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Introductory Microeconomics ECO/4002Y

Asymmetric information

Outline

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- Topics
  - Information, principal and agents
  - Hidden actions: Moral hazard
  - Hidden information: Adverse selection
  - Additional slides
    - Signaling

Questions

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- Why do top university students end up with top jobs (on average)?
- Why are sales agents' salaries are linked to sales, while sales clerks at the stores are paid a fixed salary?
- Why do we have probations and promotions?
- Why don't good used cars fetch good prices?

The nature of information

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- A prospective employee has better information about his/her weaknesses than a prospective employer, and the employee has all the incentives to hide it

- Knowing that the employer will be conservative in making a hiring decision

- Thus, the prospect of a trade is restricted: Asymmetric information causes market failure

Agency theory

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- A rational employer is a principal who wants her employee (who is an agent) to do certain work in such manner (e.g. diligently) that benefits the principal

- A rational employee may or may not find in his best interest to carry out the work as wanted by the principal (e.g. he might prefer to work at a relaxed pace)

- The rational principal may not be able to determine whether the rational agency (worker) has worked diligently or sincerely (information is asymmetric)

Principal-agent problem

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- Most commonly the principal and the agent will have different objectives
- Principal wants more profit, and the agent wants higher wage
- This is known as the Agency Problem
- There are two types of agency problems:
  - Hidden action (*Moral hazard*)
  - Hidden information (*Adverse selection*)

Asymmetric Information

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- When two parties to a transaction have different information.

- Adverse Selection
  - When an informed person has an advantage through an unobserved characteristic.
  - Eg a disproportionately large number of unhealthy people buy life insurance.

- Moral Hazard
  - When an informed person has an advantage through an unobserved action.
  - An insured car driver drives faster.

Moral Hazard

Hidden action

Hidden action

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- When the principal cannot fully observe the **actions** taken by the agent, and the outcome of the agent's actions does not allow the principal to conclude what actions the agent might have taken, the agent will take actions that suit him/her best rather than the principal.

- This type of agency problem is called the **moral hazard problem**, often referred to as the 'hidden action' problem

Moral Hazard (Hidden Action)

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- Consider the case of door-to-door sales campaign for an energy company
  - The success of the sales company depends on a number of factors: reputation of the company, willingness of the consumers to switch from their current supplier, and above all how persuasive the sales agents are
  - But how can the employing company determine whether the sales agent gave sincere effort in his/her sales campaign?
  - If the number of switches is high, it can be attributed to (1) dissatisfaction of the customers with rival suppliers (being lucky), and/or (2) hard effort of the sales agent
  - If the number of switches is low, it can be attributed to (1) satisfaction of the customers with rival suppliers (being unlucky) and/or (2) laziness of the sales agent

Other Examples

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- Employees not giving enough effort, but getting away by pretending to do so
- Teacher not teaching sincerely, but blaming students
- Students not studying hard, but blaming teacher
- US doctors protecting themselves from malpractice suits by practicing conservative medicine (too many tests paid by the patient)
- Brokers encouraging to trade too frequently (trading generates commissions)
- Senior executives pursuing status, or job security, rather than stockholders' interests
- Driving carelessly after buying car insurance

Solutions: Monitoring

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- The amount and quality of employees' efforts are difficult to monitor
- The results of efforts may be more easily observed, and monitored
- Managers may be effectively monitored by markets (replaced if they do a poor job)
- Problems with employees
  - Contracts are typically 'incomplete'
  - Who will monitor the monitor?

Solutions: Incentive contracts

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- The employee's salary could be linked to the outcome (revenue, output, profit)
  - Paying on commission rather than a fixed fee encourages the agent to work hard (banker's bonus or stock option)

- Incentive plans based on direct measures of individual contributions (including potential losses…)
  - Bonds: Ross Perot's computer service company required trainees who resigned within three years of joining the firm to pay the firm $12,000 (an engineer's annual salary in the 70's), so they would not receive costly training and leave immediately

- Bringing the market inside the firm: promotions, tournaments, employee of the month.
  - It reduces the cost of monitoring and the informational requirements

So, what?

