Topics and Lectures

A) Introduction

B) Competition and Monopoly

C) Technology and Cost; Industry Structure

D) Price Discrimination and Monopoly
   1) Linear Pricing
   2) Nonlinear Pricing

E) Product Variety and Quality under Monopoly

F) Static Games
   1) Cournot Competition
   2) Price Competition

G) Dynamic Games, First and Second Movers

H) Horizontal Product Differentiation
   1) Price Competition & Product Choice
   2) Entry & Optimum Product Variety
   3) Love of Variety Approach

I) Vertical Product Differentiation

J) Predatory Conduct

K) Research & Development

D1) Introduction

- Prescription drugs are cheaper in Canada than the United States
- Textbooks are generally cheaper in Britain than the United States

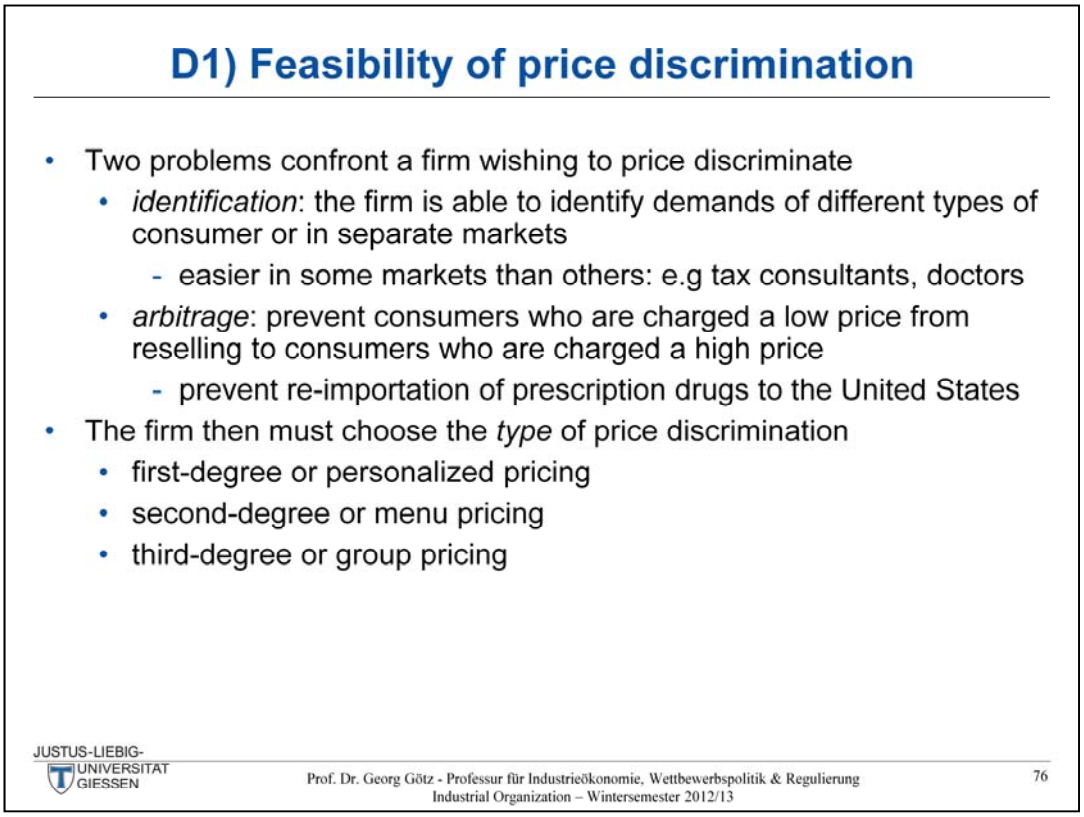
⇒ *price discrimination: Charging different prices to different consumers for the same product*

- Examples of *price discrimination*
  - presumably profitable
  - should affect market efficiency: not necessarily adversely
  - is price discrimination necessarily bad – even if not seen as "fair"?

Numerous examples for price discrimination; discuss in more detail when talking about the specific types.

Why are firms doing this? Increases profits!!

Antitrust: price discrimination only prohibited if it is intended to lessen competition (Robinson-Patman act)



Identification: Firm needs not only to know ist demand curve, i.e. how demand varies with its price, but also how consumers differ in their demand.

Arbitrage: Cases in EU-Antitrust Practice:

Dr. Sven Norberg Leuven

Director 20 June 2003

Directorate-General Competition

European Commission

Brussels *

Competition Policy of the European Commission: In the Interest of Consumers?

2. Prevention of Parallel Trade

The Commission's constant fight against obstacles to parallel trade shows many examples of how it intervenes with the help of the Competition Policy instruments at its disposal to secure the European consumers' rights to buy products wherever, within the internal market, this is most favourable to them. While the Commission does not act as a price regulator and has no mandate or intention to try to harmonise prices in Europe, the fact that there still exists very substantial price differences for products like cars or pharmaceuticals within the different Member States has over the years induced industries to try to prevent parallel trade. I will give you a few examples of our actions and will start with the motor vehicle sector where the price differences between the 15 Member States still are very substantial as demonstrated by our bi-annual car price reports, the next one to be published in about a months time[1].

D1) Third-degree price discrimination

- Consumers differ by some observable characteristic(s)
- A uniform price is charged to all consumers in a particular group – linear price
- Different uniform prices are charged to different groups
  - "kids are free"
  - subscriptions to professional journals e.g. *American Economic Review*
  - airlines
    - the number of different economy fares charged can be very large indeed!
  - early-bird specials; first-runs of movies

Linear price: Price per unit is independent of how many units are bought!

AER: income based prices (= type of professor, assistant, associate, full).

More common with journals: prices for individuals vs. prices for institutions.

Early-bird specials in restaurants

Coupons in supermarkets.

D1) Third-degree price discrimination (cont.)

- The pricing rule is very simple:
  - consumers with low elasticity of demand should be charged a high price
  - consumers with high elasticity of demand should be charged a low price

D1) Third degree price discrimination: General

- Assume two separated groups (=markets) with demand functions $q_1 = D_1(p_1)$ and $q_2 = D_2(p_2)$
- Aggregate demand: $q = q_1 + q_2$
- Profit maximization with uniform pricing (no price discrimination): single price p

$$\max_p \Pi = D_1(p)\,p + D_2(p)\,p - C(q_1 + q_2)$$

$$\text{FOC:} \quad \frac{d\Pi}{dp} = D_1'\,p + D_1 + D_2'\,p + D_2 - C'(q)\left(D_1' + D_2'\right) = 0$$

$$\Rightarrow \quad p\left(1 + \frac{D_1 + D_2}{p\left(D_1' + D_2'\right)}\right) = C'(D_1 + D_2)$$

$$= -1/\eta^{\text{AggrDem.}}$$

For special problems such as corner solutions, kinks in demand curve, not serving of certain markets see the examples below.

