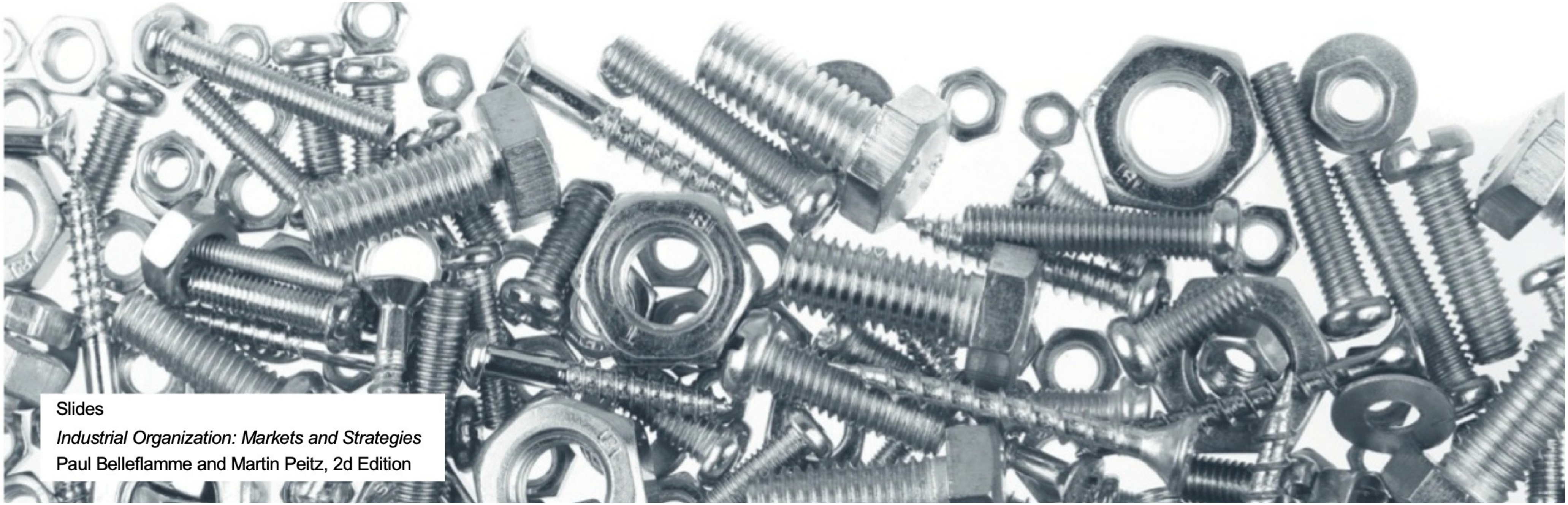
Industrial Economics

Chrysovalantou Milliou

AUEB – Erasmus Program

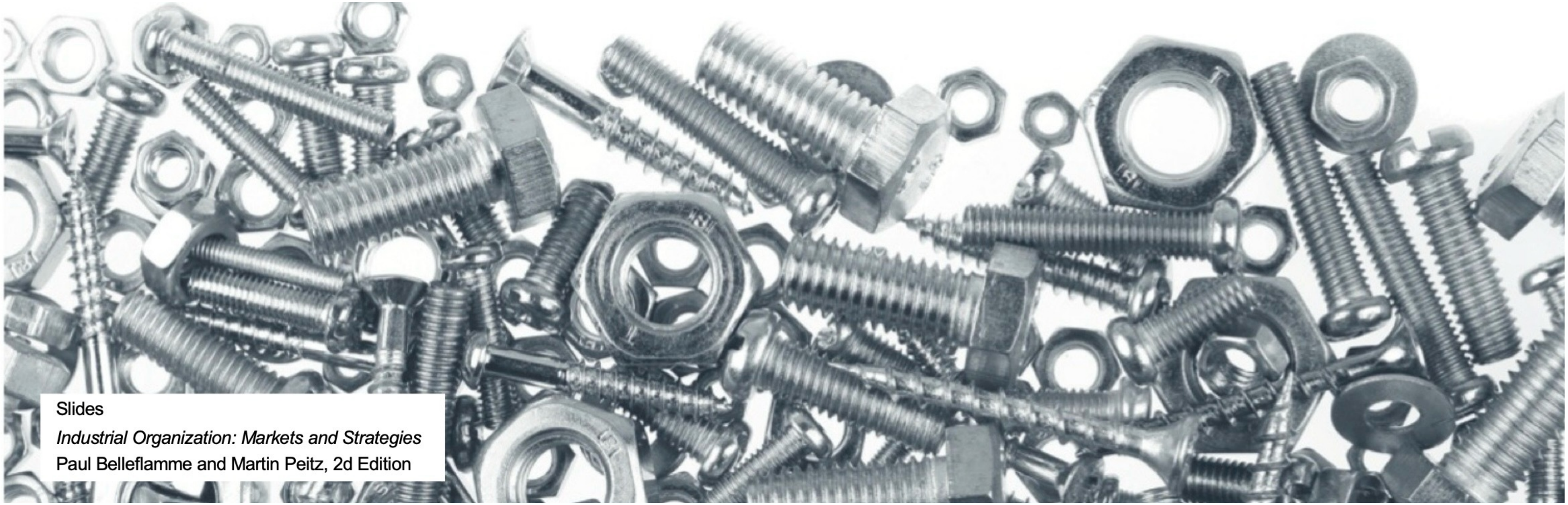


Slides

Industrial Organization: Markets and Strategies

Paul Belleflamme and Martin Peitz, 2d Edition

2. MONOPOLY



Slides

Industrial Organization: Markets and Strategies

Paul Belleflamme and Martin Peitz, 2d Edition

Contents

2.1 Single-product Monopoly

Single-Product Monopoly

- Market characteristics:
  - Only one firm in the market
  - The firm produces a single-product that does not have substitutes
  - There are high barriers to entry in the market

    Due to high entry costs, nhigh economies of scale (natural monopoly) or exclusive access to essential facility or legal restrictions (patents, public service concessions),…

Examples of markets with monopoly?

- ➢ Very few (genuine) monopolies:

  Public utilities (electricity, telecoms, transport, water,…) in the past, pharmaceuticals with patents, Diamonds (De Beers)

- ➢ Some “near monopolies”:

  Markets with a “dominant firm” approach monopoly (e.g., Google Search, Microsoft Windows).

Single-Product Monopoly

- Implications of market characteristics:
  - Monopolist produces the total quantity of the product in the market: $q = Q$

    The demand function that the monopolist faces coincides with the market demand function.
  - Monopolist has the full control of the market price P; it is the opposite of a price-taker.

