Part 4: Market Failure II - Asymmetric Information Adverse Selection and Signaling

Adverse Selection, Lemons Market, Market Breakdown,
Costly Signals, Signaling, Separating Equilibrium

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Adverse Selection

Market Failure

stylized facts:

- used cars, even if they are like new, sell far below their dealership price

- laid-off workers experience longer spells of unemployment than workers without a job for different reasons (e.g. military)

- private health care for the elderly is essentially unavailable

- corporate (group) rates for insurance policies are lower than individual rates

- initial public offerings (IPOs) are severely underpriced: first year average return $> 15\%$

What do these empirical regularities have in common?

The Lemons Market

A Model

- Akerlof (1970): asymmetric information about quality in the market for used cars (market for lemons)

- two parties: seller S and buyer B, both risk neutral

- seller owns a car, which can have two qualities q, each with equal probability

    - car is peach (mint condition) $q = q_H$

    - car is lemon (accident car) $q = q_L$

- a peach is worth
$$v^B(q_H) = 4000 \text{ to } B$$
$$v^S(q_H) = 3000 \text{ to } S$$

- a lemon is worth
$$v^B(q_L) = 1000 \text{ to } B$$
$$v^S(q_L) = 500 \text{ to } S$$

$\Rightarrow$ efficient allocation is car is sold regardless of quality

Analysis

1. Perfect Information

- **both** buyer and seller observe quality q_i, $i = H, L$

- negotiate price
  $$p_H \in [3000, 4000] \text{ if } q = q_H$$
  $$p_L \in [500, 1000] \text{ if } q = q_L$$

$\Rightarrow$ efficient trade, car is sold (Coasian bargaining)

2. Imperfect but Symmetric Information

- **neither** buyer **nor** seller observe quality q_i, $i = H, L$

$\rightarrow$ price p can no longer depend on quality

- expected valuations are $E(v^B) = 2500$ and $E(V^S) = 1750$

- negotiate price $p \in [1750, 2500] \Rightarrow$ efficient trade, car is sold

Analysis (Cont'd)

3. Imperfect and Asymmetric Information

- **only** seller, **not** buyer, observes quality q_i, $i = H, L$

- suppose car is peach, $q = q_H$

- for seller to sell car (knows it's a peach), need

$$p \geq v^S(q_H) \Leftrightarrow p \geq 3000 \qquad (\star)$$

- for buyer to buy car (doesn't know it's a peach), need

$$p \leq E(v^B) \Leftrightarrow p \leq 2500 \qquad (\star\star)$$

- $(\star)$ and $(\star\star)$ are incompatible: there is **no** price that buyer and seller find mutually acceptable

$\Rightarrow$ peach cannot be not sold $\rightarrow$ inefficient trade!

Market Breakdown

what is going on...?

- at $p \geq 3000$ there is excess supply

$\rightarrow$ prices must fall to equate demand and supply

- but:
    - seller **must** have a lemon if accepts prices $p < 3000$
    - buyer **knows** that car is lemon if offered for $p < 3000$

- for lemons, buyers are willing to pay at most $p \leq 1000$

$\Rightarrow$ only prices $p \in [500, 1000]$ are mutually acceptable

- but at those prices, peaches are no longer in the market

$\Rightarrow$ **only** lemon is sold, peach is **not** sold $\rightarrow$ peach market breaks down!

Summary

Adverse Selection

- market where some participants know more about 'quality' of the good than buyers

- examples:
    - labor markets, credit markets, insurance markets,
    - stock markets, corporate equity (IPO's), dating and marriage markets

- sellers not finding a buyer will want to lower their prices

- but if price falls, high quality sellers will drop out of the market = adverse selection

$\Rightarrow$ average quality deteriorates as price falls

$\Rightarrow$ maximum price buyers are willing to pay falls and price falls further $\Rightarrow$ market may disappear entirely

adverse selection can lead to total market failure – if trade occurs, it will be less than efficient

Adverse Selection

- in markets with adverse selection (asymmetric information)
  - prices are correlated with quality
  - prices serve dual role of info transmission and market clearing
- insitutional/market responses against market failure caused by adverse selection
  - signaling and screening devices, e.g. warrantees
  - reputation (brand names and chains)
  - experts, inspections, standards, certification
  - mandatory insurance (health, automobile)
  - liability laws