In the optimization problem I now use the optimization via choice of prices. No special reason, could be done also via quantities. Perhaps if there is price discrimination choosing prices is more „natural“.

In the foc I omit that D is a function of p for lack of space and because it is clear.

D1) Third degree price discrimination: General

- Profit maximization with price discrimination: group prices p_1 and p_2

$$\max_{p_1,p_2} \Pi = D_1(p_1)p_1 + D_2(p_2)p_2 - C(q_1+q_2)$$

FOCs:

$$\frac{\partial \Pi}{\partial p_1} = D_1' p_1 + D_1 - C'(q) D_1' = 0$$

$$\frac{\partial \Pi}{\partial p_2} = D_2' p_2 + D_2 - C'(q) D_2' = 0$$

$$\Rightarrow \quad p_1\left(1 + \frac{D_1}{p_1 D_1'}\right) = C'(q) = p_2\left(1 + \frac{D_2}{p_2 D_2'}\right)$$

$$\Rightarrow \quad \frac{p_1}{p_2} = \frac{(1 - 1/\eta_2)}{(1 - 1/\eta_1)} = \frac{\eta_1\eta_2 - \eta_1}{\eta_1\eta_2 - \eta_2}.$$

Price is lower in the market with the higher demand elasticity

η_i is (absolute value of) elasticity of demand

D1) Third degree price discrimination: example

- Harry Potter volume sold in the United States and Europe
- Demand:
  - United States: $P_U = 36 - 4Q_U$
  - Europe: $P_E = 24 - 4Q_E$
- Marginal cost constant in each market
  - $MC = \$4$

Other examples: Cars (BMWs, etc.)

I jumpt to page 83(?) in the lecture. The following slides are left for information. We‘ll talk about the formal derivation when we discuss the assignment.

D1) The example: no price discrimination

- Suppose that the same price is charged in both markets
- Use the following procedure:
  - calculate aggregate demand in the two markets
  - identify marginal revenue for that aggregate demand
  - equate marginal revenue with marginal cost to identify the profit maximizing quantity
  - identify the market clearing price from the aggregate demand
  - calculate demands in the individual markets from the individual market demand curves and the equilibrium price

D1) The example (npd cont.)

United States: $P_U = 36 - 4Q_U$ Invert this:

$Q_U = 9 - P/4$ for $P \leq \$36$

Europe: $P_U = 24 - 4Q_E$ Invert

$Q_E = 6 - P/4$ for $P \leq \$24$

Aggregate these demands

$Q = Q_U + Q_E = 9 - P/4$ for $\$36 \leq P \leq \$24$

$Q = Q_U + Q_E = 15 - P/2$ for $P < \$24$

At these prices only the US market is active

Now both markets are active

D1) The example (npd cont.)

Invert the direct demands

$P = 36 - 4Q$ for $Q \leq 3$

$P = 30 - 2Q$ for $Q > 3$

Marginal revenue is

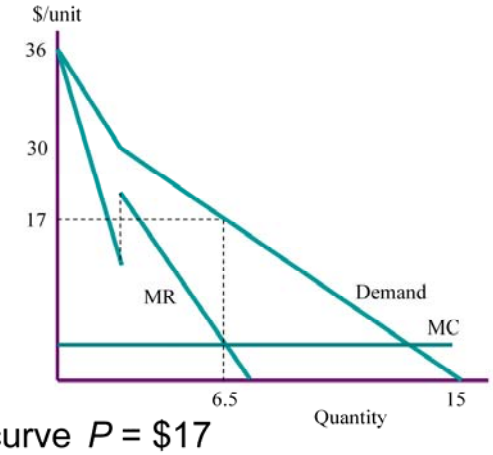
$MR = 36 - 8Q$ for $Q \leq 3$

$MR = 30 - 4Q$ for $Q \leq 3$

Set MR = MC

$Q = 6.5$

Price from the demand curve $P = \$17$



Kink in aggregate demand curve!

Attention: Check demand functions! Different from what I deed before!

D1) The example (npd cont.)

Substitute price into the individual market demand curves:

$Q_U = 9 - P/4 = 9 - 17/4 = 4.75$ million

$Q_E = 6 - P/4 = 6 - 17/4 = 1.75$ million

Aggregate profit = (17 – 4)x6.5 = $84.5 million

D1) The example: price discrimination

- The firm can improve on this outcome
- Check that MR is not equal to MC in both markets
  - MR > MC in Europe
  - MR < MC in the US
  - the firms should transfer some books from the US to Europe
- This requires that different prices be charged in the two markets
- Procedure:
  - take each market separately
  - identify equilibrium quantity in each market by equating MR and MC
  - identify the price in each market from market demand

D1) The example: (pd cont.)

Demand in the US:
$P_U = 36 - 4Q_U$

Marginal revenue:

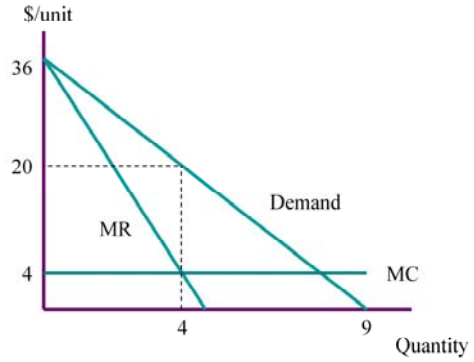
$MR = 36 - 8Q_U$

$MC = 4$

Equate MR and MC

$Q_U = 4$

Price from the demand curve $P_U = \$20$



D1) The example: (pd cont.)

