INFORMATION ECONOMICS

Transactions are undertaken in conditions of asymmetric information.

There are a lot of exchanges for which it is extremely expensive, or impossible to get information about:

- The quality of the goods or services exchanged(hidden information);
- The actions undertaken during a transaction (hidden action)

- An employer who has to hire a worker: she doesn't know his productivity and skills, which, on the contrary are well known by the potential worker!
- Or, during the job transaction, the employer may not be able to observe if the worker is working hard

Individuals **uncertainty** concerns information and/or actions that are known by the other party of the transaction but not by themselves.

Two problems:

- adverse selection
- moral hazard

W.r.t. the transaction cost economics:

- Human beings are rational (and not boundedly rational)

But:

- They are still opportunistic

- Pre-contractual opportunism →adverse selection
- Post-contractual opportunism → moral hazard

Adverse selection

When one party of a transaction knows things concerning the transaction that are relevant to, but that are unknown by the second party of the transaction

Gresham's law (1500):

- Imagine an economy in which the currency consists of gold coins.
- The holder of a coin is able to shave a bit of gold from the coin in a way that is impossible to verify, unless through very careful measurement.
- The gold so obtained can then be used to produce new coins.

Now in the economy:

- Some of the coins have been shaven, while
- Others have not been shaven

Hence, someone taking a coin in trade for goods will give positive probability that the coin she receives has been shaven and so she will be willing to exchange fewer goods than in the case in which she was certain the coin was not shaven.

Moreover:

The holder of an unshaven coin will therefore take away the coin from the trade

- → only shaven coins will circulate!!!
- → bad money drives out good money!!!

Akerlof's model of lemons

Akerlof G. A. (1970), The Market for "Lemons": Quality Uncertainty and the Market Mechanism, *The Quarterly Journal of Economics*, Vol. 84, No. 3., pp. 488-500

"bad used cars drive out good used cars"

- Anyone wishing to purchase a used car is aware of the fact that it is impossible to evaluate ex-ante, with no additional cost, the quality of the proposals of the various sellers

- On the other hand, anyone wishing to sell his used car soon realizes how little the market remunerates owners of good used cars.

- As the “good used cars” are indistinguishable from those of poor quality, the price MUST be the same for all;

→ a kind of <u>average price</u>

- But, this is certainly a price that cannot be accepted by the sellers of «good used cars».

In Akerlof’s model the interaction between asymmetric information and adverse selection can lead to the **virtual disappearance of the market for used cars**.

Assume there are:

- N used cars in the market
- quality of each car →index *x* which can assume any value between a minimum and a maximum
- In the market two types of agents operate: type 1 and type 2,
- each characterized by his own utility function:

$$U_1 = M + \sum_{i=1}^{N} x_i$$

And

$$U_2 = M + \sum_{i=1}^{N} \frac{3}{2} x_i$$

The utility that the agent gets by the number of cars, depends also on the quality, x, of the cars he owns.

- A car of good quality gives the owner greater utility than a car of poor quality

The two groups of individuals, however, differ in the weights they attribute to the possession of a car:

- individuals of type 1 perceive by a car of quality x_i an utility level equal to x_i,
- individuals of type 2 perceive by the same car of quality x_i an utility equal to 1.5 x_i

Given a car of any level of quality x:

- agents of type 1 buy it if $p \leq x$

  sell it if $p > x$

- agents of type 2 buy it if $p \leq 1.5x$

  sell it if $p > 1.5x$

E.g.
x=100

- agents of type 1 would pay a maximum price, p=100
- agents of type 2 would pay a maximum price, p=150

At a price: p=120

- agents of type 1 would sell the car of quality x=100
- agents of type 2 would buy the car

This different behavior allows us to consider:

- agents of type 1 → potential sellers
- agents of type 2 → potential buyers

All N cars are owned by agents of type 1, and they can resell them, either to agents of type 2 or to agents of type 1

- If information was perfect all the cars would be sold by the agents of type 1 to the agents of type 2 at a price:

$$x \leq p \leq 1{,}5x$$

and this price would satisfy both the parties of the transaction!

BUT

clear asymmetry of information:

- While every seller knows the quality *x* of each of his cars,
- buyers are not able to recognize the quality of each car offered on the market.

