*Undemanding*
High	3, 2	1, 1
Low	1, 1	2, 4

(b) *When Cheap Talk Fails*

Cyndi's Ability	*Job That the Firm Gives to Cyndi: Demanding*	*Undemanding*
High	3, 2	1, 1
Low	3, 1	2, 4

Education as a signal

- college education could pay because
  - it provides valuable training, or
  - it serves as a signal to employers about worker's ability
- suppose education doesn't provide training – it's only a signal

Example

- shares of the workforce:
  - high-ability workers are θ share
  - low-ability workers are $1 - \theta$
- value of marginal product of workers
  - w_h high-ability worker
  - w_l ($< w_h$) low-ability worker
- employer cannot directly determine a worker's skill level

Two types of equilibria

type of equilibrium depends on whether firm can distinguish high-ability workers from others

- pooling equilibrium
- separating equilibrium

Pooling equilibrium

- if can't distinguish high-ability workers, outcome is a *pooling equilibrium*
  - disimilar people are paid alike
  - employer pays all workers average wage:
    $$\overline{w} = \theta w_h + (1-\theta) w_l$$
  - risk-neutral, competitive firms expect to break even
    - underpay high-ability workers
    - overpay low-ability workers

Separating equilibrium

- suppose high-ability workers can get a degree at cost of c to attend college
- low-ability workers cannot graduate from college
- thus, degree is a signal of ability
- outcome is a *separating equilibrium*: one type of people take actions (send a signal) that allow them to be differentiated from other types of people
  - high-ability workers get w_h
  - low-ability workers get w_l

Is separating equilibrium possible?

- high-ability people have a choice whether they go to college
- pays if
  - $w_h - c > w_l$, or
  - $w_h - w_l > c$
- get separating equilibrium if
  - c = \$15,000; w_h = \$40,000; w_l = \$20,000, so
  - $w_h - w_l$ = \$20,000 > c = \$15,000

Is pooling equilibrium possible?

- in a pooling equilibrium, all workers are paid average wage, $\bar{w}$
- high-ability worker
  - without a degree get average wage
  - with a degree get w_h
- thus, they do *not* go to college if benefit is less than cost: $w_h - \bar{w} < c$
- if so, get pooling equilibrium

Solved problem

For what values of θ is a pooling equilibrium possible in general?

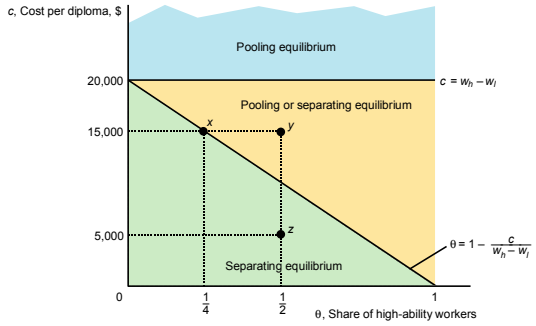
Answer

- determine values of θ for which it pays for a high-ability person to go to college
- does *not* go if $\bar{w}$
- or
- or $\theta > 1 - \frac{\bar{w}}{c}$
- if almost everyone has high ability (θ large), a high-ability person does not go to school

Unique or multiple equilibria

- only one type of ability or both may be possible
- only pooling is possible if schooling is costly: $c > w_h - w_l$
- only a separating equilibrium is possible if there are few high-ability workers $\theta < 1 - c/(w_h - w_l)$

Figure 19.2 Pooling and Separating Equilibria



Efficiency

in separating equilibrium, high-ability people's education is

- privately useful
- socially wasteful

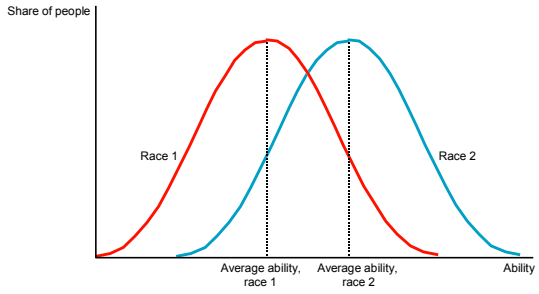
Everyone may lose in a separating equilibrium

- at point y
  - $c = \$15{,}000$; $w_h = \$40{,}000$; $w_l = \$20{,}000$; $c = \$15{,}000$; $\theta = ½$
  - can get separating or pooling equilibrium
- in pooling equilibrium, everyone earns $\overline{w} = \$30{,}000$
- in separating equilibrium,
  - high-ability workers get $w_h - c = \$25{,}000$
  - low-ability workers get $w_l = \$20{,}000$

Screening in hiring

- employers use interviews and tests to identify high-ability employees
- statistical discrimination: employer believes than an individual's gender, race, religion, or ethnicity is a proxy for ability

Figure 19.3 Statistical Discrimination



Statistical discrimination

- employer may use this approach even knowing correlation between ability and proxy is imperfect
- employer may deny being prejudiced – only interested in maximizing profit
- false beliefs can persist even if ability distributions are same across groups
- lowers social welfare: keeps skilled members of discriminated against group out of appropriate jobs