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- The theory of the firm revisited…
- Moral hazard causes market failure!
- Insurance market is plagued with moral hazard problems
- Once a rational insurer takes out a policy (on motor insurance) his incentive to be careful diminishes
  - Knowing that, rational insurance companies charge more Rational motorists end up buying less cover than they should
  - Either few insurance firms can stay in business too long or few motorists buy due cover (market failure)

Moral Hazard in Health Insurance
Problems in Insurance

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- If being insured affects behavior in such a way that the expected payout from the insurance company is increased, this is called moral hazard
  - Health insurance reduces the cost of the expenditure (medical care) associated with adverse outcome, e.g. illness
  - If the demand for medical care is the usual downward sloping function, and if health insurance reduces the price of medical care, being insured would tend to lead to the use of more medical care, everything else being held constant
  - If the insurance company pays half the bill and the insured pays the other half (e.g. has a 50% coinsurance), then the demand curve rotates on the x-axis
  - Main form of moral hazard associated with having health insurance is increased use of medical care by an individual or family
  - How much moral hazard is induced depends on the coinsurance rate and the elasticity of demand for the medical service

Moral Hazard in Health Insurance Deadweight Loss

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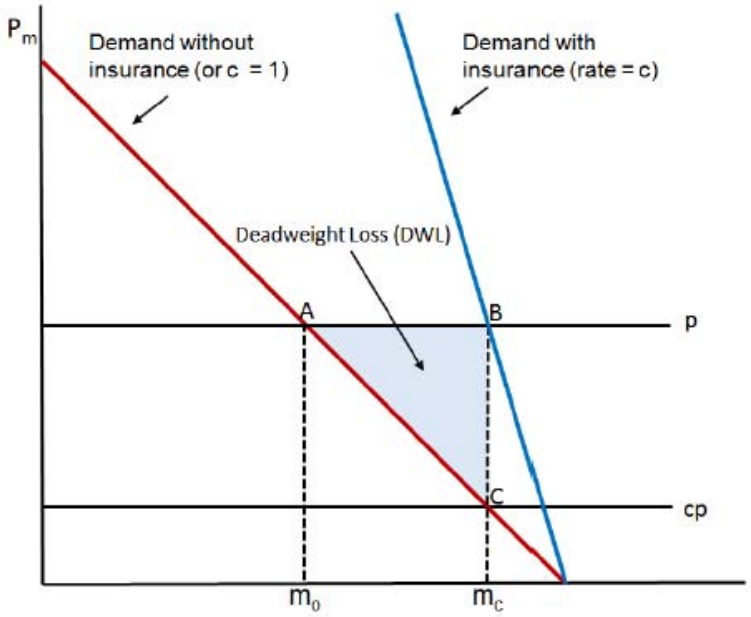
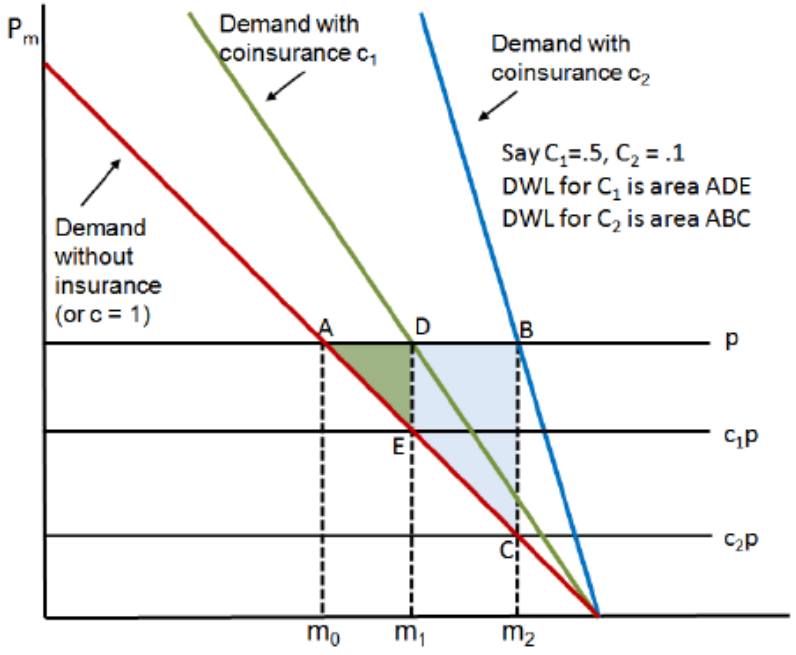
- Moral hazard relates to any change in behavior that occurs in response to a contractual arrangement (here the decision to insure)
  - Without insurance, the consumer would pay the full price p and purchase m_0 units of medical care
  - With coinsurance rate of c, the consumer pays cp per unit and purchases m_c units of medical care
  - Consuming additional units $m_c - m_0$ has an incremental cost equal to area of rectangle m_0ABm_c and an incremental benefit given by area m_0ACm_c