Demand in the Europe:
$P_E = 24 - 4Q_U$

Marginal revenue:

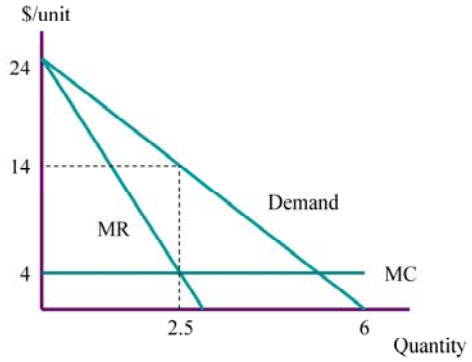
$MR = 24 - 8Q_U$

$MC = 4$

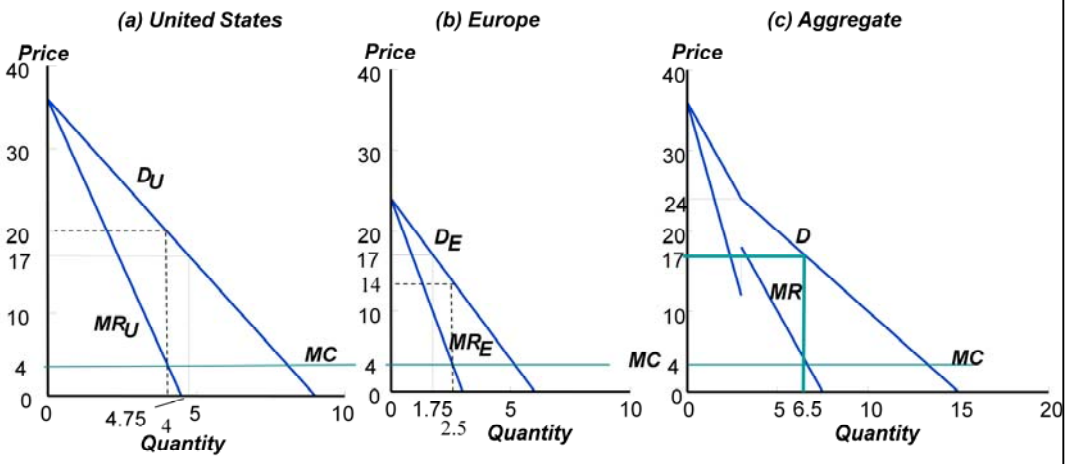
Equate MR and MC

$Q_E = 2.5$

Price from the demand curve $P_E = \$14$



D1) The example: (pd cont.)



D1) The example (pd cont.)

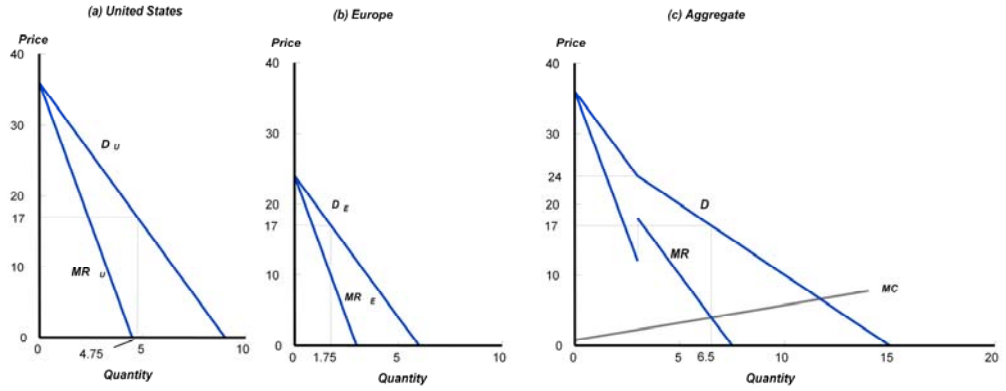
- Aggregate sales are 6.5 million books
  - the same as without price discrimination
- Aggregate profit is (20 – 4)x4 + (14 – 4)x2.5 = $89 million
  - $4.5 million greater than without price discrimination

D1) No price discrimination: non-constant cost

- The example assumes constant marginal cost
- How is this affected if MC is non-constant?
  - Suppose MC is increasing
- No price discrimination procedure
  - Calculate aggregate demand
  - Calculate the associated MR
  - Equate MR with MC to give aggregate output
  - Identify price from aggregate demand
  - Identify market demands from individual demand curves

D1) The example again

Applying this procedure assuming that MC = 0.75 + Q/2 gives:



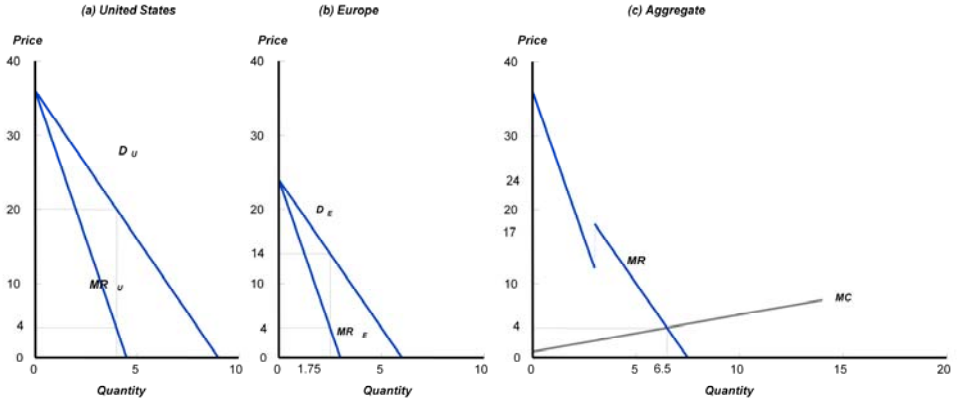
D1) Price discrimination: non-constant cost

- With price discrimination the procedure is
  - Identify marginal revenue in each market
  - Aggregate these marginal revenues to give aggregate marginal revenue
  - Equate this MR with MC to give aggregate output
  - Identify equilibrium MR from the aggregate MR curve
  - Equate this MR with MC in each market to give individual market quantities
  - Identify equilibrium prices from individual market demands

Important: Graphically aggregate marginal revenue is obtained by horizontal aggregation.

D1) The example again

Applying this procedure assuming that MC = 0.75 + Q/2 gives:



D1) Some additional comments

- Suppose that demands are linear
  - price discrimination results in the same aggregate output as no price discrimination
  - price discrimination increases profit
- For any demand specifications two rules apply
  - marginal revenue must be equalized in each market
  - marginal revenue must equal aggregate marginal cost

With isoelastic demand aggregate output might well increase! Reason: Aggregate marginal revenue is not just the „horizontal sum“ of individual outputs.

D1) Third-degree price discrimination (cont.)

- Often arises when firms sell *differentiated products*
  - hard-back versus paper back books
  - first-class versus economy airfare
- Price discrimination exists in these cases when:
  - "two varieties of a commodity are sold by the same seller to two buyers at different *net* prices, the net price being the price paid by the buyer corrected for the cost associated with the product differentiation." (Phlips)
- The seller needs an easily observable characteristic that signals willingness to pay
- The seller must be able to *prevent arbitrage*
  - e.g. require a Saturday night stay for a cheap flight

Now: Extension of basic model to allow for discrimination via use of product differentiation. Different varieties may and will in general differ in marginal costs. Main point: Is the difference in prices different from the cost difference. Caveat: The prices two independent monopolist will charge for two different varieties (with identical demand functions) will in general not differ by exactly the cost difference! Remember: pass through with linear demand ½, with iso-elastic more than 1. So Phlips definition seems to be not perfect.