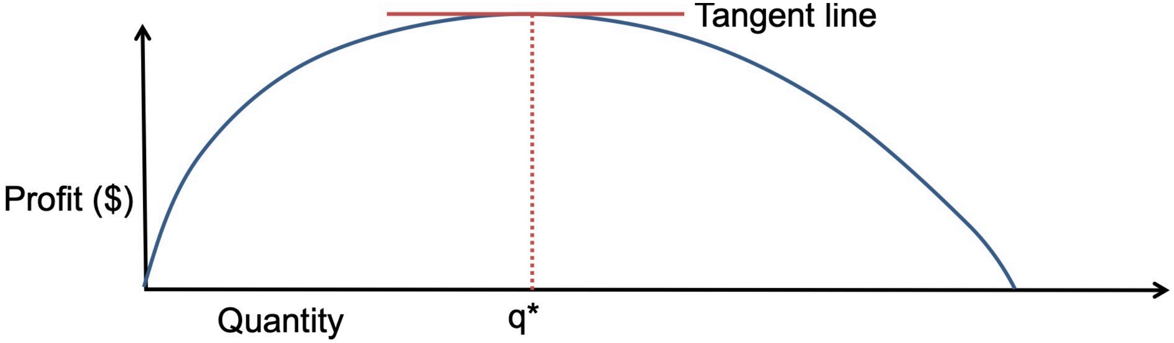
    The quantity that the monopolist produces Q, given the market demand (consumers preferences), determines the market price: $P(Q)$

Monopolist’s Choice of Quantity

- Monopolist solves the following problem:

$$\max_q \pi(q) = qP(q) - C(q)$$

Assumption that $\pi(q)$ is globally concave and has an interior optimum:



First order condition (FOC):

$$\partial\pi(q)/\partial q = P(q) + q\ \partial P(q)/\partial q - \partial C(q)/\partial q = 0$$

$$P(q) + q\ \partial P(q)/\partial q = \partial C(q)/\partial q$$

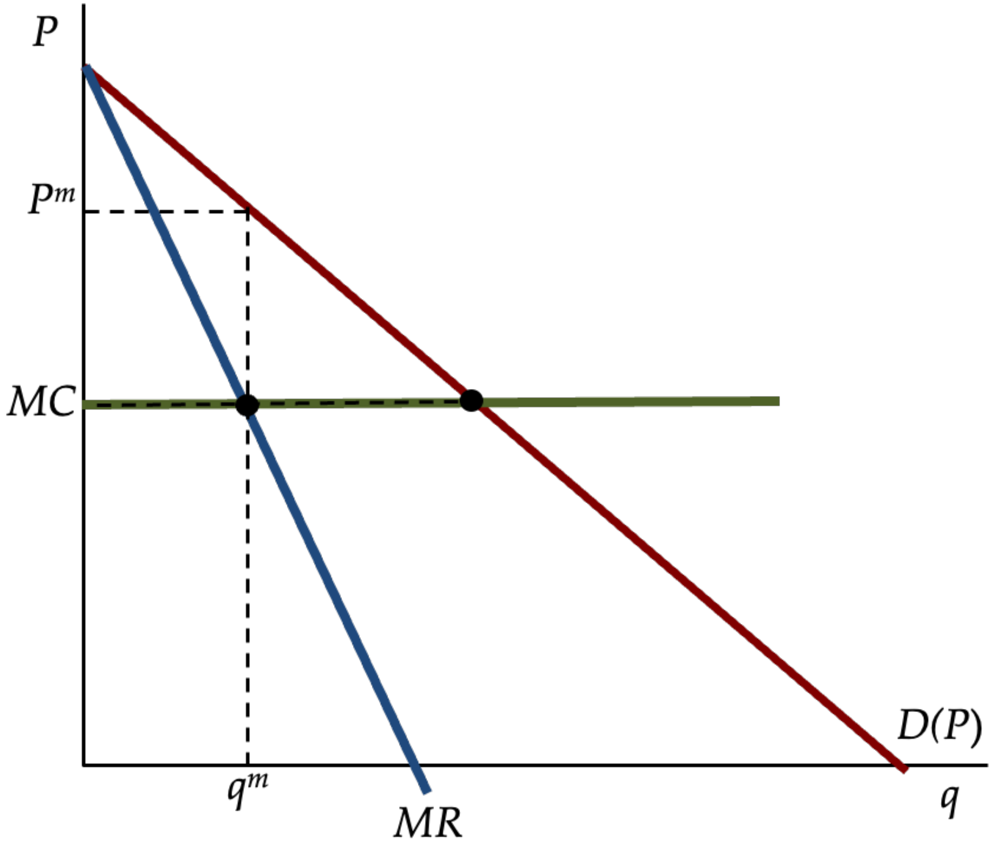
$$MR = MC$$

Note for MR: It has two elements:

- $P(q)$ the price that it receives for the sale of the additional unity
- $q\partial P(q)/\partial q$ lost revenue due to reduction in the price of all the units that the firm sells

Monopolist’s Choice of Quantity

- Graphically with a linear demand function (& constant MC):



Monopolist’s Choice of Quantity

- Algebraically with the linear demand function ($P(q) = a - bq$) & with constant marginal cost ($MC = c,$ with $a/b > c > 0$):

$$\max_q \pi(q) = qP(q) - C(q) = q(a - bq) - cq$$

First order condition (FOC):

$$\partial\pi(q)/\partial q = a - 2bq - c = 0$$

$$(MR = a - 2bq \text{ \& } MC = c)$$

Thus, the monopolist’s quantity is:

$$q^m = \frac{a - c}{2b}$$

And the monopolist’s price is:

$$P^m = a - bq^m = \frac{a + c}{2}$$

Monopoly Pricing Formula

- How does the monopoly price its product?

Take the $MR = MC$ condition from before:

$$P(q) + qP'(q) = C'(q)$$

where $C' = \frac{\partial C}{\partial q}$

We can rewrite it as:

$$P(q) - C'(q) = -qP'(q)$$

Dividing the above by $P(q)$ yields:

$$\frac{P(q) - C'(q)}{P(q)} = \frac{1}{\eta}$$

Markup or *Lerner index*

Inverse elasticity of demand

Markup: difference between price and marginal costs as a percentage of the price.

A monopolist increases its markup as demand becomes less price elastic.