- The difference between these areas, given by the triangle ABC is a loss in well being (called a deadweight loss), because the incremental resource cost exceeds the incremental benefit

Moral Hazard in Health Insurance Coinsurance

- Deadweight loss increases with deeper coverage (lower value of coinsurance)
  - For coinsurance rate c_1 (say 50%), deadweight loss is area given by triangle ADE
  - For coinsurance rate c_2 (say 10%), deadweight loss is area given by triangle ABC
  - Deadweight loss associated with c_2 is grater than that associated with c_1



Moral Hazard in Health Insurance
Price Responsiveness

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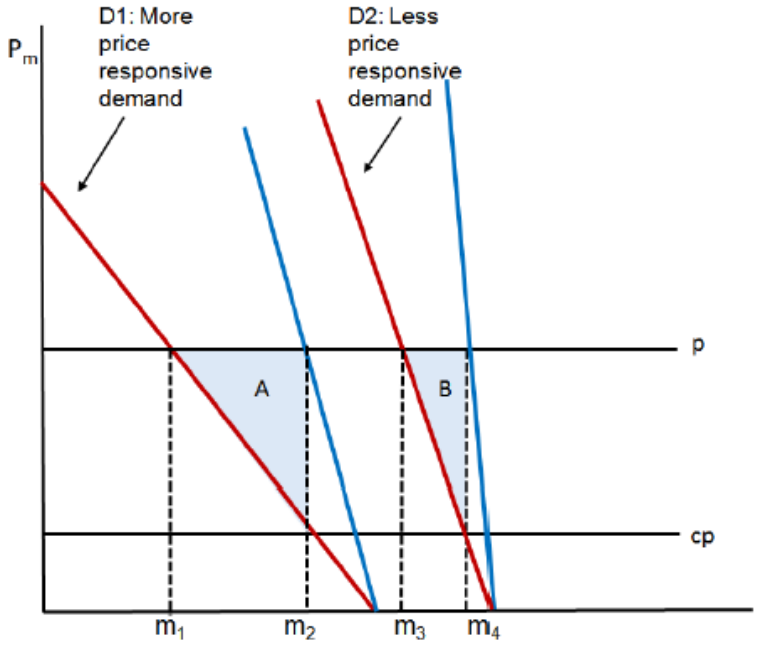
- Deadweight loss is larger for medical services with more elastic demand
  - Let *D*1 be the demand for a medical service that is more price responsive – the associated deadweight loss is given by area marked A
  - Let *D*2 be the demand for a medical service that is less price responsive – the associated deadweight loss is given by area marked B
  - Deadweight loss associated with *D*1 (more elastic demand) is greater than that associated with *D*2 (less elastic demand)



Moral Hazard in Health Insurance
Elasticity of Demand and Coinsurance

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- We can combine link between coinsurance, elasticity of demand and welfare loss due to moral hazard into one statement
  - It can be shown that for linear demand curves, the deadweight loss due to a coinsurance rate of c is will equal

$$\text{DWL} = \frac{\eta(1-c)^2 pm}{2}$$

  - where η is the elasticity of demand for medical care, c is the coinsurance rate, p is the price of medical care and m is the level of medical that the insured patient will consume
  - Deadweight loss will be larger for medical services with more elastic demand but this can be offset with less complete coverage (i.e. larger values of co-insurance rate)

Adverse selection

Hidden information

The problem of hidden information

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- In some cases, the principal may not know (or easily determine) certain information that the agent knows

- This is called adverse selection (or the problem of hidden information)
  - Trying to pass off a 'bad' used car (a lemon) as a 'good' car
  - Worker pretending to be 'highly skilled', while he is not, or claiming to be highly motivated, while he is not

The lemon problem

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- For some products there is no easy way to transmit information
  - Nobel laureate George Akerlof introduced the idea of asymmetric information in the pre-owned, used car market in 1970

- Lemons Problem in Used Cars
  - If we can't distinguish between "good" and "bad" (lemons) used cars, we are willing pay only an average of good and bad car values
  - Result: Good cars won't be sold, and the used car market will function inefficiently.