It's reasonable to think that the buyers are at least able to assess the average quality of the cars offered on the market.

SUPPLY CURVE

Suppliers= agents of type 1

We must better specify the quality of all the N cars owned by the agents of type 1.

- Assume for simplicity that:

  $0 \leq x \leq 2$

- assume also that the cars are evenly distributed within this range.

  If we consider a range of quality of any size within the segment [0, 2], it includes an identical share of cars, regardless of its location within the segment.

A similar structure of the distribution of the quality of used cars is well represented by a rectangle of area equal to N, the base of which is given by the segment [0, 2] and the height of which is equal to N / 2

- How many cars are supplied on the market at each price p?
- Given their utility function the sellers are willing to supply all those cars whose quality index *x* is such that:

$$x \leq p$$

- In the figure: if we consider along the segment [0,2] the market price of the used cars, the shaded area to the left of *p* is the number of cars that the owners are willing to sell at that price (all the cars whose quality is lower or equal to the price p). For construction this area is equal to

$$pN / 2$$

The supply function *S* is, therefore:

$$S(p) = p\,\frac{N}{2}$$

If we denote by:

μ = the average quality of cars on the market (assumption of uniform distribution):

$$\mu = \frac{0 + x(MAX)}{2}$$

That is:

$$\mu = \frac{p}{2}$$

- **NOTE**: the presence of "bad cars" together with "good cars" lowers buyers' perception of the average quality: it is no longer identical to the price, but it is only half.

- Mechanism of adverse selection

- The average quality of the cars offered for sale decreases as price decreases ($\mu = \frac{p}{2}$)

- On the <u>supply side</u>, for every price p, all cars whose quality x is less than or equal to p are offered for sale
- Given the assumption of uniform distribution of the quality, we know that this quantity corresponds to the area of the rectangle with height $N / 2$ and basis p, i.e. it is equal to

$$pN/2$$

with an index of average quality equal to:

$$\mu = \frac{p}{2}$$

DEMAND CURVE

- Buyers know the average quality of cars offered (*μ*). Not the quality of each car

- The total demand (*D*) is the sum of the demands of the two groups of agents:

$$D = D_1 + D_2$$

- Y_1 and Y_2: the income of each of the two types of agents that will be used to buy used cars only
- **<u>Agents of Type 1</u>** will use their income to buy a used car if the price of the car is less than or equal to its quality.
  Since only the average quality is known:

$$\begin{cases} D_1 = \frac{Y_1}{p} \; if \; p \leq \mu \quad i.e. \; if \; \frac{p}{\mu} \leq 1 \\ D_1 = 0 \; if \; p > \mu \quad i.e. if \; \frac{p}{\mu} > 1 \end{cases}$$

- **<u>Agents of Type 2</u>** will use their income to buy a used car if the price of the car is less than or equal to 3/2 its quality.
  Since only the average quality is known:

$$\begin{cases} D_2 = \dfrac{Y_2}{p} \;\; if \;\; p \leq \dfrac{3}{2}\mu \quad\quad i.e. \;\; if \;\; \dfrac{p}{\mu} \leq \dfrac{3}{2} \\ D_1 = 0 \quad if \;\; p > \dfrac{3}{2}\mu \quad\quad i.e \quad if \;\; \dfrac{p}{\mu} > \dfrac{3}{2} \end{cases}$$

NOTE: differently from the supply side, the demand of each group of agents depends not only on the price, but also on the average quality

- Supply function:

$$S = S\,(p),$$

- The two demand functions:

$$D_1 = D_1\,(p;\,\boldsymbol{\mu}),$$

$$D_2 = D_2\,(p;\,\boldsymbol{\mu}).$$

Given Y_1 and Y_2

The function of total demand is:

$$D(p,\mu) = D_1(p,\mu) + D_2(p,\mu) \qquad (1.6)$$

We will have three cases:

1)

$$D(p,\mu) = \frac{(Y_1+Y_2)}{p} \quad if \quad \frac{p}{\mu} \leq 1$$

That is, if:

p ≤ μ (average quality)

→ both groups will demand used cars

2)

$$D(p,\mu) = \frac{Y_2}{p} \ if \ \ 1 < \frac{p}{\mu} \leq \frac{3}{2}$$

That is, if:

p > μ (average quality)

but p ≤ 1,5 μ

→ only agents of Type 2 will demand used cars

3)

$$D(p, \mu) = 0 \; if \;\; \frac{p}{\mu} > \frac{3}{2}$$

That is, if:

p > 1,5 μ

→ neither group will demand used cars

THE EXISTENCE OF EQUILIBRIUM

Does the equilibrium exist?