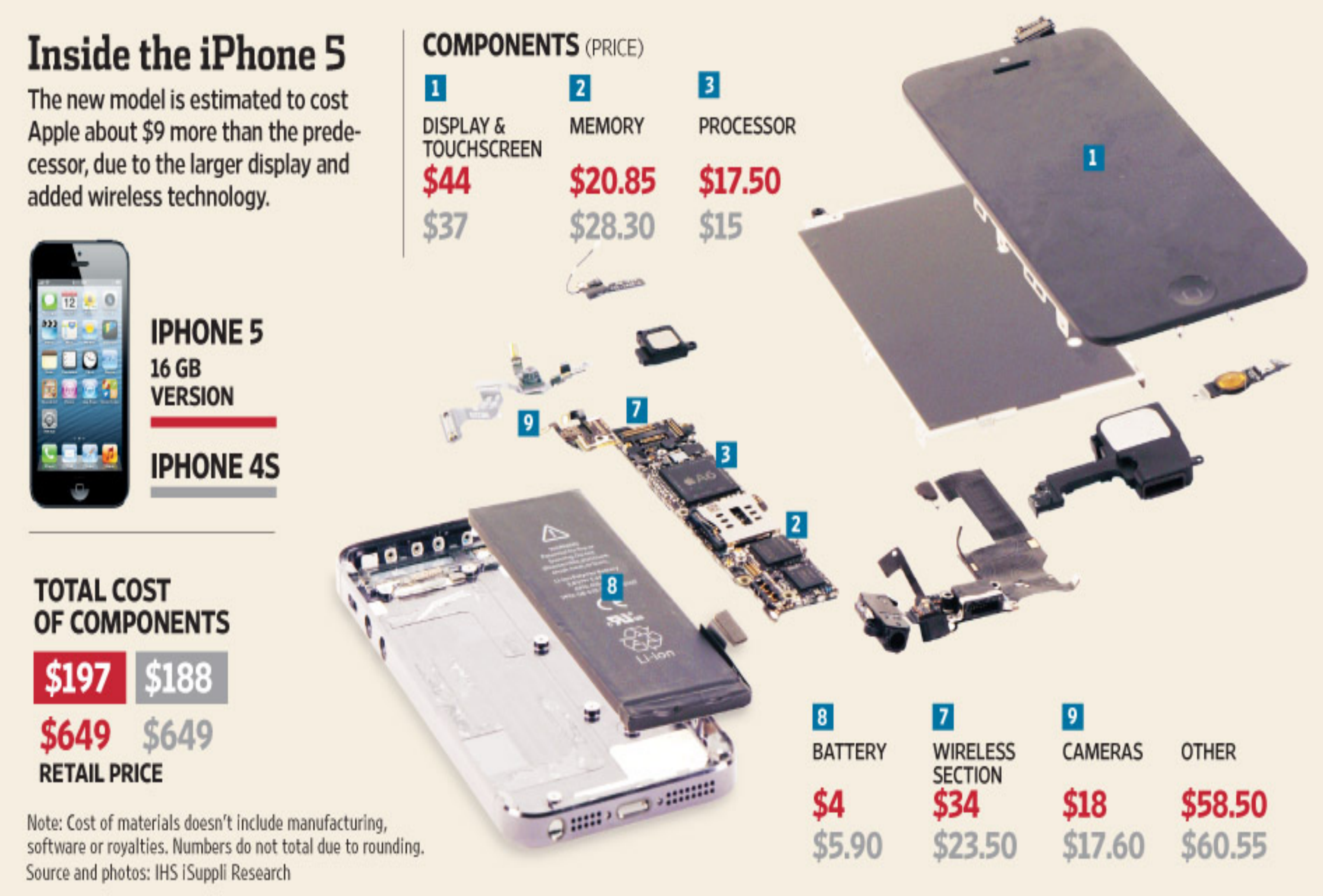
Is the sky the limit in the price that the monopolist will set? No, because of the elasticity of demand.

Case: **Astra-Merck Prices Prilosec**

In 1995, Prilosec, represented a new generation of antiulcer medication. Prilosec was based on a very different biochemical mechanism and was much more effective than earlier drugs.

- By 1996, it had become the best-selling drug in the world and faced no major competitor.
- The *MC* of producing and packaging Prilosec was only about 30 - 40 cents per daily dose.
- The price elasticity of demand was in the range of roughly 1,0 to 1,2.
- Astra-Merck was pricing Prilosec at about $3,50 per daily dose.

Its price was consistent with the monopoly pricing formula (rule of thumb).



Inside the iPhone 5

The new model is estimated to cost Apple about $9 more than the predecessor, due to the larger display and added wireless technology.

IPHONE 5
16 GB VERSION

IPHONE 4S

COMPONENTS (PRICE)

	IPHONE 5	IPHONE 4S
1 DISPLAY & TOUCHSCREEN	$44	$37
2 MEMORY	$20.85	$28.30
3 PROCESSOR	$17.50	$15
8 BATTERY	$4	$5.90
7 WIRELESS SECTION	$34	$23.50
9 CAMERAS	$18	$17.60
OTHER	$58.50	$60.55
TOTAL COST OF COMPONENTS	$197	$188
RETAIL PRICE	$649	$649

Note: Cost of materials doesn't include manufacturing, software or royalties. Numbers do not total due to rounding.
Source and photos: IHS iSuppli Research

Some observations

- In a monopoly market where demand for the monopolist's product is not perfectly elastic (since there are no substitutes for the monopolist's product) and thus, $P > MC$.

- The monopolist never produces at the inelastic part of the demand.

  Producing where demand is inelastic means reducing quantity would increase total revenue and lower costs, leading to higher profits.

- Instead of choosing the quantity, the monopolist may choose price:

$$\max_P \pi(P) = Pq(P) - C(q(P))$$

Solving the FOC with respect to P, we find the same monopoly price as before.

In monopoly, setting (choosing) price or quantity leads to the same results.

2.2 Multi-product Monopoly

Monopolist with Multiple Products

- Consider a monopolist which produces two products.
  - Demand functions for its products are: $q_1 = Q_1(p_1,p_2)$ and $q_2 = Q_2(p_1,p_2)$
  - Cost function: $C(q_1,q_2)$

Thus, the maximization problem that it solves is:

$$\max_{p_1,p_2} p_1 Q_1(p_1,p_2) + p_2 Q_2(p_1,p_2) - C(Q_1(p_1,p_2), Q_2(p_1,p_2))$$

The FOC for product i (where $i,j = 1, 2$ and $i \neq j$) is:

$$Q_i + p_i \frac{\partial Q_i}{\partial p_i} + p_j \frac{\partial Q_j}{\partial p_i} = \frac{\partial C}{\partial Q_i}\frac{\partial Q_i}{\partial p_i} + \frac{\partial C}{\partial Q_j}\frac{\partial Q_j}{\partial p_i} \qquad MR_i = MC_i$$

If demand & cost of the two products are independent (not linked across the two markets), then the Monopoly Pricing Formula applies for each product (and the product with the smallest elasticity of demand has the highest markup).

What happens though when demand or costs are linked?