- The logic is simple
  - If the price is low, buyers think the car is bad
  - If the price is high, buyers think it cannot be good (why is the owner selling it?)

- Sellers cannot signal car's quality through prices!!

A numerical example

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- Sellers are willing to sell cars at the following (minimum) prices:
  - 800 if the car is bad (L) [50%]
  - 1,600 if the car is good (H) [50%]

- Buyers are willing to buy cars at the following (maximum) prices:
  - 1,000 if the car is bad (L) [50%]
  - 2,000 if the car is good (H) [50%]

- Room for market exchange?

A numerical example

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- Rational sellers always 'sell' good cars because buyers don´t know about its true quality (asymmetric information)

- Market exchange?
  - Sellers charge the average price buyers are willing to pay:
  - $p_s = .5 \times 1000 + .5 \times 2000 = 1500$
  - Buyers expected value is non-negative and sellers make an average profit $(1500 - 1200)$

- Market failure
  - Rational sellers looking for high quality cars anticipate that no good cars sold below 1,600 (below min price): they don´t buy
  - Rational sellers looking for low quality cars will never pay 1,500 (above max price): they don't buy

Market failure

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- Very few (no) good cars will be placed for sale, and very few (no) buyers will be willing to pay good price
- The bad cars will crowd out the good cars (market failure)
- It is a *deal gone sour* (the lemon problem)

Solutions?

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- Why are dealers of new cars also successful in selling old cars?
- Buyers tend to believe that the seller has sold it back to the dealer probably to buy a new car, not because the car was necessarily bad.
- Thus they are willing to pay a bit more. The dealer also has reputation at stake.

Solution to adverse selection
Screening and Signalling

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- Employment situation (use of screening contracts):

- Screening through tests, probation clause (will be made permanent subject to review of performance)

- Attracting only motivated workers by putting clauses like travelling required in job adverts

Solution to adverse selection
Screening and Signaling

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- A high productivity individual often uses his/her own educational achievements (a degree from Oxford, for instance) as a signal for being 'better than others'
  - Exam scores, university ranking, summer internship

- Product quality: product warranty gives a signal of quality, so does low fees for after sales service

- Solicitors and estate agents signal their success and sincerity through expensive clothing

- British Universities relative to Universities in other countries…

Application of Lemons Principle Health Insurance

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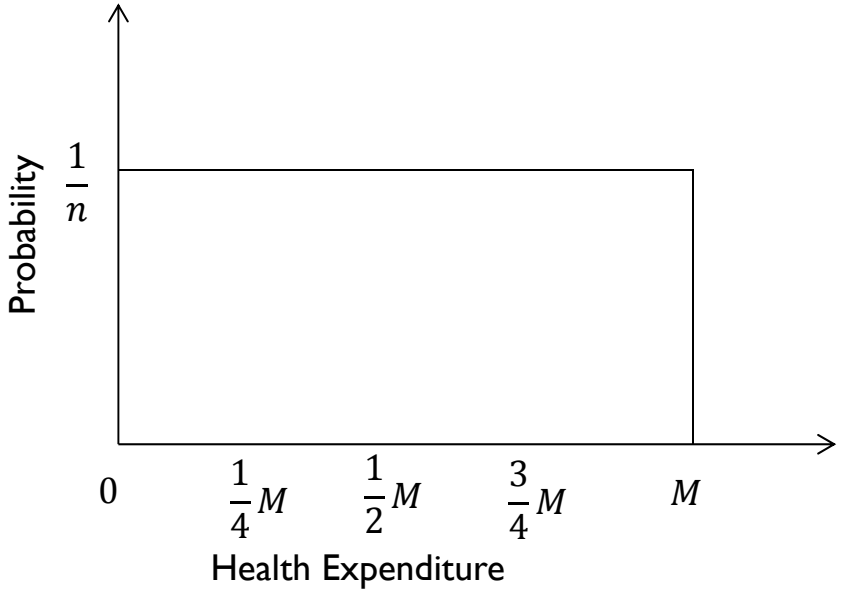
- Information asymmetry will occur because potential insured persons know more about their expected health expenditures in the coming period than does the insurance company.

