Public Economics
Imperfect information

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Asymmetric Information

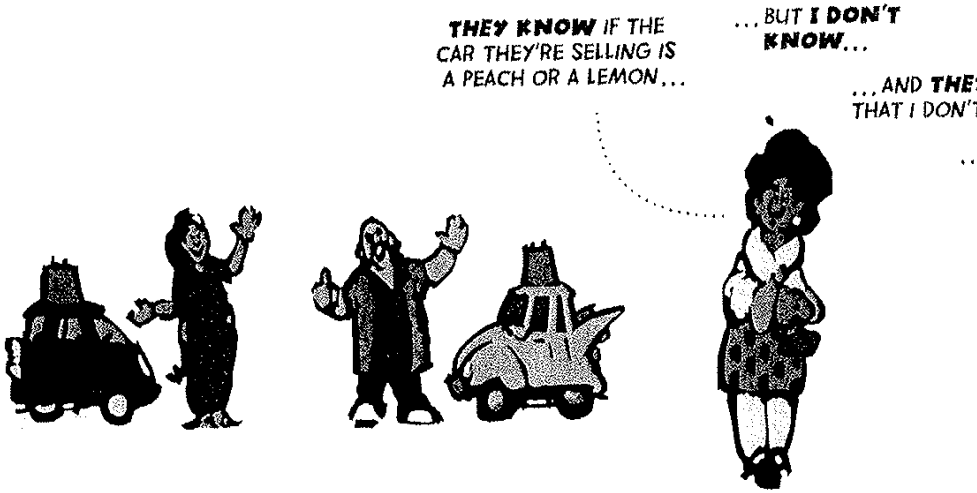
Def. *Asymmetric information* is related to situations where one economic agent knows something that another economic agent doesn't $\Rightarrow$ this leads to an inefficient outcome.

Definitions

Adverse selection, refers to situations where one side of the market can't observe the "type" or "quality" of the goods on other side of the market.

$$\Downarrow$$

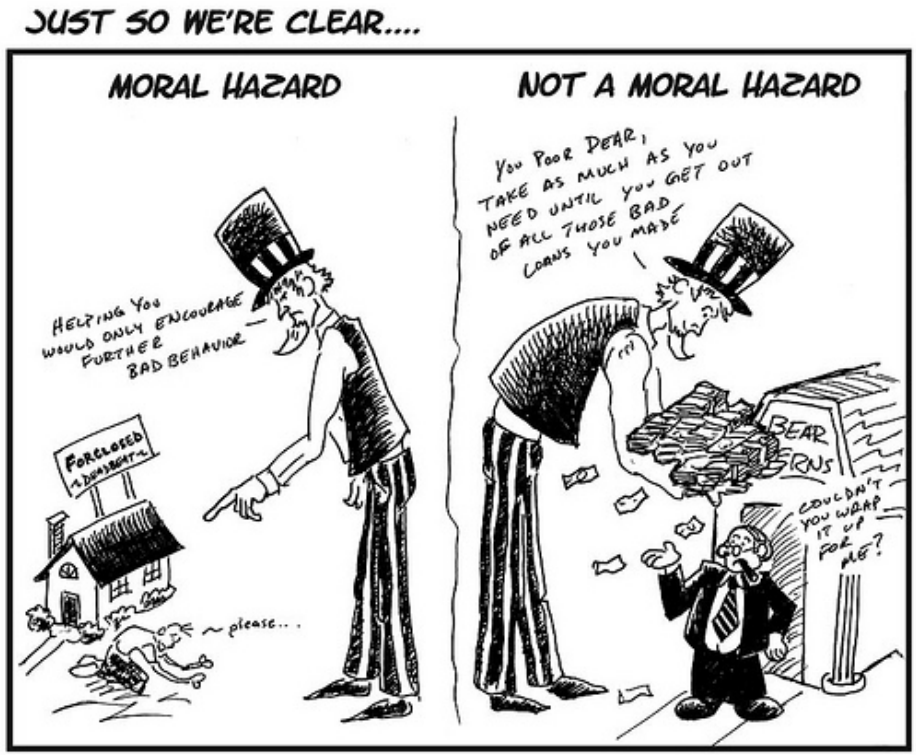
This leads to a hidden information problem.



Moral hazard, refers to situations where one side of the market can't observe the *"actions"*.

$$\Downarrow$$

This leads to a hidden action problem.



Or said in different words when one party is able to take some action that affects the quality of a good or a contract and this action cannot be observed by the other party.

The Market for Lemons

Akerloff (1970) "*The Market for Lemons : Quality Uncertainty and the Market Mechanism*".