It is impossible in this case to draw the traditional curves of supply and demand on the price-quantity plane.

- When you draw such curves, the assumption that it is conceptually possible to vary the price, keeping constant the other factors that influence the quantity demanded and supplied is implicit.

- It is possible to isolate the effect of price changes on consumer demand!

In the situation just described this conceptual operation is not possible:

since:

- Given the assumption of uniform distribution:

$$\mu = \frac{p}{2}$$

- when the price changes, the average quality of the supplied cars also changes,
- and this change retroacts on the behavior of the buyers.

In other words, it is not possible to analyze the effects of price changes in a situation of “other conditions being equal”, because the other relevant conditions (the average quality in this case) change just to changes in the price.

We draw the curves of supply and demand in a system of axes where we consider:

- the quantity on the horizontal axis and
- the ratio $\frac{p}{\mu}$ on the vertical axis.

It is obvious that the supply line lies above the intersection of the demand curve with the vertical axis.

The supply curve can usually be represented in the same figure, by a horizontal line at the market price, which, given the assumption of uniform distribution:

$$\mu = \frac{p}{2}$$

is given by the equation:

$$p = 2\mu$$

That is:

$$\frac{p}{\mu} = 2$$

- The only equilibrium configuration of this market is the one that provides NO exchanges

- virtual disappearance of the market.

In a hypothetical situation of **perfect information** market can be characterized by a positive volume of exchanges

- In perfect information: **the quality of each car is perfectly known by** both sellers and **buyers**
- Remember that for some buyers, those of Type 2, a car of quality x has a greater value than x (3/2 x), and a greater value than the one attributed by the sellers (agents of Type 1, who value x a car of quality x)
- Hence for each quality level you could find sellers (agent of Type 1) and buyers (agents of Type 2)
- => **exchange would be guaranteed!!**!
- The presence of **asymmetric information** may lead to the collapse of the exchange!

In presence of asymmetric information:

- The market price depends on the average quality and hence
- it will be profitable for the sellers of «bad cars» («lemons»),
- but not necessarily for those who offer «good cars».

If this is the case, at <u>that price</u>:

- the sellers of good cars will leave the market,
- further lowering the average quality of the cars that are offered.

→ **bad cars drive out good cars!!!**

NOTE:

- The average quality depends on the price

- The price, in turn reflects the average quality

This circular relationship between quality and price is generated from the inefficiency due to asymmetric information

Some observations about the Akerlof's model

Obviously, the result of the analysis crucially depends on the values of the relevant parameters

Anyway, what the model highlights is a phenomenon frequently observed in many markets, a phenomenon which can be summarized in the following way:

- When in a market the quality of each product or service offered is not evident to the eyes of the buyer, the price must necessarily be the same for products of good and of bad quality.
- The market price cannot therefore satisfy those who offer goods of high quality.
- For producers of high quality goods can therefore be convenient not to enter the market.
- They are systematically driven out from the market by the presence of producers of poor quality goods.
- This mechanism can lead to the disappearance of the market, as in the case of the model of Akerlof.

The insurance market

- **life/health insurance**.
- If premiums reflect the average health conditions of population as a whole, insurance may be a bad deal for healthy people, who then will refuse to buy.
- Only the sick will sign up, further lowering the average quality of buyers. And premiums must hence be set to reflect this!

In this case, at <u>that premium</u>:

→ **sick people drive out healthy people!!!**

- **Automobile insurance**:

→ **bad drivers drive out good drivers!!!**

NOTE:

- In standard economic analysis prices adjust to clear the market (Demand=supply)
- In presence of adverse selection prices may influence the quality of consumers.
- For instance In the insurance markets a higher premium drives out the best clients
- Same situation is analyzed in **credit markets** by:

  Stiglitz-Weiss (1981) “Credit rationing in markets with imperfect information”, American Economic Review, n. 71.

HERE: interest rates fixed by banks may influence the kinds of clients