

# Principles of Microeconomics 2

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## *Chapter 4*

*(Imperfect Competition – Monopoly – Discriminating Monopoly)*

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# Imperfect competition

## Entry barriers to the market

- For a company to occupy a dominant position in a market, there have to be barriers to entry.

Several types of barriers to entry the market:

- **Patent:** Legal barrier to market entry – remains effective as long as a competing product has not been invented (e.g., patent on a drug).
- **Concession:** Legal barrier to entry – authorization granted by the state to the concessionaire for exclusive market use (e.g., television networks).

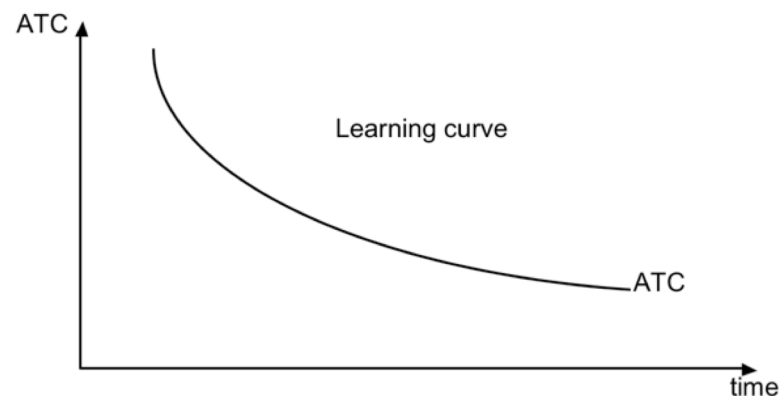
- **Economies of scale:** Possibility to lower the long run average total cost by producing at a large scale.

Effective barrier to entry for new competitors in capital-intensive industries (e.g., petrochemical, metallurgy, shipbuilding).

Small businesses – to survive in the face of large firms – are sometimes brought to merge (**horizontal merger**) in order to benefit from scale economies.

- **Dynamic economies** (learning/experience curves): Lowering the total cost per unit of output of the same product over time ("**learning-by-doing**").

Note: Dynamic economies at the origin of the "**infant industry**" argument designed to justify protectionism practiced by some countries in the developing world.