Monopolist with Multiple Products

- **Linked Demands & Unlinked Costs:**

Costs of the two products are separated: $C(q_1,q_2) = C_1(q_1) + C_2(q_2)$

Recall the FOC for product i from before:

$$Q_i + p_i \frac{\partial Q_i}{\partial p_i} + p_j \frac{\partial Q_j}{\partial p_i} = \frac{\partial C}{\partial Q_i}\frac{\partial Q_i}{\partial p_i} + \frac{\partial C}{\partial Q_j}\frac{\partial Q_j}{\partial p_i}$$

We can rewrite it in this case as:

$$(p_i - C_i')\frac{\partial Q_i}{\partial p_i} = -Q_i + (p_j - C_j')\frac{\partial Q_j}{\partial p_i} \qquad \text{where } C_i' = \frac{\partial C_i}{\partial q_i}$$

Dividing both sides by $p_i \frac{\partial Q_i}{\partial p_i}$:

$$L_i \equiv \frac{p_i - C_i'}{p_i} = \frac{1}{\eta_i} + \frac{(p_j - C_j')}{p_i}\frac{\partial Q_j/\partial p_i}{-\partial Q_i/\partial p_i}$$

The above pricing rule has an additional term relative to the Monopoly Pricing Formula.

The sign of this additional term depends on the sign of $\partial Q_j/\partial p_i$, whether it is positive or negative and the latter depends on whether the products are *substitutes* or *complements*.

Monopolist with Multiple Products

- **Linked Demands & Unlinked Costs (cont.):**

(a) Substitute products

When products i and j are substitutes, then $\partial Q_j / \partial p_i > 0$.

Recall the pricing rule from before:

$$L_i \equiv \frac{p_i - C_i'}{p_i} = \frac{1}{\eta_i} + \underbrace{\frac{(p_j - C_j')}{p_i} \frac{\partial Q_j / \partial p_i}{-\partial Q_i / \partial p_i}}_{+}$$

Since $\partial Q_j / \partial p_i > 0$ (and all the other terms are negative), it follows that its additional term on the right-hand side is positive.

→

The multi-product monopolist sets higher prices than two separate firms.

Why? The multi-product monopolist internalizes the (negative externality) competition effect between the two products and thus has less incentives to decrease the prices than two separate firms.

Monopolist with Multiple Products

- **Linked Demands & Unlinked Costs (cont.):**

(b) Complement products

When products i and j are complements, then $\partial Q_j / \partial p_i < 0$.

Recall the pricing rule from before:

$$L_i \equiv \frac{p_i - C_i'}{p_i} = \frac{1}{\eta_i} + \underbrace{\frac{(p_j - C_j')}{p_i} \frac{\partial Q_j / \partial p_i}{-\partial Q_i / \partial p_i}}_{-}$$

Since $\partial Q_j / \partial p_i < 0$ (and all the other terms are positive), it follows that its additional term on the right hand side is negative.

→

The multi-product monopolist sets lower prices than two separate monopolists.

Why? The multi-product monopolist internalizes the (positive externality) positive demand effect between the two products and thus has more incentives to decrease the prices than two separate firms.

Monopolist with Multiple Products

- **Unlinked Demands & Linked Costs:**

  Demand of the two products are separated, $q_1 = Q_1(p_1)$ and $q_2 = Q_2(p_2)$ while $C(q_1,q_2)$ is not separated.

  Recall the FOC for product i from before:

$$Q_i + p_i \frac{\partial Q_i}{\partial p_i} + p_j \frac{\partial Q_j}{\partial p_i} = \frac{\partial C}{\partial Q_i}\frac{\partial Q_i}{\partial p_i} + \frac{\partial C}{\partial Q_j}\frac{\partial Q_j}{\partial p_i}$$

  Since now $\partial Q_j / \partial p_i = 0$, can rewrite it in this case as:

$$L_i \equiv \frac{p_i - C_i'(qi,qj)}{p_i} = \frac{1}{\eta_i}$$

  The above pricing rule differs from the single-monopoly Monopoly Pricing Formula since C_i' depends in this case on q_j.

  How C_i' depends on q_j can have to do with whether there are *economies of scope* or *diseconomies of scope* in production.

Monopolist with Multiple Products

- **Unlinked Demands & Linked Costs (cont.):**

(a) *Economies of scope*

Economies of scope are present when an increase in the production (quantity) of one product reduces at the margin the cost of the production of the other product: $\partial^2 C(q_1,q_2)/\partial q_i \partial q_j < 0$

Recall the pricing rule from before:

$$L_i \equiv \frac{p_i - C_i'(qi,qj)}{p_i} = \frac{1}{\eta_i}$$

The multi-product monopolist realizes that by decreasing p_j, it increases q_j and thereby decreases $C_i'(qi, qj)$ which has the effect of increasing the markup for product i.

$\rightarrow$

The multi-product monopolist sets lower prices than two separate firms.

(b) *Diseconomies of scope*

When $\partial^2 C(q_1,q_2)/\partial q_i \partial q_j > 0$, we have the reverse conclusion.

Monopolist with Multiple Products

A multi-product monopolist sets lower prices than separate monopolists when the products are complements or when there are economies of scope.

A multi-product monopolist sets higher prices than separate monopolists when the products are substitutes or when there are diseconomies of scope.

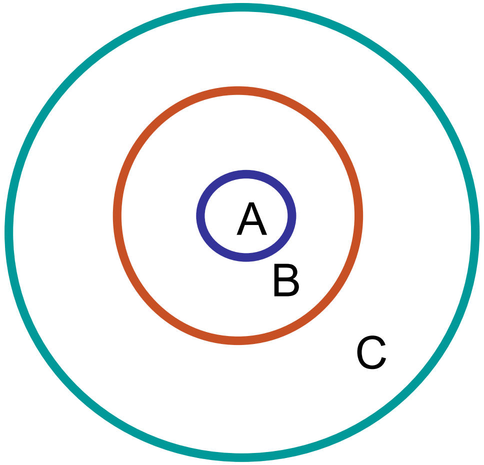
2.3 Market Definition & Market Power

How to define a market?

- Identify the closest substitutes to the product under review;
  Identify the competitive constraints that the firm that produces it faces.
- How? Hypothetical monopoly test

  Relevant market = smallest product group such that a hypothetical monopolist controlling that product group could profitably sustain a **S**mall and **S**ignificant **N**on-transitory **I**ncrease in **P**rices (SSNIP).

  5-10% price increase above competitive levels for at least a year.



Start with narrowest definition (A).

Can a hypothetical monopoly on A sustain a SSNIP?

Yes? STOP THERE: A is relevant market

NO? INCLUDE CLOSE SUBSTITUTES → B

Can a hypothetical monopoly on B sustain a SSNIP?

Yes? STOP THERE: B is relevant market

NO? INCLUDE MORE SUBSTITUTES → C, etc.

How to assess market power?

- Market power = firm’s ability to (profitably) raise price above the perfectly competitive level (its marginal cost).
- Measure of market power:

Lerner index → $\frac{p-C'}{p}$

It is measured at firm level L_i for firm i -- so it can take different values for different firms.

Higher L_i means higher market power. Its max value is 1.

Markup: difference between price and marginal costs as a percentage of the price.

- A related feature of market performance is market concentration.