D1) Product differentiation and price discrimination

- Suppose that demand in each submarket is $P_i = A_i - B_iQ_i$
- Assume that marginal cost in each submarket is $MC_i = c_i$
- Finally, suppose that consumers in submarket *i* do not purchase from submarket *j*
  - "I wouldn't be seen dead in Coach!"
  - "I never buy paperbacks."
- Equate marginal revenue with marginal cost in each submarket

$$A_i - 2B_iQ_i = c_i \Rightarrow Q_i = (A_i - c_i)/2B_i \Rightarrow P_i = (A_i + c_i)/2$$
$$\Rightarrow P_i - P_j = (A_i - A_j)/2 + (c_i - c_j)/2$$

It is highly unlikely that the difference in prices will equal the difference in marginal costs

Important about price difference: expression with *A*'s enter => price discrimination.

With identical demand functions and therefore „no" incentive for price discimination, price difference would be just one half of the cost difference. Remember pass through.

D1) Other mechanisms for price discrimination

- Impose restrictions on use to control arbitrage
  - Saturday night stay
  - no changes/alterations
  - personal use only (academic journals)
  - time of purchase (movies, restaurants)
- "Crimp" the product to make lower quality products
  - *Mathematica®*
- Discrimination by location

Deneckere, McAffee: Damaged Goods, JEMS, 1996: IBM Laser Printer, Express and ordinary delivery parcel service. Low quality good costs more (in terms of variable costs)! Full product is deteriorated to give low quality product. (Certain features are disabled).

D1) Discrimination by location

- Suppose demand in two distinct markets is identical
  - $P_i = A - BQ_i$
- But suppose that there are different marginal costs in supplying the two markets
  - $c_j = c_i + t$
- *Profit maximizing rule:*
  - equate MR with MC in each market as before
  - $\Rightarrow P_i = (A + c_i)/2$; $P_j = (A + c_i + t)/2$
  - $\Rightarrow P_j - P_i = t/2 \neq c_j - c_i$
  - difference in prices is not the same as the difference in costs

Austrian firm selling at home and in Germany.

Again problem with the definition of price discrimination see above. Following my line of argument above, I would not call the result price discrimination. But this is more about semantics rather than economics.

For a better(?) example see Assignment 2. Transport costs can be an important device to separate markets!

D1) Third-degree Price discrimination and welfare

- Does third-degree price discrimination reduce welfare?
  - not the same as being “fair”
  - relates solely to efficiency
  - so consider impact on total surplus

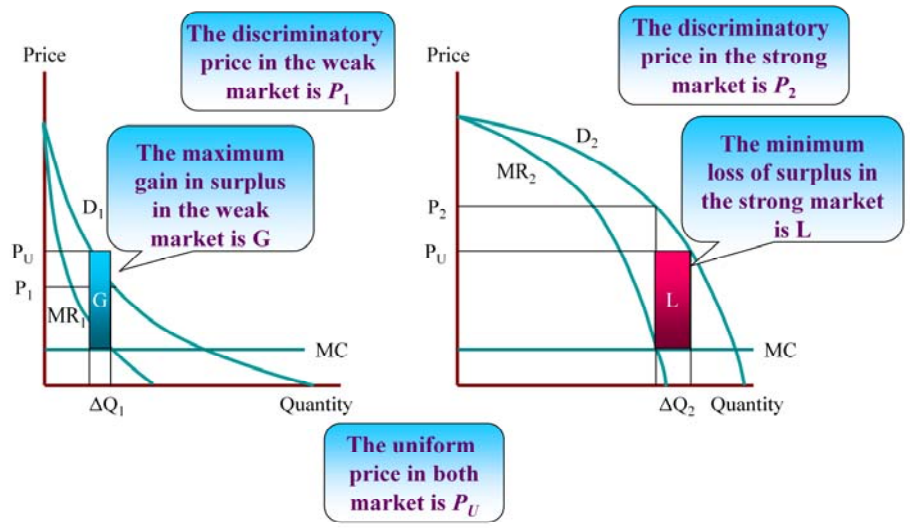
Answer to the question not straightforward since there are potential trades due to the deadweight loss in the situation without discrimination.

Fairness: Some consumers gain, some lose, so fairness is hard to tell. In particular types of winners and losers differ: Students gain!

Does discrimination worsen or reduce monopoly distortion?

D1) Price discrimination and welfare

Suppose that there are two markets: “weak” and “strong”



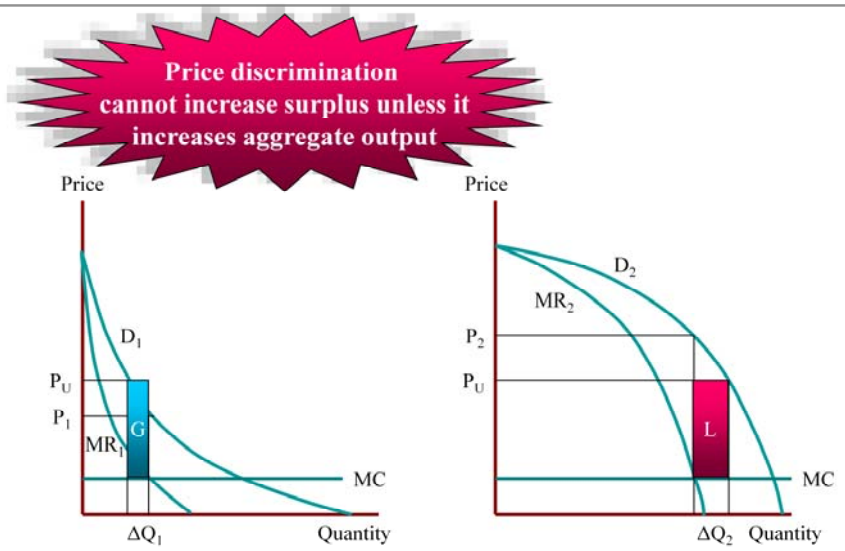
„Strong market“: (Discriminatory) Price higher than uniform price.

„Weak market“: (Discriminatory) Price lower than uniform price.

So weak and strong is from the viewpoint of the firm!

Shape of the curves is irrelevant: Maximum gain and minimum loss are an upper and lower bound, resp. for the welfare changes in the two markets.