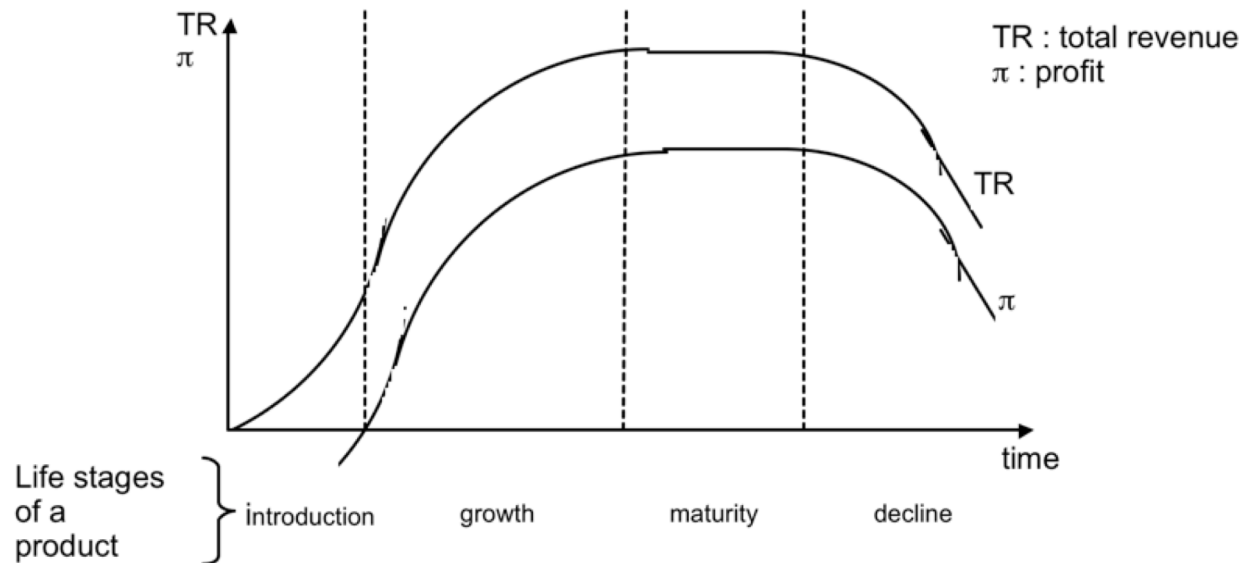


- **Exclusivity of an "input"**: A company with exclusive access to an input or an intermediate product required to produce a good is *de facto* protected against potential competition.
- **Excess Capacity**: Availability of unused production capacities among producers in place (allows to **rapidly respond to a possible increase in demand**, thus preventing a price rise, and attracting new competitors on the market, or because it makes a credible **threat of price wars** against potential entrants).

# Remark: Barriers to entry and the **product cycle**

Possible to establish a relationship between certain barriers to entry and the product cycle theory of Vernon:

- Stage of introduction: Patent as a protective barrier
- Stage of growth: Economies of scale as a protective barrier
- Stage of maturity: Dynamic economies as a protective barrier
- Stage of decline: No more barriers to entry



# The monopoly

- Market form in which **a single firm** provides the entire production for a large number of consumers (condition of atomicity disappears on the supply side).
- In reality, the pure monopoly does not exist nor perfect competition.
- For there to be a pure monopoly, the firm must be **the only one on the market**, it **does not suffer from potential competition** from domestic or foreign producers, and the product in question has **no close substitutes**.

The analysis of the monopoly as a borderline case to the extreme opposite of perfect competition is useful to the understanding of specific situations:

- Monopoly restricted to a **given geographical area**

E.g., a grocery store in an outlying area, where there are no other grocery stores or supermarkets, will have a quasi-monopolistic situation.

- **Temporary** monopoly

A company developing and selling a new product (position will be called into question when other companies manage to put on the market identical or substitutable products).

- **Cartel-agreement**

Monopoly model used to represent the situation of companies which have concluded a cartel-agreement (e.g., price cartel), and behave accordingly on the market as a single monopolistic firm.

- **Supply of production factors**

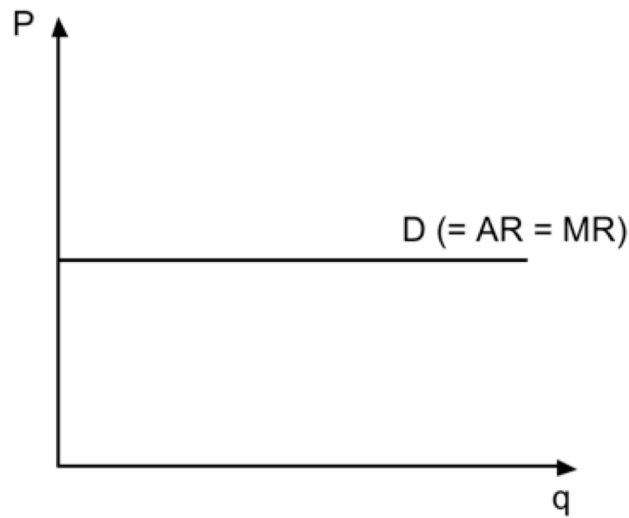
E.g., workers from the same branch united in a single union form a monopoly for labor services offered to the companies of this industry.