Concentration indices →

- *m*-firm concentration ratio: $I_m = \sum_{i=1}^{m} \alpha_i$

  where $\alpha_i = q_i / Q$ is firm i’s market share and the n firms which are in the market are ordered by decreasing market share and $m \leq n$.

- Herfindahl index: $I_H = \sum_{i=1}^{n} \alpha_i^2$

It captures the impact of both number of firms & dispersion of market shares.

Practice Exercise:

(i) Calculate and compare the Herfindahl index for the following 2 markets:

- Market A: $n = 4$ and market share of each firm 25%
- Market B: $n = 5$ and market share of each firm 20%

$$I_H^A = 4\ (25)^2 = \mathbf{2500}$$
$$I_H^B = 5\ (20)^2 = \mathbf{2000}$$

$$I_H = \sum_{i=1}^{n} \alpha_i^2$$

$$I_H^A > I_H^B$$

(ii) Calculate and compare the Herfindahl index for the following 2 markets:

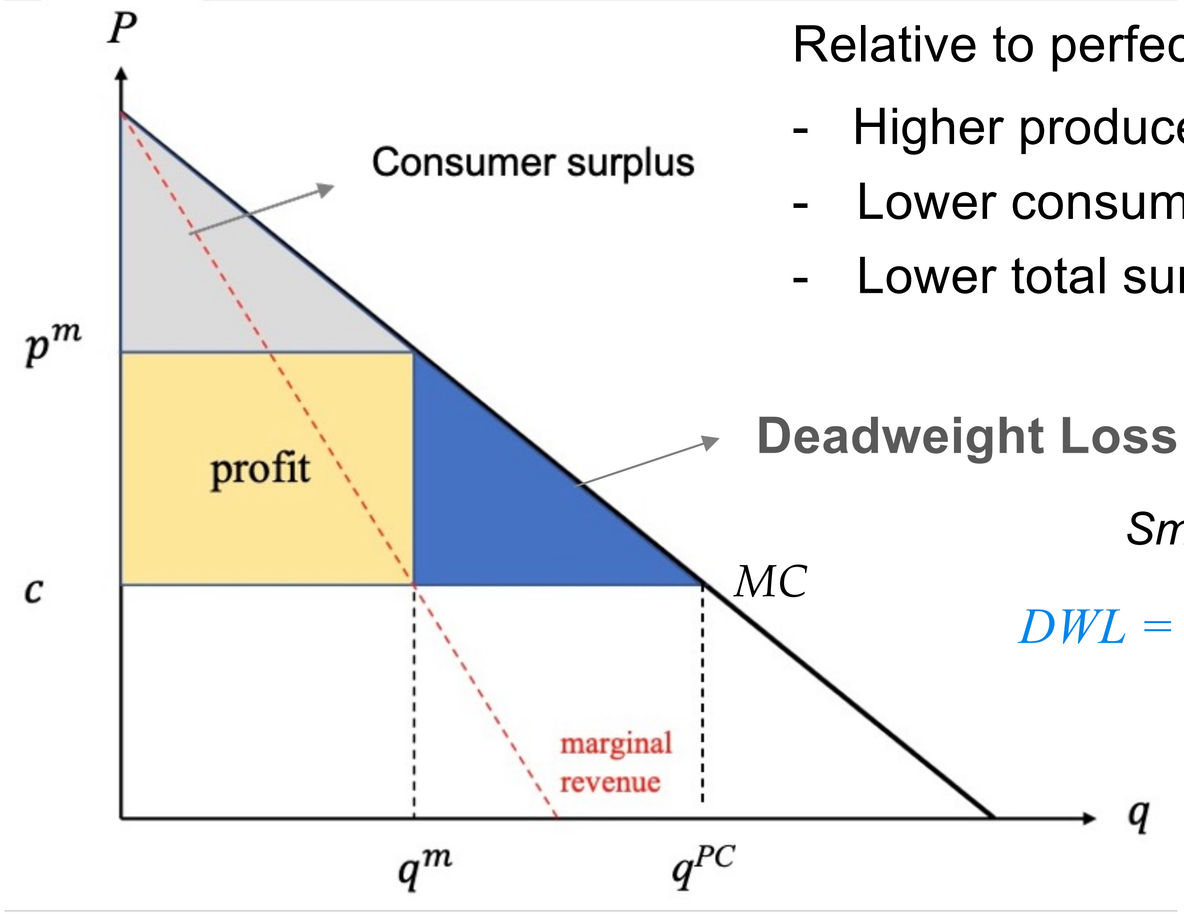
- Market A: $n = 2$ and market share of one firm 60% and the other firm 40%
- Market B: $n = 2$ and market share of one firm 90% and the other firm 10%

$$I_H^A = 60^2 + 40^2 = \mathbf{5200} < I_H^B = 90^2 + 10^2 = \mathbf{8200}$$

2.4 Monopoly & Welfare

Welfare Implications of Monopoly

- Inefficiency of Monopoly



Relative to perfectly competitive market ($P = c$):

- Higher producer surplus (profit)
- Lower consumer surplus
- Lower total surplus (welfare)

Smaller size of the "pie".

$$DWL = \frac{1}{2}(Pm \ - c)(qPC - qm)$$

The higher is the markup (market power), the larger the loss of welfare.

Contents

Up to now we have assumed:

Uniform pricing

Same price for all the units of product for all the consumers.

2.5 Price Discrimination

Definition of Price Discrimination

- Price discrimination is selling two varieties of a product by the same firm to two different consumers at different net prices.

  Net price = price paid by the consumer – cost associated with product differentiation

  Price discrimination is selling the units of the same product at different net prices either to different consumers or to the same consumer.

- Examples:

  Student prices; volume discounts; airplane tickets; vouchers/memberships; …

- *Feasibility?* Necessary conditions:
  - ➢ Market power (firm operates in an imperfectly competitive market)
  - ➢ No arbitrage

    Consumers find it impossible or too costly to transfer/resell the product to other consumers.