D1) Price discrimination and welfare



It follows that $\Delta W \leq G - L = (P_U - MC)\Delta Q_1 + (P_U - MC)\Delta Q_2$

$= (P_U - MC)(\Delta Q_1 + \Delta Q_2)$

ΔW gives an upper bound for the change in welfare!

Necessary condition only. Not sufficient; see example with isoelastic demand!
Welfare decreases even though output increases!

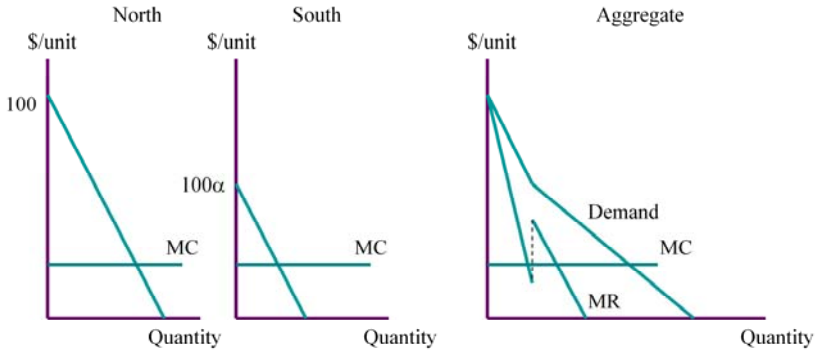
D1) Price discrimination and welfare (cont.)

- Previous analysis assumes that the same markets are served with and without price discrimination
- This may not be true
  - uniform price is affected by demand in “weak” markets
  - firm may then prefer not to serve such markets without price discrimination
  - price discrimination may open up weak markets
- The result can be an increase in aggregate output and an increase in welfare

D1) New markets: an example

Demand in "North" is $P_N = 100 - Q_N$; in "South" is $P_S = 100\alpha - Q_S$

Marginal cost to supply either market is \$20

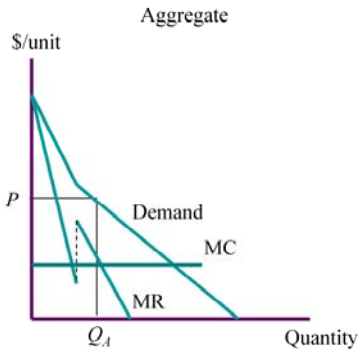


D1) The example: continued

Aggregate demand is $P = (1 + \alpha)50 - Q/2$ provided that both markets are served

Equate MR and MC to get equilibrium output $Q_A = (1 + \alpha)50 - 20$

Get equilibrium price from aggregate demand $P = 35 + 25\alpha$



D1) The example: continued

Now consider the impact of a reduction in α

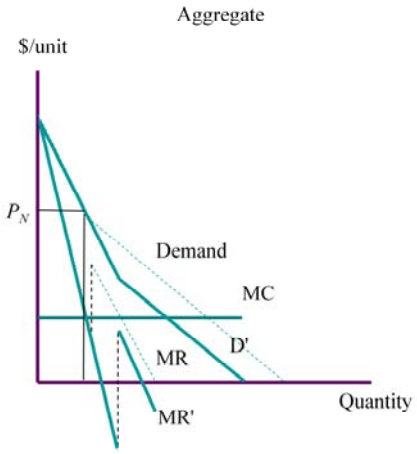
Aggregate demand changes

Marginal revenue changes

It is no longer the case that both markets are served

The South market is dropped

Price in North is the monopoly price for that market



D1) The example again

Previous illustration is too extreme

MC cuts MR at two points

So there are potentially two equilibria with uniform pricing

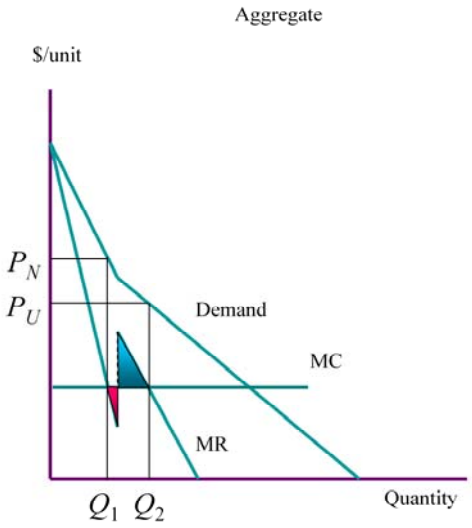
At Q_1 only North is served at the monopoly price in North

At Q_2 both markets are served at the uniform price P_U

Switch from Q_1 to Q_2:

- decreases profit by the red area
- increases profit by the blue area

If South demand is "low enough" or MC "high enough" serve only North



Red and blue areas: Additional revenue (due to serving both markets) can be derived from the diagram by the area below the MR curve (area below is the integral over MR which gives R). Additional costs is equal to the area below the marginal cost function. Profit change is equal to the difference of these two areas.

D1) Price discrimination and welfare (cont.)

In this case only North is served with uniform pricing

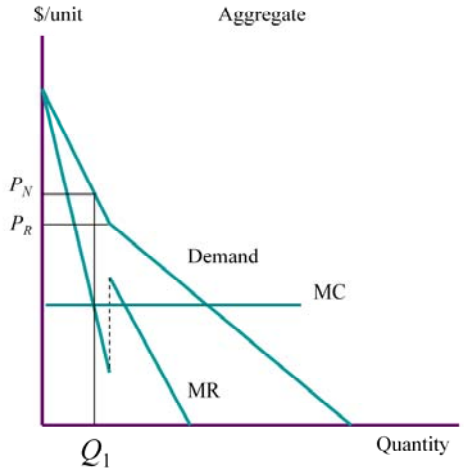
But MC is less than the reservation price P_R in South

So price discrimination will lead to South being supplied

Price discrimination leaves surplus unchanged in North

But price discrimination generates profit and consumer surplus in South

So price discrimination increases welfare



D1) Price discrimination and welfare again

- Suppose only North is served with a uniform price
- Also assume that South will be served with price discrimination
  - Welfare in North is unaffected
  - Consumer surplus is created in South: opening of a new market
  - Profit is generated in South: otherwise the market is not opened
- As a result price discrimination increases welfare.

D2) First-Degree Price Discrimination or Personalized Pricing

First-degree price discrimination occurs when the seller is able to extract the *entire* consumer surplus

⇒ Price equals willingness to pay for each unit sold

Example:

- suppose that you own five antique cars and you meet several collectors
- The keenest is willing to pay up to $10,000 for a car, the second keenest up to $8,000 for, the third keenest up to $6,000, the forth keenest up to $4,000, and the fifth keenest up to $2,000 for a car.
- sell the cars to each buyer her WTP
- total revenue $30,000
- Revenue with uniform monopoly price of $6000: $18,000; 3 units sold.