# The marginal revenue of the monopolist

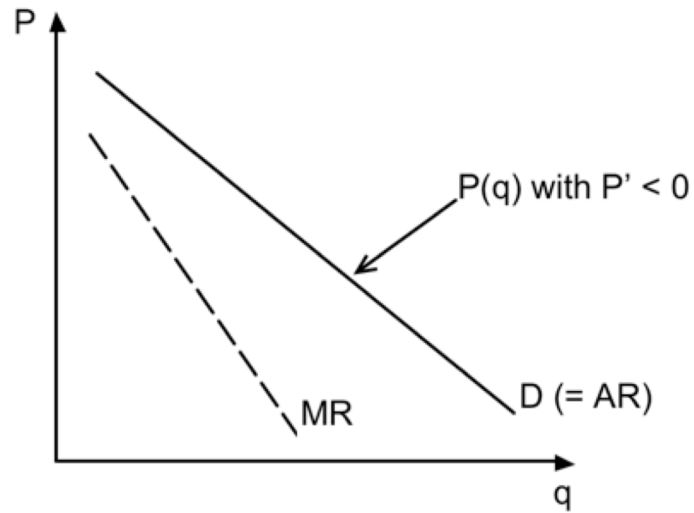
- Contrary to the situation of perfect competition (each producer faces a perfectly elastic demand), the monopolist producer faces a **negatively sloped demand** (demand function of the market).
- => **The monopolist directly influences the price** by its production: By increasing its production, it lowers the price; by reducing its production, it raises the price.



This relationship has a direct impact on the **marginal revenue** ( $MR$ ) of the monopolist:



Perfect competition



Monopoly

- Intuitively: One expects the marginal revenue to be lower than the **average revenue** ( $AR = P$ ), because the monopolist when producing and selling one additional unit, causes not just a price decrease of the last unit produced and sold, but also of the entire quantity originally produced.

Demonstration:

$$\text{Total revenue: } TR = P(q) \cdot q$$

$$\text{Marginal revenue: } MR = \frac{dP}{dq} \cdot q + P(q)$$

It appears that  $MR < P$  because  $dP/dq < 0$ .

# Relation between the price elasticity of demand and the marginal revenue of the monopolist

As we have seen, the marginal revenue of the monopolist is written:

$$\begin{aligned}MR &= \frac{dP}{dq} \cdot q + P(q) \\ &= P \left( 1 + \frac{dP}{dq} \cdot \frac{q}{P} \right) \\ &= P \left( 1 + \frac{1}{\frac{dq}{dP} \cdot \frac{P}{q}} \right)\end{aligned}$$

...which is nothing other than:

$$MR = P \left( 1 + \frac{1}{\varepsilon} \right) \quad \Leftrightarrow \quad MR = P \left( 1 - \frac{1}{|\varepsilon|} \right)$$

where ' $\varepsilon$ ' represents the price elasticity of demand ( $\varepsilon < 0$ ).

=> The higher the price elasticity of demand, the weaker the difference between the marginal revenue and the price.

Notes:

1. In **perfect competition**, the firm faces a perfectly elastic demand relative to price ( $\varepsilon \rightarrow -\infty$ ).

It follows:

$$\lim_{\varepsilon \rightarrow -\infty} MR = \lim_{\varepsilon \rightarrow -\infty} P \left( 1 + \frac{1}{\varepsilon} \right) = P$$

=> Perfect competition is a special case of the monopoly when the price elasticity of demand in absolute value tends to infinity.

In this case: The marginal revenue of the producer is equal to the price; in other words: the producer is “price-taker”.

2. The **marginal revenue of the monopolist is zero for a price elasticity of demand equal to -1**. Indeed,

$$MR = 0 \iff P \left( 1 + \frac{1}{\varepsilon} \right) = 0 \iff 1 + \frac{1}{\varepsilon} = 0 \iff \varepsilon = -1$$

Intuitively: Unit price elasticity means that by increasing production by 1 percent, this lowers the price by 1 percent, so that the total revenue does not change (i.e., the marginal revenue is zero).

Note: In this case the total revenue is at its maximum.

### 3. Special case: Marginal revenue associated with a **linear demand function**

Consider a linear (inverse) demand function:

$$P = a - bq$$

where  $a$  and  $b$  are positive parameters. The total revenue function is written:

$$TR = P(q) \cdot q = (a - bq) \cdot q = aq - bq^2$$

It follows:

$$MR = \frac{dTR}{dq} = a - 2bq$$

- We note that the marginal revenue function is also linear and negatively sloped.
- In fact: Its slope is twice as large as that of the demand function.
- Easily verified that the marginal revenue is below the price regardless of the quantity produced ( $a - 2bq < a - bq$ ).



