

## Lecture 16

### Price discrimination

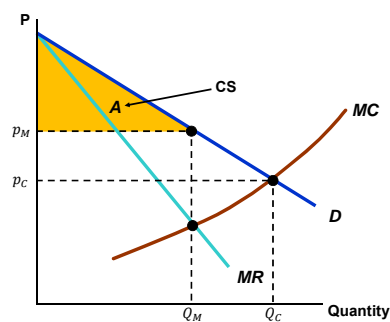


Industrial  
Economics

## Price discrimination

- ★ Our **most usual** variable:  $p$   
what does it stand for?
- ★ In our analysis we have **assumed** that the firm can charge only one **universal price**
- ★ However, firms often charge **different** prices to **different** consumers  
and often different prices to the **same** consumer
- ★ If we **relax the assumption** of single price, the firm has more **instruments** in its optimization process

## Monopoly and CS



## Terminology

### Price-in (a consumer)

*Verb*

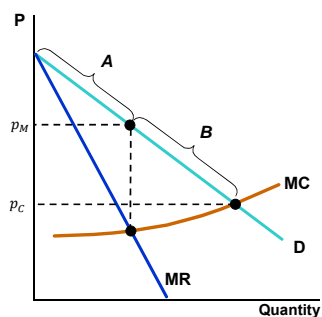
To lower the price sufficiently, so that a consumer who previously could not afford the good, now can

### Price-out (a consumer)

*Verb*

To increase the price sufficiently, so that a consumer who previously could afford the good, now cannot

## Target customers



- ★ Only A is served
- ★ What about B?
- ★ If both A and B are served in different prices the firm will capture more consumer surplus

## Limitations in scope

There are two important **limitations** in PD

### 1. Arbitrage

- ◆ The perspective of **transactions between** consumers
- ◆ The **scope** for price discrimination is higher in markets with lower possibilities for **arbitrage**

### 2. Information scarcity

- ◆ Consumers should be charged according to their **willingness to pay**
- ◆ Consumers will not **truthfully reveal** their willingness

★ We will examine pricing **techniques** of capturing consumer surplus and transferring it to the producer

## Degrees of price discrimination

- ★ **First-degree** (or perfect) price discrimination
  - when every unit is sold at its reservation price capturing the entire consumer surplus
- ★ **Third-degree** (segmentation) price discrimination
  - when the seller uses direct involuntary signals about demand of different groups of consumers
- ★ **Second-degree** (self-selection) price discrimination
  - when the seller has incomplete information about consumer preferences, but extracts part of the consumer surplus by using self-selecting devices.

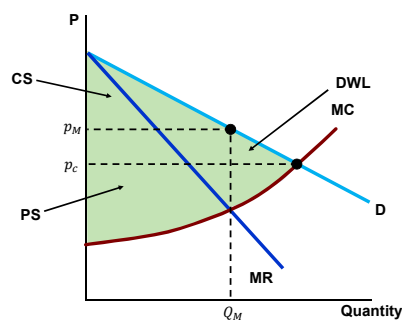
## Market power requirement

- ★ We will analyze PD in the context of a **single firm**
- ★ PD is contingent to the amount of **market power**
  - ◆ **Monopolists have** market power
  - ◆ But **other sellers also have** some market power
- ★ Most PD analysis **carries over to any setting** with market power
- ★ PD may be **possible** for firms that have even minimal market power. .

## First degree PD

- ★ Perfect discrimination in which the CS is **captured** by the seller in its **entirety**
- ★ **Every consumer**, for **every unit** of the product has a different reservation price
  - we assume that the seller knows the **exact matrix** of prices and is able to charge everyone up to their reservation price
- ★ In reality this is not possible to happen because of **information scarcity** and **arbitrage**
- ★ However, first degree PD is a useful theoretical **benchmark**.