- Consider a market with 100 people who want to sell their used cars and 100 people who want to buy a used car.
- Everyone knows that 50 of the cars are "plums (good quality)" and 50 are "lemons (bad quality)". The current owner of each car knows its quality, but the prospective purchasers don't know whether any given car is a plum or a lemon.
- The owner of a lemon is willing to part with it for 1000 and the owner of a plum is willing to part with it for 2000.
- The buyers of the car are willing to pay 2400 for a plum and 1200 for a lemon.
- The lemons will sell at some price between 1000 and 1200 and the plums will sell at some price between 2000 and 2400.

Problem

What happens to the market if the buyers can't observe the quality of the car?

- The probability of a car being plum is $q = \frac{1}{2}$.
- Expected (average) value of a car will be:

$$Ec = qp_l + (1-q)p_h = \tfrac{1}{2}1200 + \tfrac{1}{2}2400 = 1800$$

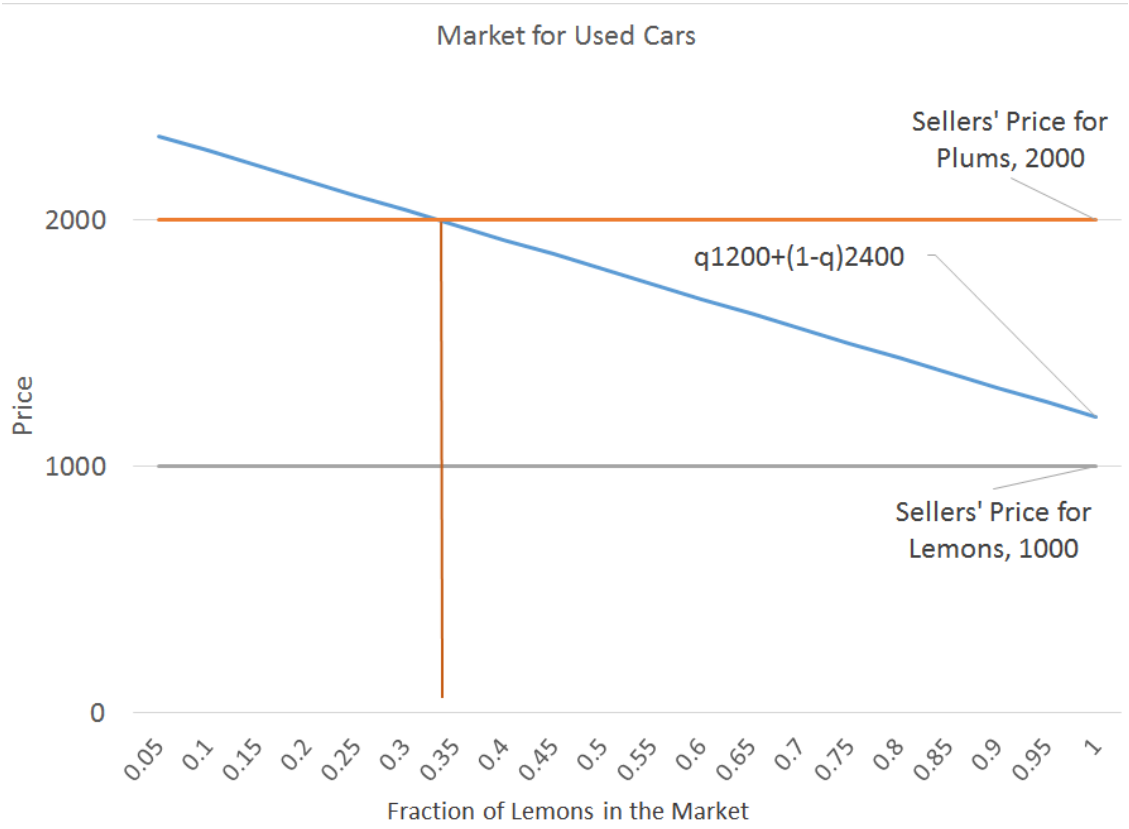
- At a price of 1800 only lemons would be offered for sale.
- No market for good quality cars. Lemons will dominate the market.
- Gresham's Law "Bad money drives out good".

Market Failure. The problem is that there is an **externality** between the sellers of good cars and bad cars $\Rightarrow$ when an individual decides to try to sell a bad car, he affects the purchasers' perceptions of the quality of the average car on the market.

- Market Failure due to information asymmetry: Sellers know the quality of their car, while buyers do not know the quality of car on the market.

No Market Failure $\Rightarrow$ perceptions of buyers (condition).

- $Ec \geq p_h^s = qp_l + (1-q)p_h$
- $2000 = q1200 + (1-q)2400 \rightarrow q \leq \frac{1}{3}$



Adverse selection in Insurance Market

Assumption (1)

- Consider an insurance market and a large population of customers. These are of two types customers:
  - *high* risk, in proportion μ,
  - *low* risk, in proportion $1 - \mu$.
- The customers' type is their own private information.
- The customers are risk adverse.