- Moreover: The marginal revenue function has the same intercept as the demand function, its abscissa at the origin is half that of the demand function.

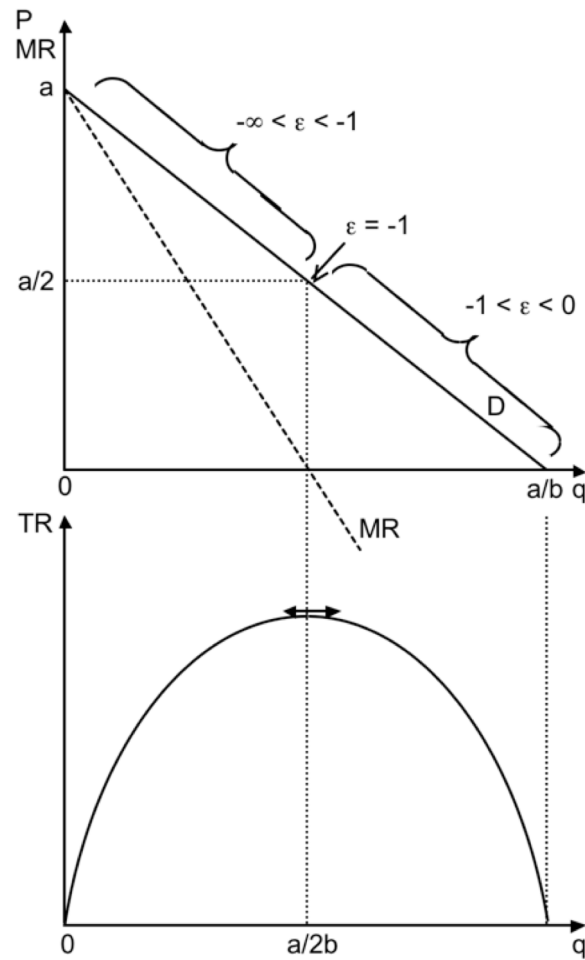
$$q = 0 \iff MR = a$$

$$MR = a - 2bq = 0 \iff q = \frac{a}{2b}$$

- We note that the quantity for which  $MR = 0$  ( $\varepsilon = -1$ ) corresponds to the middle of the demand line.

# Graphical representation:

Graphs below:  $TR$  and  $MR$  functions corresponding to a linear demand function.



## Note:

- The **total revenue** increases as a function of the quantity produced when the **demand is elastic**.
- It reaches its maximum level (corresponding to a zero marginal revenue) when the price elasticity of **demand is unitary**.
- It decreases with the quantity produced when the **demand is inelastic**.
- Finally, it **becomes zero** when the quantity produced is large enough to push the price to zero.
- In principle, the monopolist has no incentive to produce a quantity larger than  $a/2b$ .  
=> The monopolist will **never be faced with the inelastic portion** of the demand function.

# The monopolist's optimum

We assume that the monopolist:

- Seeks to **maximize its profit**.
- Has the same type of cost functions than the firm under perfect competition.

The monopolist seeks to produce a quantity such that its profit is maximized:

$$\underset{q}{\text{Max}} \pi(q) = TR(q) - TC(q)$$

First order condition:

$$\frac{d\pi}{dq} = 0 \iff \frac{d(TR)}{dq} - \frac{d(TC)}{dq} = 0 \iff MR = MC$$

Second order condition:

$$\frac{d^2\pi}{dq^2} < 0 \iff (MR)' < (MC)'$$

=> The monopolist seeks to produce a quantity such that for this quantity:

- The marginal revenue is equal to the marginal cost,
- The slope of the marginal revenue is inferior to that of the marginal cost.

(Cf. **graphical representation.**)

=> The monopolist has to produce the quantity  $q^*$  such that  $MC(q^*) = MR(q^*)$ .