- Highly profitable but requires detailed information and ability to avoid arbitrage
- Leads to the efficient choice of output: since price equals marginal revenue and MR = MC

Not only personalized pricing in the sense that every person might in principle be charged a different price, but every unit is sold at a different price!

Think of example in which consumers buy more than one unit.

D2) First-degree price discrimination (cont.)

- The information requirements appear to be insurmountable
- No arbitrage is less restrictive but potentially a problem
- *But* there are pricing schemes that will achieve the same output
  - non-linear prices
  - two-part pricing as a particular example of non-linear prices

D2) Two-Part Pricing

Take an example:

Jazz club:

n identical consumers

Individual demand is P = V - Q

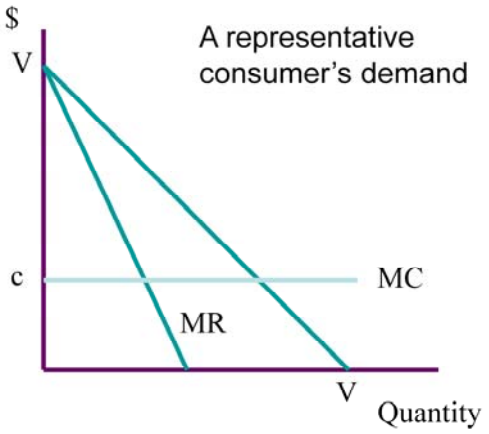
Cost is C(Q) = F + cQ

Marginal Revenue is

MR = V - 2Q

Marginal Cost is

MC = c



D2) Two-Part Pricing

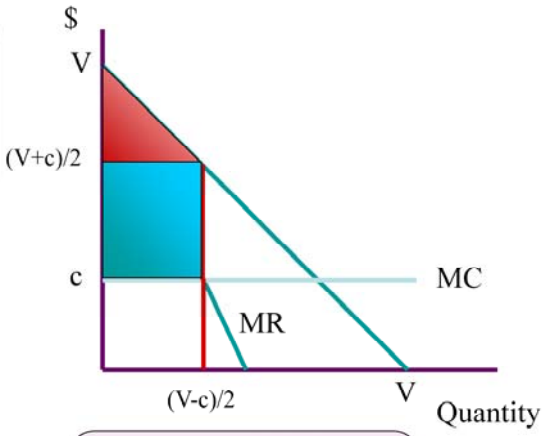
With a uniform price profit is maximized by setting marginal revenue equal to marginal cost