Assumption (2)

- Insurance companies offer a combination of *insurance premium* p, that customers have to pay in order to get *coverage* c (net of the premium) is something bad happens.
- Assume for simplicity that there can be two relevant states of nature that can occur:
  - a *good* state,
  - a *bad* state.

Assumption (3)

Assume that all consumers will get the endowment:

- w_g^0 if the good state occurs,
- w_b^0 if the bad state occurs.

Nature draws the bad state with different probabilities for the two types of customers:

- ρ_l for the low risk type,
- ρ_h for the high risk type.

with $\rho_h > \rho_l$.

Assumption (3)

An **insurance company** offers contracts with premia p and coverage c based on the average risk.

For the low risk type we have:

$$\begin{cases} w_g^l = w_g^0 - p & \text{with probability} \quad 1 - \rho_l \\ w_b^l = w_b^0 + c & \text{with probability} \quad \rho_l \end{cases} \tag{1}$$

and for the high risk type we have:

$$\begin{cases} w_g^h = w_g^0 - p & \text{with probability} \quad 1 - \rho_h \\ w_b^h = w_b^0 + c & \text{with probability} \quad \rho_h \end{cases} \tag{2}$$

Problem

The insurance company will get the following expected profit:

$$E[\pi] = \begin{cases} \rho_h(-c) + (1-\rho_h)p & \text{from high risk customers} \\ \rho_l(-c) + (1-\rho_l)p & \text{from low risk customers.} \end{cases} \tag{3}$$

Let's assume that customers are risk adverse. The insurance company will unavoidably select customers:

- the high risk customers will be more willing to buy coverage,
- the low risk customers will be less willing to buy coverage, in the limit of $\rho_l = 0$, they do not need coverage at all!

This means that an **adverse selection** occurs.

Market Failure

- If insurance companies would know the type, they could set:
  - contracts (p_l, c_l) for the low risk type,
  - contracts (p_h, c_h) for the high risk type.
- We can expect that, once the state of nature has been drawn most claims will be made by the high risk customers, for which the bad state occurs with higher probability.
- Insurance companies will anticipate this **adverse selection**, and set premia and coverage in a way to avoid negative expected profits.
- Doing so, they **will crowd out low risk customers**. In particular, this **hidden information** prevents an efficient allocation of contracts.

$$\Downarrow$$

Instead, a **market failure** occurs.

Different scenario... $\Rightarrow$ **Moral Hazard**

Let's consider now a modified scenario, where there is only one type of customer, and a given risk that the bad state of nature occur.

- Now there is not hidden private information, and there can not be adverse selection, because there is no type to select.
- However, there are *hidden* actions: customers who have bought an insurance have less incentives to make sure that the bad state of nature does not occur, and act with less preventive measures.
- For instance, drivers can drive with less care, and bicycle owners may not bother locking their bicycle safely.

This lack of incentive to take care is called **moral hazard**.

- Consider the **bicycle-theft insurance market** again and suppose for simplicity that all of the consumers live in areas with identical probabilities of theft, so that there is no problem of adverse selection. On the other hand, the probability of theft may be affected by the actions taken by the bicycle owners.
- If a consumer can purchase bicycle insurance, then the cost inflicted on the individual of having his bicycle stolen is much less. If the bicycle is stolen then the person simply has to report it to the insurance company and he will get insurance money to replace it. In the extreme case, where the insurance company completely reimburses the individual for the theft of his bicycle, the individual has no incentive to take care at all.
- Buying an insurance policy may make the buyer more likely to take exactly the risks that are now insured.

Moral Hazard Tradeoff

- too little insurance means that people bear a lot of risk,
- too much insurance means that people will take inadequate care.

- If the amount of care (action) is observable, then there is no problem. The insurance company can base its rates on the amount of care taken.
- In general, the insurance companies will not want to offer the consumers "complete" insurance. They will always want the consumer to face some part of the risk.

Possible solutions

The fundamental feature of asymmetric information is the inability to distinguish the good from the bad items' quality or behaviour.

- **Compulsory insurance policy**.
- **Screening**.
- **Signaling**.

Compulsory insurance policy (1)

The government can avoid the adverse selection process by which only the high risk customers buy an insurance.

$$\Downarrow$$

Compulsory insurance policy: forcing all individuals to buy an insurance, e.g.:

- automotive insurance,
- employee protection insurance,
- health care insurance,
- unemployment insurance.

Compulsory insurance policy (2)

Are the consumers better off?