Signalling

Using a Signal

- asymmetric information causes market failure

- $\rightarrow$ everybody (even those who have an informational advantage over others) may be worse off
  expl.: sellers in lemons market, consumers in insurance market

- those (sellers) who have superior information about a good may want to **convey** this information to others (buyers)

- problem: information conveyed must be **credible**

  - $\rightarrow$ use of signals

- examples:
  - warranties
  - lineups
  - peacock tail

- **but:** for the signal to work, it must be costly to fake

Education as a Signal

A Model

- Spence (1974): asymmetric information about ability in job market

- two parties: worker W and employer E, both risk neutral

- worker's ability (=marginal product) a can either be high or low, each with equal probability

    - high productivity worker is worth $a = a_H$ to E

    - low productivity worker is worth $a = a_L$ to E

    with $\quad a_H > a_L$

- worker can invest in education (college degree) or not

- cost of obtaining degree is $\quad c_H$ if $a = a_H$

    with $\quad c_H < c_L \qquad c_L$ if $a = a_L$

A Model (Cont'd)

- assumptions:

  - competitive labor market $\rightarrow$ wage = marginal product

  - no dis-utility of labor

  - education no effect on productivity

  $\rightarrow$ efficient allocation is worker works for employer and does **not get degree**

1. Perfect Information

- **both** worker and employer observe ability a_i, $i = H, L$

- firm offers wage $\quad w_H = a_H$ if $a = a_H$
  $$w_L = a_L \text{ if } a = q_L$$

- wage will be independent of education

$\rightarrow$ worker won't invest in education $\Rightarrow$ efficient

Analysis

2. Imperfect but Symmetric Information

- **neither** worker **nor** firm observe ability a_i, $i = H, L$

  $\rightarrow$ wage w can no longer depend on ability
  ... will it depend on education?

- suppose $w^{degree} > w^{nodegree}$

- worker's problem (doesn't know cost): get degree if

$$w^{degree} - w^{nodegree} > \frac{1}{2}c_H + \frac{1}{2}c_L$$

- **but**: education decision is independent of ability

$\rightarrow$ firm will offer expected marginal product
  $w^{degree} = w^{nodegree} = \frac{1}{2}a_H + \frac{1}{2}a_L$ independent of education

$\rightarrow$ worker won't invest in education $\Rightarrow$ efficient

Analysis (Cont'd)

3. Imperfect and Asymmetric Information

- **only** worker, **not** employer, observe ability a_i, $i = H, L$
  $\rightarrow$ wage w again cannot depend on ability
  ... will it depend on education?

- suppose firm beliefs able workers get degree, unable workers do not
  $\rightarrow$ offers wages $\quad w^{degree} = a_H \qquad\qquad\qquad w^{nodegree} = a_L$

- worker's problem (knows ability a_i)

  get degree if

  $$w^{degree} - w^{nodegree} > c_i \;\Leftrightarrow\; a_H - a_L > c_i, \quad i = H, L$$

$\Rightarrow$ able worker gets degree, unable worker gets no degree if

$$c_H < a_H - a_L < c_L \qquad\qquad\qquad\qquad (\star)$$

Equilibrium

- if ($\star$) holds:

    - firm's **beliefs** about worker are **confirmed**

    - firm **offers competitive wages** given beliefs

    - worker **maximizes utility** given wages

    - workers are **separated** by education decision:

        - high ability workers get degree
        - low ability workers do not get degree

$\Rightarrow$ situation is a (separating) equilibrium

Equilibrium

- in this equilibrium, unproductive education is used as a signal:

  - information about ability is **credibly** conveyed to employer

  - allocation is **inefficient**

in a separating equilibrium, workers use education to signal high ability; the signal only works because it is more costly for low ability workers to send the same signal

Market Failure

Wasteful Signaling

- individuals who hold relevant private information can sometimes use signals to convey this information

- signal only works (information only credible) if sending the same signal is too costly for other individuals

- signal is costly $\rightarrow$ sending signal is inefficient

- examples of socially wasteful signaling

  - labor markets (signal = education)

  - consumer product markets (signal = warranty, advertisements, price)

  - corporate equity markets (signal = debt/equity ratio)

  - legal disputes (signal = pre-trial settlement demands)

  - bargaining (signal = rejection of offer/delay)

  - live entertainment and restaurants (signal = lineups)

  - marriage and dating (signal = fancy car)