Typology of Price Discrimination (PD)

perfect

Information that firm has about consumers' willingness to pay

Personalized pricing (1st degree PD)

Individualized price for each unit purchased by each consumer → *full surplus extraction*

Group pricing (3rd degree PD)

Segmentation based on indicators related to consumers' preferences → different prices per group of consumers

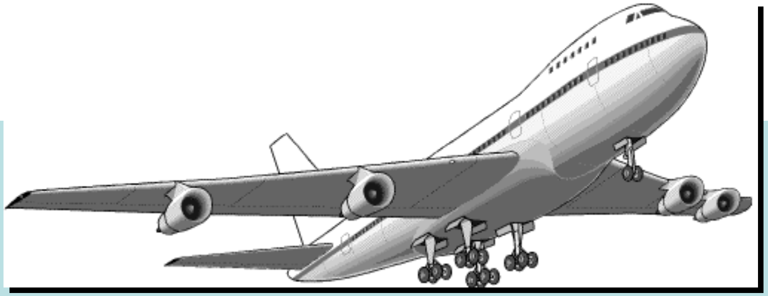
Menu pricing (2nd degree PD)

No observable indicators → use of self-selecting devices (target a specific package for each class of consumers)

Uniform price

limited

Case: **Airline fares**



- Favorable context
  - Great heterogeneity across consumers
  - Limited arbitrage opportunities
- Discount fares based on restrictions:
  - Restrictions fostering self-selection
    Purchase in advance, Saturday-night stay over, surcharge for one-way tickets, ...
  - Restrictions based on observable characteristics
    Family, age, students

1st Degree Price Discrimination

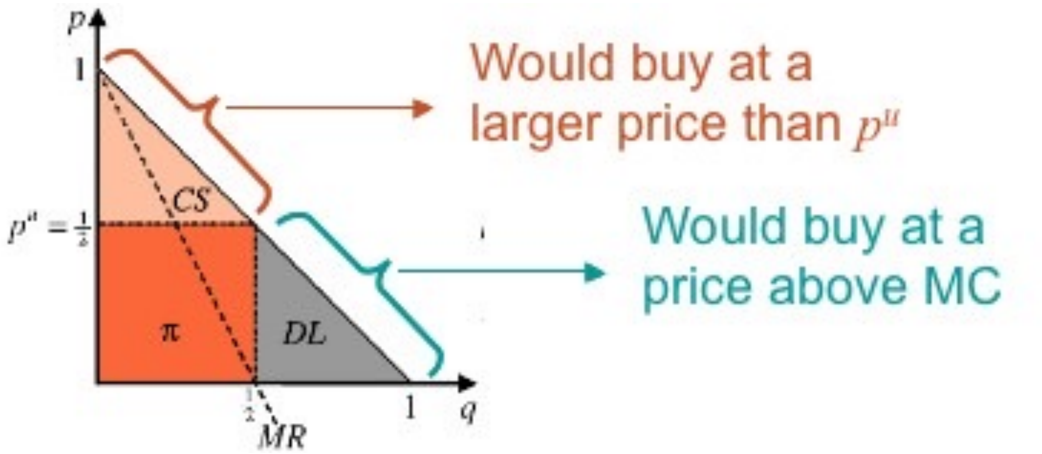
Personalized Pricing

Perfect Price Discrimination

1st Degree PD (Personalized pricing)

- Monopolist obtains refined information about consumers' reservation prices (willingness to pay) and charges each consumer a price equal to its reservation.

- Model:
  - ○ Unit mass of consumers with unit demand
  - ○ Valuation θ uniformly distributed over $[0,1]$
  - ○ Buy if $\theta \geq p \rightarrow$ demand: $q = 1 - p$
  - ○ Zero marginal cost; Monopolist profits: $p\,(1 - p)$
  - ○ If uniform price: $p^u = 1/2,\ \pi^u = 1/4,\ CS^u = 1/8,\ DWL^u = 1/8$
  - ○ Not satisfactory outcome:



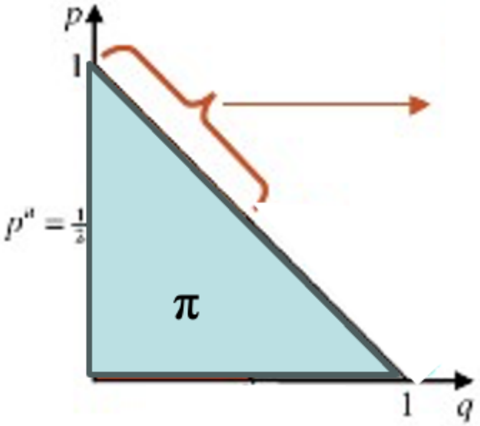
Would buy at a larger price than p^u

Would buy at a price above MC

1^{st} Degree PD (Personalized Pricing) (cont'd)

- Suppose now that the monopolist acquires customer-specific information – it learns the reservation price θ of each consumer.

Then the monopolist can charge each consumer a price equal to its reservation price.



$CS^u = 0$ It is all extracted by the monopolist.

$$\pi > \pi^u \quad \pi = TS \quad DWL = 0$$

Efficient but inequitable outcome

Same quantity as with perefct competitition.

Under 1st degree price discrimination (personalized prices), the monopolist captures entire surplus and deadweight loss vanishes.

3rd Degree Price Discrimination

Group Pricing

3rd Degree PD (Group Pricing)

- If the monopolist can observe a characteristic of consumers on the basis of which it can divide consumers into "groups" then it can practices 3rd price discrimination.

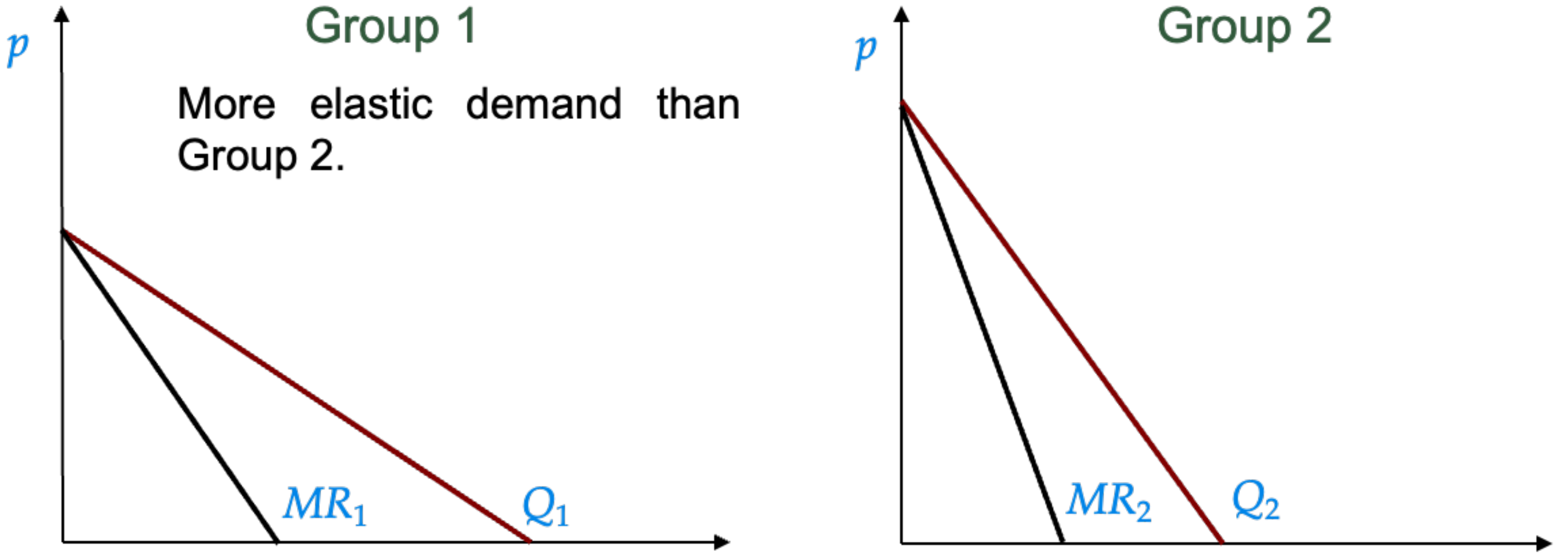
  3rd degree price discrimination occurs when the monopoly sets a different price for each of its customer groups.