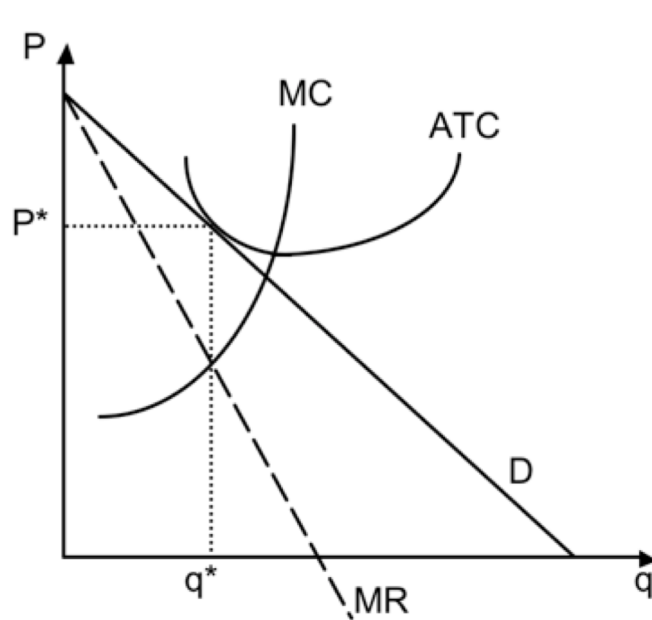
=> The price will be set at  $P^*$ .

The monopolist will realize a profit equal to:

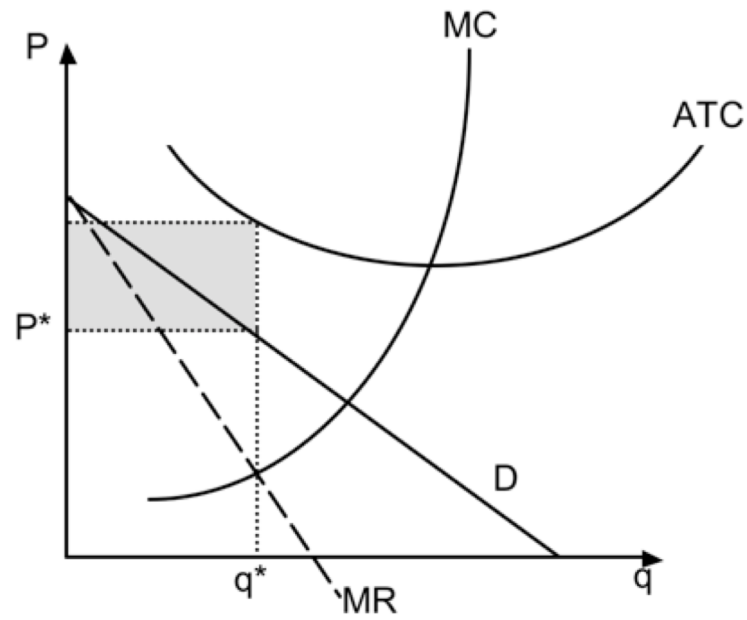
$$\begin{aligned}\pi^* &= TR(q^*) - TC(q^*) \\ &= \text{area } P^*Cq^*O - \text{area } ABq^*O \\ &= \text{area } P^*CBA \text{ (shaded)}\end{aligned}$$

Note: Having a monopoly on a market does **not necessarily imply a positive profit!**

E.g.: A company holding a patent, but who has no interest in producing the considered good because production costs are too high or demand is too low.