## Perfect price discrimination



## Optimal price

- ★ Consider a monopolist and  $N$  **heterogeneous consumers**
- ★ Each consumer  $i$  has **demand**  $q_i = D_i(p)$ ,  $i = 1, \dots, N$ 
  - demands are **common knowledge** and there is no **arbitrage** possibility
- ★ The monopolist **maximizes surplus** by setting
 
$$p_i(q_i) = D_i^{-1}(p)$$
  - prices vary by consumer** and by **quantity**
- ★ The monopolist captures the **entire surplus** of the market.

## 2-part-tariff

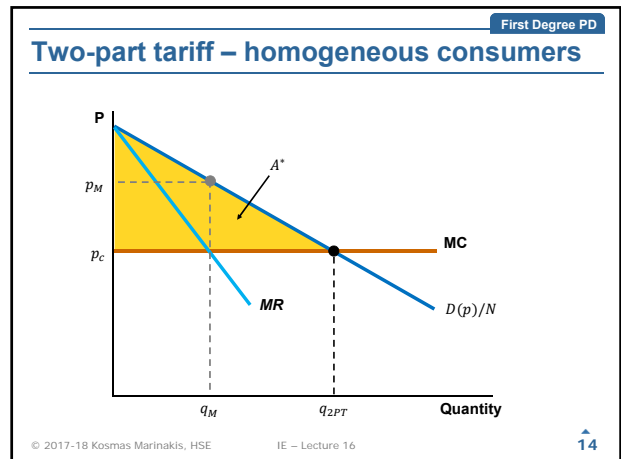
- ★ If the  $N$  consumers are **identical**, the **same result** can be obtained with a **non-price discriminating** method
- ★ If the monopolist charges  $p_c = MC$ , **total CS** will be
 
$$S_c = \int_0^{q_c} [D^{-1}(q) - p_c] dq$$
- ★ Assume now that on top of  $p_c$ , the firm charges a **participation fee** per consumer
 
$$A = S_c/N$$
- ★ **Expenditure** per consumer will be
 
$$T = A + p_c q$$
- ★ Will the introduction of  $A$  **price-out** consumers? .

First Degree PD

## 2-part-tariff equivalency

- ★ Consumers will remain **marginal buyers**
- ★ The monopolist's **profit** will be
 
$$\Pi = S_c + p_c q - C(q)$$
- ★ The monopolist acquires the **entire surplus** of the market
- ★ If consumers are **homogeneous**, the 2PT solution is **equivalent** to 1PD.

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First Degree PD

## Can it really work?

- ★ In practice, perfect PD is almost **never** possible
  - ◆ Because of **info scarcity** and **arbitrage**
  - ◆ But also because of the **impracticality** and **menu costs**
- ★ However, sellers often discriminate **imperfectly**
  - ◆ Charge a **few different prices** based on some **proxy** for willingness to pay
- ★ **Examples** of imperfect price discrimination where the seller may **segment** the market to some fine extent:
  - ◆ Car salespersons
  - ◆ Colleges and universities
  - ◆ Lawyers, accountants

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First Degree PD

## Efficiency and welfare effects

- ★ Perfect price discrimination **allocates** the entire surplus to the producer  
the market is **perfectly efficient** – no DWL
- ★ **Overall welfare effect** however is **ambiguous** compared to single price monopoly
  1. Seller is **better off**
  2. Higher reservation price consumers are **worse off**
  3. Lower reservation price consumers are **priced-in**

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## Third degree PD

- ★ In some markets it is easy for the seller to **segment** the consumer base into **groups** of different willingness to pay that is, groups with **different elasticities** of demand
- ★ Examples:
  - ◆ **Students** are willing to pay less for transportation
  - ◆ **Senior citizens** are willing to pay less for cinema
  - ◆ **Women** are willing to pay less than men for clubbing
  - ◆ **Locals** are willing to pay less than tourists for taxi
- ★ If the groups are **identifiable** (direct involuntary signals) the seller may proceed with **profiling** that is, treatment **analogous** to every subject's profile.