- Examples:

  Student discounts; senior discounts; ladies' night discounts at bars; pink tax; geographical discrimination; …

3rd Degree PD (Group Pricing) (cont'd)

- Model:
  - Monopolist can sell its product on k separate markets (groups)
  - $Q_i(p_i)$: distinct demand curve for market (group) i



  - $C(q)$: monopolist's total cost (q: total quantity)

3rd Degree PD (Group Pricing) (cont'd)

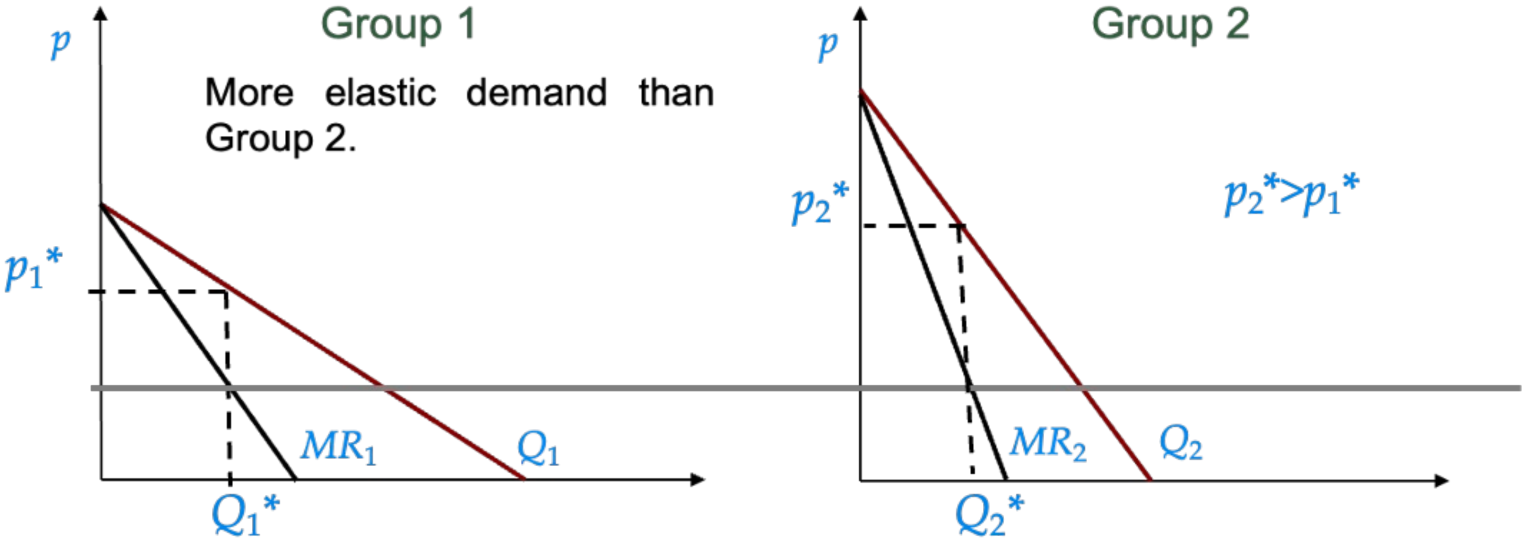
- Model Solution – Equilibrium:

Monopolist chooses vector of prices to maximize:

$$\Pi(p_1, p_2, \dots, p_k) = \sum_{i=1}^{k} p_i Q_i(p_i) - C\left(\sum_{i=1}^{k} Q_i(p_i)\right)$$

For any i, markup is given by inverse elasticity rule:

$$\frac{p_i - C'(q)}{p_i} = \frac{1}{\eta_i} \rightarrow \text{ if } \eta_i > \eta_j, \text{ then } p_i < p_j$$



3rd Degree PD (Group Pricing) (cont'd)

- Model Solution – Equilibrium:

  Monopolist chooses vector of prices to maximize:

$$\Pi(p_1, p_2, \dots, p_k) = \sum_{i=1}^{k} p_i Q_i(p_i) - C\left(\sum_{i=1}^{k} Q_i(p_i)\right)$$

  For any i, markup is given by inverse elasticity rule:

$$\frac{p_i - C'(q)}{p_i} = \frac{1}{\eta_i} \rightarrow \text{ if } \eta_i > \eta_j, \text{ then } p_i < p_j$$

Under 3^{rd} degree price monopolist, a monopolist optimally charges less to groups (markets) with a higher elasticity of demand.

3rd Degree PD (Group Pricing) (cont'd)

- Welfare implications relative to uniform pricing:
  - ➢ Higher Profit and thus higher Producer Surplus.
  - ➢ Higher Consumer Surplus for the group with higher elasticity of demand due to lower price.
  - ➢ Lower Consumer Surplus for the groups with the lower elasticity of demand due to higher price.
  - ➢ Lower Total Surplus (Welfare) unless the total quantity increases (very rare e.g. if with uniform pricing no sales to high elasticity group).

Case: **International price discrimination in the textbook market** (Cabolis *et al.*, 2006)

- Differences in book prices, US vs. elsewhere
  - No difference for general audience books
  - Textbooks substantially more expensive in the US

- Why?

No cost factor (most textbooks are printed in the US)

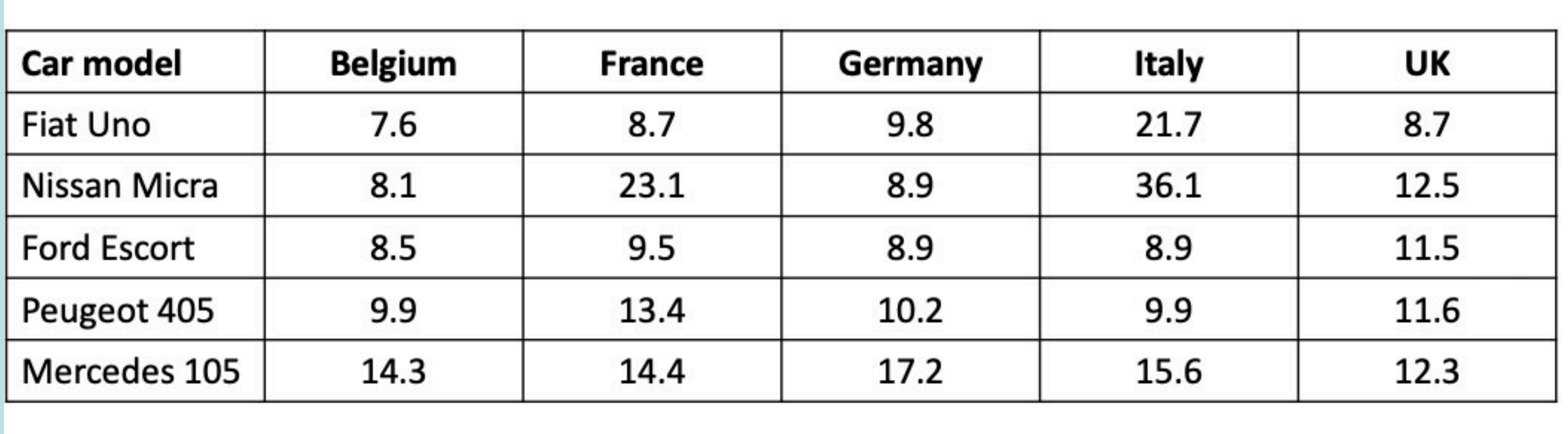
→ Must be due to different demand elasticities