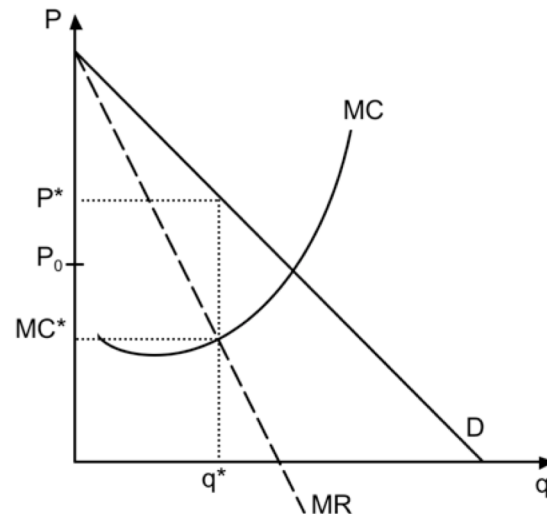
Zero profit



Loss

# The inefficiency of the monopoly

- The monopoly is an inefficient form of market organization from the point of view of the community.
- For proof: Consider a monopolist which produces the optimal quantity  $q^*$  sold at a price  $P^*$ .
- The marginal cost of the monopolist is  $MC^*$  ( $< P^*$ ).



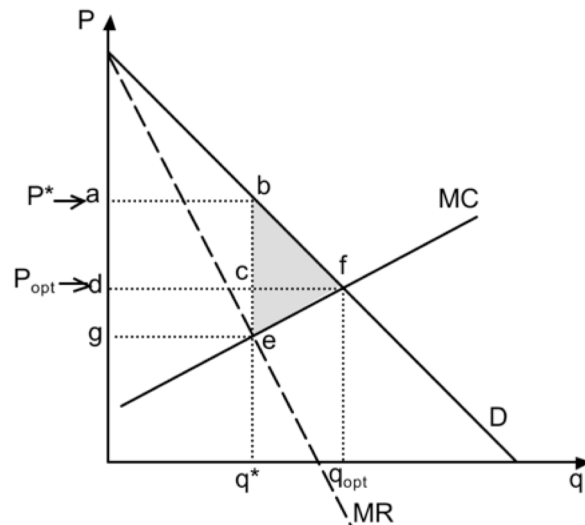


Suppose we **require the monopolist to produce one unit more** than in  $q^*$  and sell (only this unit) at price  $P_0$  randomly selected in between  $MC^*$  and  $P^*$  ( $MC^* < P_0 < P^*$ ).

We note that following this operation:

- The **net welfare of the consumers is improving**; in fact, anyone who has purchased the additional unit produced and sold was willing to pay  $P^*$  for this unit, but in reality he only pays  $P_0$ .
- The **net welfare of the producer is also improving**; in fact, the additional unit produced and sold only cost  $MC^*$ ; by cons, it brought  $P_0$ , which is higher than  $MC^*$ .
- => The optimal quantity  $q^*$  sold at  $P^*$  **does not correspond to the optimum from the point of view of the community**.
- To achieve this: **Necessary to increase the quantity produced**. In fact, it is necessary that the quantity produced is such that  **$MC = P$**  (perfect competition).

# Illustration: **Compelling the monopolist to practice marginal cost pricing**



If one requires the monopolist to sell quantity  $q_{opt}$  at price  $p_{opt}$  :

- Consumers win  $abfd$  in consumer surplus.
- Producer wins  $cfe$  and loses  $abcd$  (to the benefit of the consumers) in producer surplus.

=> **Net welfare gain** for the community equivalent to the area  $bfe$ .

# The discriminating monopoly (price differentiating monopoly)

- Situation where the monopolist sells the **same good** on **different markets** at **different prices**.
- For the monopolist to be able to differentiate prices on different markets, it must be able to separate markets at a reasonable cost; i.e., it must be able to prevent resale of the good from one market to another.
- E.g., easy to differentiate the price of a movie ticket for the elderly people compared to ordinary consumers (identity check at the entrance is not very expensive, and sufficient to restrict cheaper tickets to seniors).

The **separation** (or **segmentation**) of markets may be of different natures:

- Temporal nature (e.g., high-season, mid-season, low season rates)
- Geographical nature (e.g., dumping)
- Socio-economic nature (e.g., discounts for students, seniors, unemployed, etc.)

- Suppose the monopolist sells its product on two markets (I and II).
- Initially, we assume for simplicity, that the marginal cost of production of the good is constant.
- => Possible to juxtapose the graphics representing the two markets.