- High-risk consumers benefit from a lower premium than the actual risk.
- Low-risk consumers can buy a policy at more favorable premium than that offered if only high-risk people purchased it.
- Only the very low-risk are made worse off - they would rather have no insurance than pay the average premium.

Screening

Mechanism that can be used by Insurance companies to **distinguish between the high-risk and low-risk customers**.

- The insurance companies are able to **tailor insurance policies for each type of consumers**, and hence avoid the pooling of risks.
- The insurance companies offer a menù of different contracts designed so that each type risk self selects the contract designed for it.
- *By self select*, the consumers find it in their own interest to select the contract aimed for them:
  - high-risks: full insurance coverage at high premium,
  - low-risks: partial coverage at a low premium requiring them to bear part of the loss

$$\Downarrow$$

Separating equilibrium $\rightarrow$ different types of consumers buy different contracts.

Signaling

- One sensible signal in this context would be for the owner of a good used car to offer a **warranty/insurance**. This would be a promise to pay the purchaser some agreed upon amount if the car turned out to be a lemon.
- Owners of the good used cars can afford to offer such a warranty while the owners of the lemons can't afford this.
- This is a way for the owners of the good used cars to signal that they have good cars.
- But there are other cases where signaling can make a market perform less well.

Educational Signaling - Problem

- Suppose that we have two types of workers, able and unable.
- The able workers have a marginal product of a_2, and the unable workers have a marginal product of a_1, where $a_2 > a_1$.
- Suppose that a fraction b of the workers are able and $(1 - b)$ of them are unable.
- If worker quality is easily observable, then firms would just offer a wage of $w_2 = a_2$ to the able workers and of $w_1 = a_1$ to the unable workers. That is, each worker would be paid his marginal product and we would have an efficient equilibrium.

Problem

- But what if the firm can't observe the marginal products?
- If a firm can't distinguish the types of workers, then the best that it can do is to offer the average wage, which is $w = (1 - b)a_1 + ba_2$.

Educational Signaling - Solution (1)

- Suppose now that there is some signal that the workers can acquire that will distinguish the two types.
- For example, suppose that the workers can acquire education.
- Let e_1 be the amount of education attained by the type 1 workers and e_2 the amount attained by the type 2 workers.
- Suppose that the workers have different costs of acquiring education.
- The total cost of education for the able workers is $c_2 e_2$ and the total cost of education for the unable workers is $c_1 e_1$.
- Suppose that $c_2 < c_1$.
- This says that the marginal cost of acquiring education is less for the able workers than the unable workers.

Educational Signaling Solution (1)

- Let e^* be an education level that satisfies the following inequalities:

$$\frac{a_2 - a_1}{c_1} < e^* < \frac{a_2 - a_1}{c_2}.$$

- Note that the choice of the education level of a worker perfectly signals his type.
- $a_2 - a_1 < c_1 e^*$ for will choose zero education for unable worker.
- $a_2 - a_1 > c_2 e^*$ for will choose education for able worker.
- This pattern of wages is an equilibrium: if each able worker chooses education level e^* and each unable worker chooses a zero educational level, then no worker has any reason to change his or her behavior.

Educational Signaling - Equilibria (1)

Separating equilibrium

The equilibrium involves each type of worker making a choice that allows him to separate himself from the other type.

Pooling equilibrium

each type of worker makes the same choice.

Educational Signaling - Equilibria (2)

- The separating equilibrium is especially interesting since it is inefficient from a social point of view. Each able worker finds it in his interest to pay for acquiring the signal, even though it doesn?t change his productivity at all.
- It is worth thinking about the nature of this inefficiency. As before, it arises because of an externality. If both able and unable workers were paid their average product, the wage of the able workers would be depressed because of the presence of the unable workers.
- Thus they would have an incentive to invest in signals that will distinguish them from the less able.
- This investment offers a private benefit but no social benefit.

Conclusion

Adverse selection or hidden information problem refers to situations where one side of the market can't observe the "type" or quality of the goods on other side of the market.

- Equilibrium in a market involving hidden information will typically involve too little trade taking place because of the externality between the "good" and "bad" types.

Moral hazard or hidden action problem refers to situations where one side of the market can't observe the actions of the other.

- Equilibrium in a market involving hidden action typically involves some form of rationing -firms would like to provide more than they do, but they are unwilling to do so since it will change the incentives of their customers.

Food for thought

- Explain why adverse selection leads to produce and externality? Comment
- Education is often viewed as signaling in the labor market. Why?
- In a market where there is separating equilibrium, different types of agents make different choices of actions. Comment

Readings

- Varian (2014), Intermediate Microeconomics: A Modern Approach (Ninth Edition), ch. 38.
- Hindriks and Myles (2013), Intermediate Public Economics, Ch. 10.