- Adverse selection exists when people who are more likely to buy insurance or policies with more extensive coverage are also more likely to use more insured medical services.

- Adverse selection in an insurance pool will:
  - Drive up the price of insurance premiums, causing those who expect to purchase fewer insured services (the younger and healthier) to drop out of the pool.
  - May lead to a "Death Spiral" - the pool of insured will become smaller and smaller, with only the high risk members of the pool remaining, in which case, the insurer may discontinue marketing the product, since the market has shrunk.

Application of Lemons Principle Health Insurance

- Population of size n and each person has a probability of being sick of $1/n$. Let the horizontal axis represent the expected health expenditure – ranges from $0\ to\ \$M$ – for each person.
- If the insurance company sets the premium to be $0, all persons would buy insurance – but the insurance company, expecting an average expenditure of $(1/2M)$, would require a premium of a least $(1/2)M$.
- If the insurance company sets a higher premium, say $(1/2)M$, beneficiaries whose expected expenditure is less than $(1/2)M$ would not insure. The expected cost to the insurance company for the remaining would be $(3/4)M$ thus they would need to raise the premium to $(3/4)M$.



- If the insurance company sets a higher premium, say $(3/4)M$, beneficiaries whose expected expenditure is less than $(3/4)M$ would not insure. The expected cost to the insurance company for the remaining would be (3/4)M thus they would need to raise the premium to $(.875)M$.
- And so on …

Takeaway messages

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- Asymmetric information generates market failure whenever rational principal and rational agents don't share the same goals
- Hidden action generates moral hazard problems: too little insurance (and too much shrinking!)
- Hidden information generates adverse selection problems: too little exchanges (and expensive health insurance, see below)
- Solutions associated to both problems

Extra Slides

Signaling

Signaling

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- Adverse selection is an outcome of an informational deficiency.
- What if information can be improved by high-quality sellers signaling credibly that they are high-quality?
- E.g. warranties, professional credentials, references from previous clients etc.

Signaling

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- A labor market has two types of workers; high-ability and low-ability.
- A high-ability worker's marginal product is a_H.
- A low-ability worker's marginal product is a_L.
- $a_L < a_H$.

Signaling

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- A fraction h of all workers are high-ability.
- $1 - h$ is the fraction of low-ability workers.

- Each worker is paid his expected marginal product.
- If firms knew each worker's type they would
  - pay each high-ability worker $w_H = a_H$
  - pay each low-ability worker $w_L = a_L$.

- If firms cannot tell workers' types then every worker is paid the (pooling) wage rate; i.e. the expected marginal product $w_P = (1 - h)a_L + ha_H$.

Signaling

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- $w_P = (1 - h)a_L + ha_H < a_H$, the wage rate paid when the firm knows a worker really is high-ability.

- So high-ability workers have an incentive to find a credible signal.
- Workers can acquire "education".
- Education costs a high-ability worker c_H per unit and costs a low-ability worker c_L per unit.
- $c_L > c_H$.

Signaling

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- Suppose that education has no effect on workers' productivities; i.e., the cost of education is a deadweight loss.

- High-ability workers will acquire e_H education units if
  (i) $w_H - w_L = a_H - a_L > c_H e_H$, and
  (ii) $w_H - w_L = a_H - a_L < c_L e_H$.

- (i) says acquiring e_H units of education benefits high-ability workers.
- (ii) says acquiring e_H education units hurts low-ability workers.

Signaling

- For both $a_H - a_L > c_H e_H$ and $a_H - a_L < c_L e_H$ to be true, we must have $\frac{a_H - a_L}{c_L} < e_H < \frac{a_H - a_L}{c_H}$.

  – Acquiring such an education level credibly signals high-ability, allowing high-ability workers to separate themselves from low-ability workers.

- Q: Given that high-ability workers acquire e_H units of education, how much education should low-ability workers acquire?
  – A: Zero. Low-ability workers will be paid $w_L = a_L$ so long as they do not have e_H units of education and they are still worse off if they do.

Signaling

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- Signaling can improve information in the market.
- But, total output did not change and education was costly so signaling worsened the market's efficiency.
- So improved information need not improve gains-to-trade.