(Cf. **graphical representation.**)

- Starting with a production equal to zero, whenever the monopolist will produce one more unit, it will raise the question: On which of the two markets the sale of this unit will bring more?
- If the marginal revenue corresponding to the additional unit is found to be higher in one market compared to the other, he would sell the unit in question in the market where it pays the most.
- => We find (see graphic above) that the first units will be sold on market I, but from a certain quantity, the producer also will begin selling on the other market.
- This process will continue as long as the marginal revenue will exceed the marginal cost, and as long as there will be a difference between the marginal revenues in both markets.
- **At the equilibrium, we will have  $MR_I = MR_{II} = MC$ .**

# At what levels prices will be fixed on the two markets?

According to the optimality condition found  $MR_1 = MR_2$ , which is written:

$$P_1 \left( 1 - \frac{1}{|\varepsilon_1|} \right) = P_2 \left( 1 - \frac{1}{|\varepsilon_2|} \right)$$

I.e.,

$$\frac{P_1}{P_2} = \frac{1 - \frac{1}{|\varepsilon_2|}}{1 - \frac{1}{|\varepsilon_1|}}$$

- To have an incentive to differentiate prices between two markets, the monopolist must be confronted with different price elasticities of demand in these markets.

Then, for example, if  $|\varepsilon_1| < |\varepsilon_2|$ , i.e., if the demand is less elastic in market 1 than in market 2:

$$\frac{1}{|\varepsilon_1|} > \frac{1}{|\varepsilon_2|} \Leftrightarrow -\frac{1}{|\varepsilon_1|} < -\frac{1}{|\varepsilon_2|} \Leftrightarrow 1 - \frac{1}{|\varepsilon_1|} < 1 - \frac{1}{|\varepsilon_2|}$$

I.e.,  $P_1 > P_2$ .

=> The discriminating monopolist seeks to set a **higher price where, at the equilibrium, the demand is less elastic.**



# Monopolistic competition

- Type of market characterized by the existence of a **large number of producers** and **product differentiation**.
- **Product differentiation** (most important characteristic): Products, all while meeting the **same needs**, are **not identical**.  
=> Each individual producer has a monopoly on its product which is slightly differentiated from competing products.
- Examples: Cigarettes, toothpastes, laundry products, etc.
- In fact: Product differentiation is typical of most if not all markets in our economies.

# Oligopoly

- Market situation characterized by a **small number of producers**.
- In an oligopoly, a firm is able to **identify each of its competitors**, and **takes account of their behavior** in its own decisions.
- A **direct interdependence** between companies appears – distinguishes this form of competition from perfect competition or monopolistic competition.
- Companies may adopt a **strategic behavior**, i.e., act in accordance with the reactions of its competitors following its own actions.
- This type of situation can lead to **conflicting or cooperative behaviors**.

# The cartel

- Definition: Agreement between independent producers and competitors in order to **maximize their joint profits**.
- => The cartel acts as a **monopolist** in front of the demand.
- Cartel agreements are focused on the **quantity produced** by each member, and thus the product price (**price cartel**).
- However: May also cover other aspects such as market sharing, the pooling of patents, eliminating troublesome competitors, etc.

# Comparison between perfect competition, monopolistic competition and the monopoly

	Perfect competition (PC)	Monopolistic competition (MONC)	Monopoly (MON)
<b>Similarities between all three market forms</b>			
Objective of the firm	Profit maximization	Profit maximization	Profit maximization
Rule of maximization	MR = MC	MR = MC	MR = MC
Short term profits?	Yes	Yes	Yes
<b>Similarities between MONC and MON</b>			
Price taker	Yes	No	No
Price	Price = Marginal cost	Price > Marginal cost	Price > Marginal cost
Does the output correspond to the social optimum?	Yes	No	No
<b>Similarities between PC and MONC</b>			
Number of firms	Many	Many	One
Long term market entry?	Yes	Yes	No
Long term profits?	No	No	Yes