- Demand less elastic in the U.S. because teachers require a single comprehensive textbook per course (not so much the tradition in European universities).

- Arbitrage is prevented: *“International edition. Not for sale in the US”*

Case: **European Car Market in 1990s** (Verboven, 1996)

Relative markups ($(p - c)/c$) for a list of car models in Europe (in %)



Car model	**Belgium**	**France**	**Germany**	**Italy**	**UK**
Fiat Uno	7.6	8.7	9.8	21.7	8.7
Nissan Micra	8.1	23.1	8.9	36.1	12.5
Ford Escort	8.5	9.5	8.9	8.9	11.5
Peugeot 405	9.9	13.4	10.2	9.9	11.6
Mercedes 105	14.3	14.4	17.2	15.6	12.3

2.5 Price Discrimination

Case: **Pink tax**

PINK TAX

SHAMPOO AND CONDITIONER

WOMEN	$8.39
MEN	$5.68
TAX	**48% DIFFERENCE**

RAZORS

WOMEN	$8.90
MEN	$7.99
TAX	**11% DIFFERENCE**

BABY ONESIE

GIRLS	$20.91
BOYS	$20.07
TAX	**4% DIFFERENCE**

Practice Exercise:

Assume there is a monopolist with total cost function: $C(q) = 50.000 + 2q$, where q denotes its total quantity. It sells its product to two different (separate) markets.

Market demand in market 1 is given by: $q_1 = 50.000 - 2.000p_1$

Market demand in market 2 is given by: $q_2 = 10.000 - 500p_2$

(i) Find price that the monopolist will charge in each market (assuming that it practices 3rd degree price discrimination), the elasticity of demand at these prices and its profit.

$$MC = \partial C/\partial q = 2$$

Market 1:

$$q_1 = 50.000 - 2.000p_1 \rightarrow p_1 = 25 - q_1/2000$$

$$R_1 = p_1q_1 = (25 - q_1/2000)q_1$$

$$\rightarrow MR_1 = \partial R_1/\partial q_1 = 25 - q_1/1000$$

2.5 Price Discrimination

Market 2:

$$q_2 = 10.000 - 500p_2 \rightarrow p_2 = 20 - q_2/500$$

$$R_2 = p_2q_2 = (20 - q_2/500)q_2 \rightarrow MR_2 = \partial R_2/\partial q_2 = 20 - q_2/250$$

Thus:

$$MC = MR_1 \rightarrow 2 = 25 - q_1/1000 \rightarrow q_1 = 23.000$$

$$MC = MR_2 \rightarrow 2 = 20 - q_2/250 \rightarrow q_2 = 4.500$$

It follows:

$$p_1 = 25 - 23.000/2.000 \rightarrow p_1 = 13{,}5$$

$$p_2 = 20 - 4.500/500 \rightarrow p_2 = 11$$

Elasticities:

$$\eta_1 = - (\partial q_1/\partial p_1)(p_1/q_1) = 2.000(13{,}5/23.000) \rightarrow \eta_1 = 1{,}17$$

$$\eta_2 = - (\partial q_2/\partial p_2)(p_2/q_2) = 500(11/4.500) \rightarrow \eta_2 = 1{,}22$$

Profit:

$$\pi = R_1 + R_2 - TC = 23.000(13{,}5) + 4.500(11 - 50.000 - 2(23.000 + 4.500)$$

$$\rightarrow \pi = 255.000$$

2.5 Price Discrimination

(ii) If the monopolist is obliged to charge the same price (uniform price) in the two markets, find the total market demand, the price that it charges and its total profits.

Now there is just one demand function:

- If $p > 25 \rightarrow Q = 0$
- If $25 > p > 20 \rightarrow Q = q_1 = 50.000 – 2.000p \rightarrow p = 25 – Q/2000$
- If $0 < p < 20 \rightarrow Q = q_1 + q_2 = 50.000 - 2.000p + 10.000 - 500$

$$\rightarrow p = 24 – Q/2500$$

Thus:

$$R = p\,Q = (24 – Q/2500)Q$$

$$\rightarrow MR = \partial R/ \partial Q = 24 – Q/1250$$

It can be checked that it prefers to sell to both markets than to one in this exercise.

It follows:

$$MR = MC \rightarrow 24 – Q/1250 = 2 \rightarrow Q = 27.500$$

$$p = 24 – Q/2500 \rightarrow p^u = 13$$

$$\pi = R – C = 13(27.500) – 50.000 – 2(27.500)$$

$$\rightarrow \pi^u = 252.500 < 255.000$$

2nd Degree Price Discrimination

Menu Pricing

2nd degree PD vs. 3rd (and 1st) degree PD

- 3rd and 1st degree PD

  Seller can infer consumers' willingness to pay from observable and verifiable characteristic (e.g., age).

- 2nd degree PD

  Willingness to pay = private information

  Seller must bring consumer to reveal this information.

  How?

  - Identify product dimension valued differently by consumers.
  - Design several versions of the product along that dimension.
  - Price versions to induce consumers' self-selection.

    → **Menu pricing** (a.k.a. versioning, nonlinear pricing)

    Uninformed party brings informed parties to reveal their private information

2nd degree PD

- Examples:

  Volume discounts; phone companies packages; amusement parks offering a menu of ticket packages; first class vs. economy class airline ticket; season tickets; insurance contracts; …

Case: **Menu pricing in the information economy**

- Versioning based on quality

  ‘Nagware’: software distributed freely but displaying ads or screen encouraging users to buy full version.

  → annoyance = discriminating device

- Versioning based on time
  - Books: first in hardcover, later in paperback
  - Movies: first in theaters, next on DVD, finally on TV

  → price decreases as delay increases

- Versioning based on quantity
  - Software site licenses
  - Newspaper subscription

  → quantity discounts