$V - 2Q = c$

So $Q = (V - c)/2$

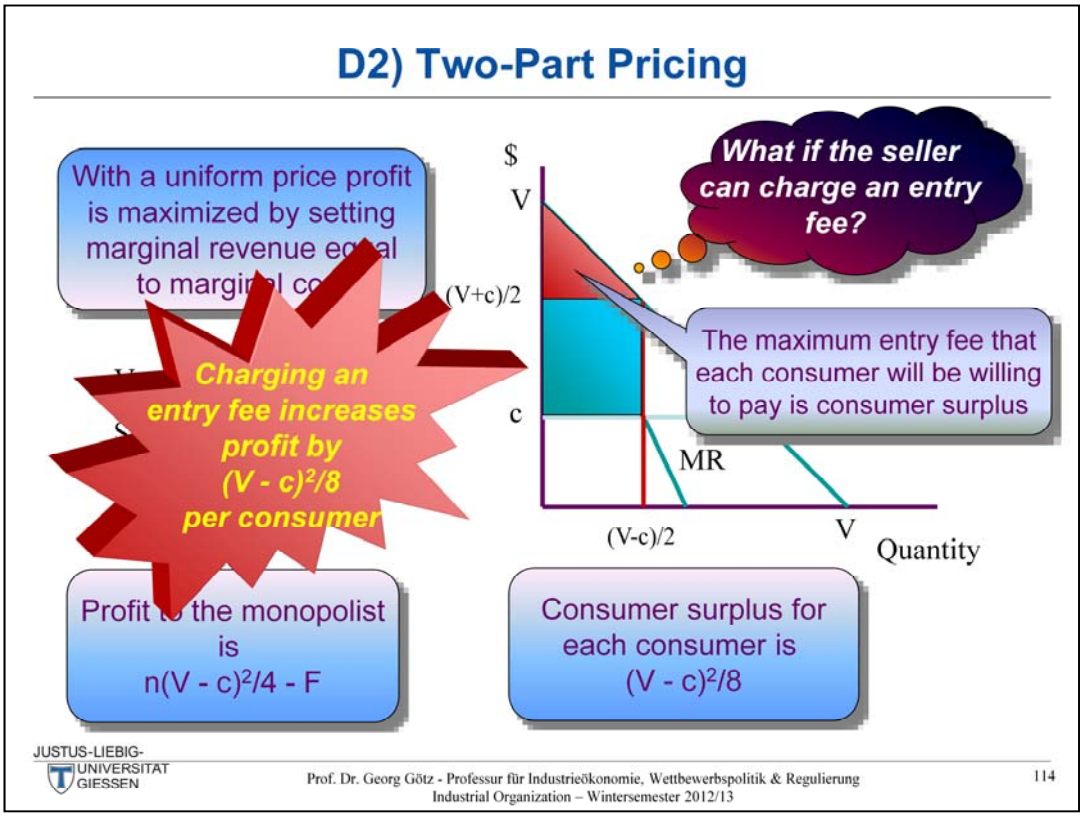
$P = V - Q$

So $P = (V + c)/2$



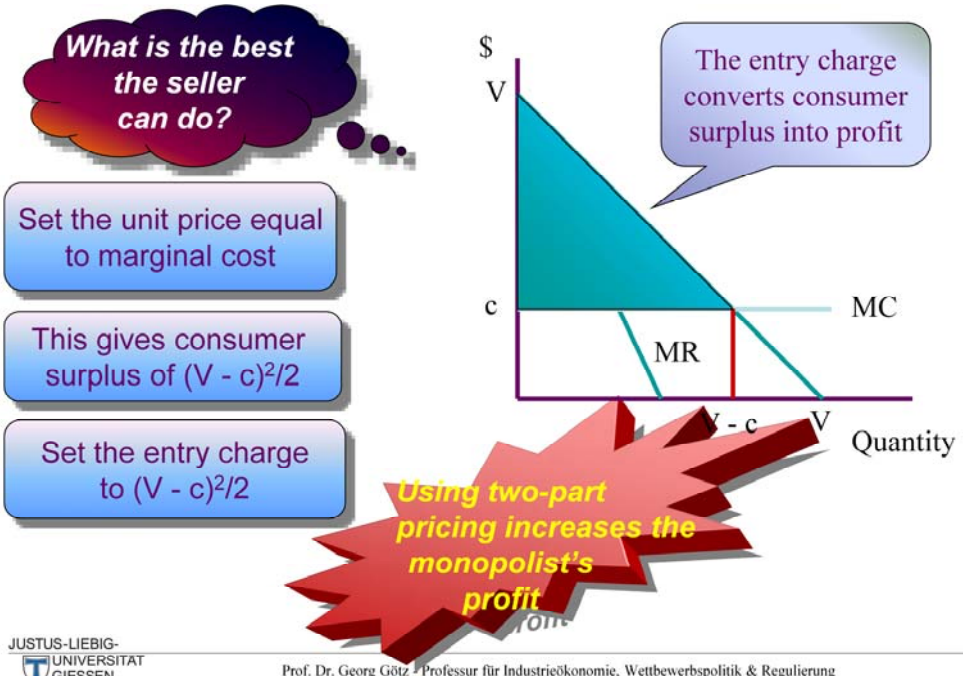
Profit to the monopolist is $n(V - c)^2/4 - F$

Consumer surplus for each consumer is $(V - c)^2/8$



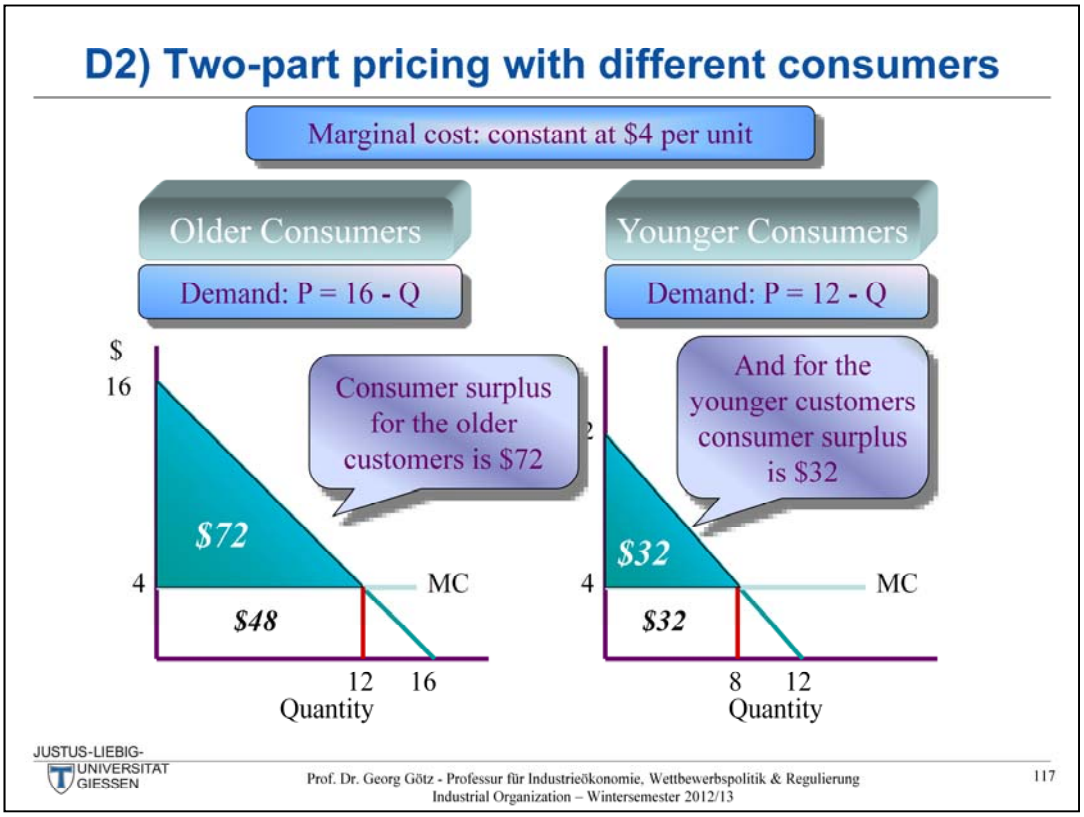
Lower the unit price. This increases consumer surplus and so increases the entry charge

D2) Two-Part Pricing

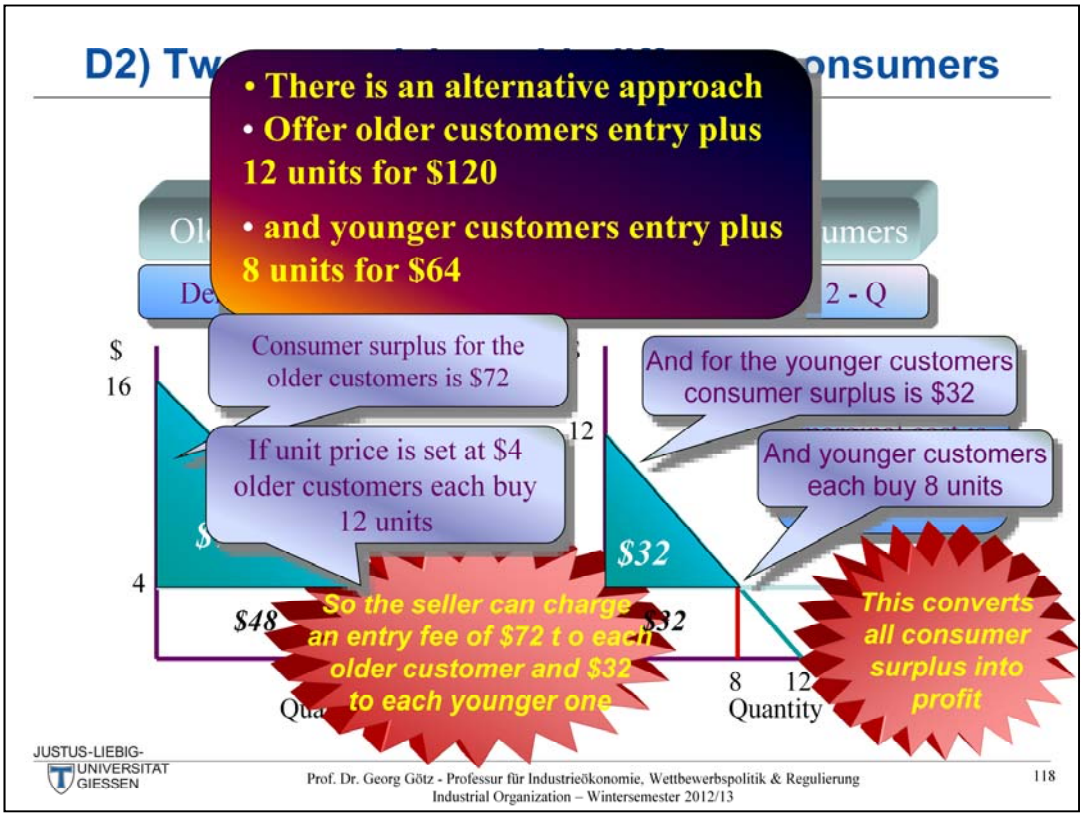


D2) Two-part pricing (cont.)