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Third Degree PD

## Segmentation

- ★ Suppose the seller **segments** the market into **two groups** the enthusiasts ( $E$ ) and the usuals ( $R$ )
 
$$\Pi = p_E \cdot q_E + p_R \cdot q_R - c(q_E + q_R)$$
- ★ FOCs are:  $p_E + \frac{dp_E}{dq_E} q_E = \frac{\partial c}{\partial q_E}$  and  $p_R + \frac{dp_R}{dq_R} q_R = \frac{\partial c}{\partial q_R}$
- ★ Or, using the **elasticity**

$$p_E \left(1 - \frac{1}{\varepsilon_E}\right) = p_R \left(1 - \frac{1}{\varepsilon_R}\right) = \frac{\partial c}{\partial (q_E + q_R)}$$

$$p_i = \frac{\partial c}{\partial (q_E + q_R)} \bigg/ \left(1 - \frac{1}{\varepsilon_i}\right) \quad \text{for } i = E, R$$
 the more inelastic group  $E$  will **pay more**.

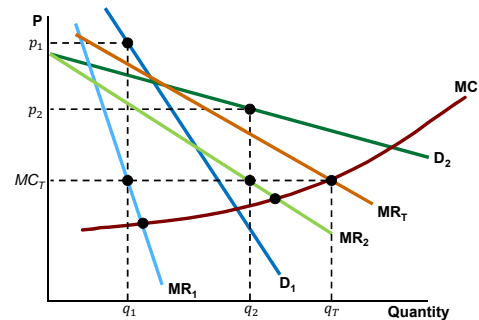
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## Market segregation

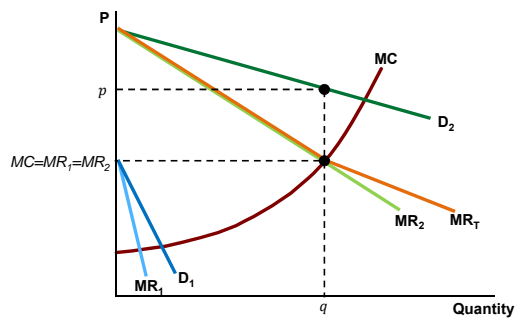
- ★ Contrary to popular belief, **3PD segmentation** does **not** imply **complete market segregation**
- ★ The seller will always have to check the case where **only** the market with the **lower elasticity** (the enthusiasts) will have to be served
- ★ The market of usuals might drive **MC to the overhead** and the firm might decide to **exclude** them  
in this case, the seller will set **only one price**, mapped to the elasticity of the enthusiasts

$$p_E = \frac{\partial c}{\partial q_E} / \left(1 - \frac{1}{\varepsilon_E}\right)$$

## Third-degree PD equilibrium



## Weak market exclusion



## Net welfare changes

- ★ The net welfare changes are **similar** to 1PD
  1. **Seller's** profits clearly increase
  2. **Enthusiasts** are worse off because  $p_E > p_M$
  3. **Usuals** are better off because  $p_R < p_M$

## Total surplus: quantity diminishing PD

- ★ If  $q_E + q_R \leq q_M$  then **total surplus** must have **decreased** because of **allocation inefficiency**
  - ◆ The **first enthusiast** priced-out at  $p_E$  has **higher reservation price** that the **last usual** priced-in at  $p_R$
  - ◆ If  $p_E = 100$  and  $p_R = 50$  an **enthusiast** willing to pay 99 is **out** and a **usual** willing to pay 50 is **in**

## Total surplus: quantity enhancing PD

- ★ If  $q_E + q_R > q_M$  **total surplus** is **ambiguous** with one **exception**:  
single monopoly price **excludes** the usuals ( $p_M = p_E$ )
- ★ Allowing 3PD with different  $p_R$  and  $p_E$ 
  - ◆ **Usuals** will be **priced-in** by  $p_R$
  - ◆ **Enthusiasts** will be **unaffected** (because  $p_E$  will not change)
  - ◆ **Seller** will be **better off** from gaining some profit from usuals
- ★ Market segmentation is a **weak Pareto improvement**  
this **assumes** that  $\Delta MC$  from  $\Delta Q$  to supply the regular market does not price-out any enthusiasts

Thank you!



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