- First-degree price discrimination through two-part pricing
  - increases profit by extracting all consumer surplus
  - leads to unit price equal to marginal cost
  - causes the monopolist to produce the efficient level of output
- What happens if consumers are not identical?
- Assume that consumers differ in types *and* that the monopolist can identify the types
  - age
  - location
  - some other distinguishing and observable characteristic
- We can extend our example



This slide is only for printing. I skip it it because everything is on the next slide.
Note: Optimal entry fees: 72 and 32.
If unit price is set at $4 older customers each buy 12 Units And younger customers each buy 8 units

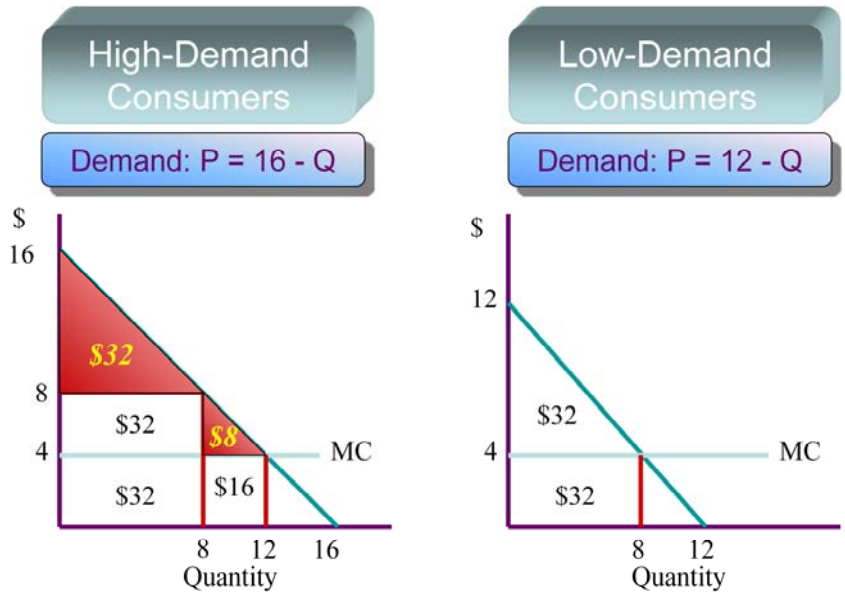


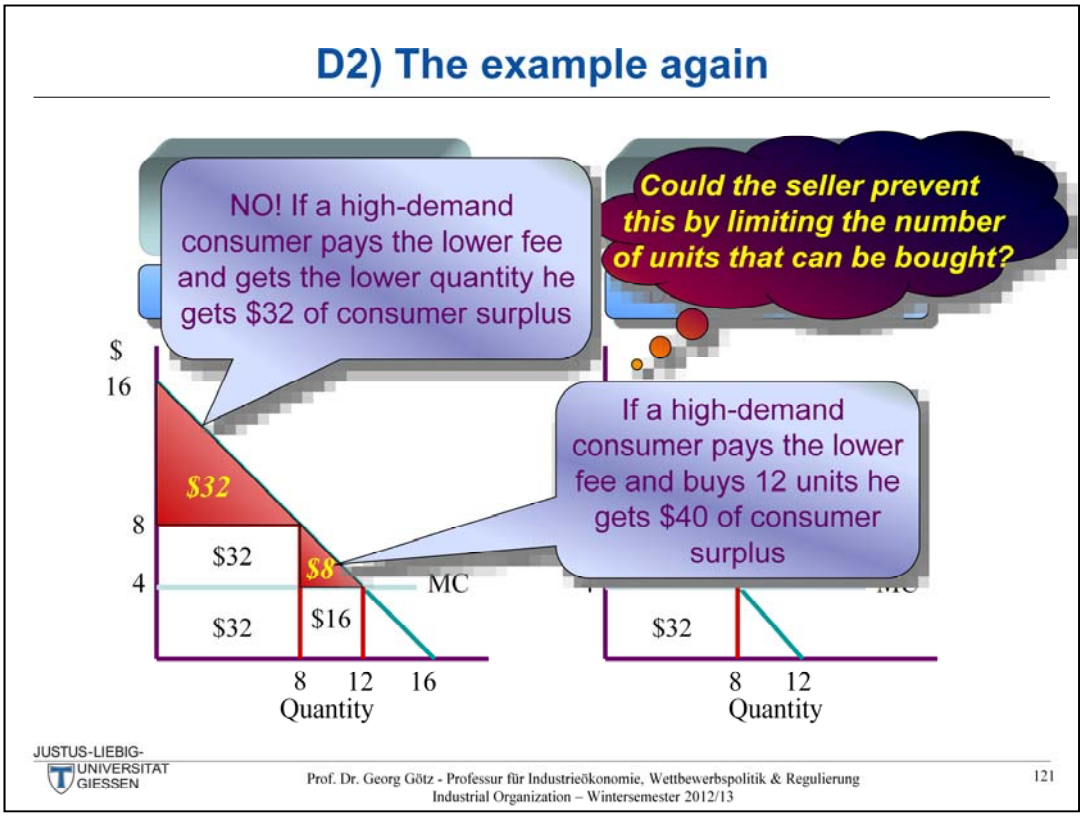
Alternative approach: Block pricing

D2) Second-Degree Price Discrimination or Menu Pricing

- What if the seller cannot distinguish between buyers?
  - perhaps they differ in income (unobservable)
- Then the type of price discrimination just discussed is impossible
- High-income buyer will pretend to be a low-income buyer
  - to avoid the high entry price
  - to pay the smaller total charge
- Confirm from the diagram

D2) The example again



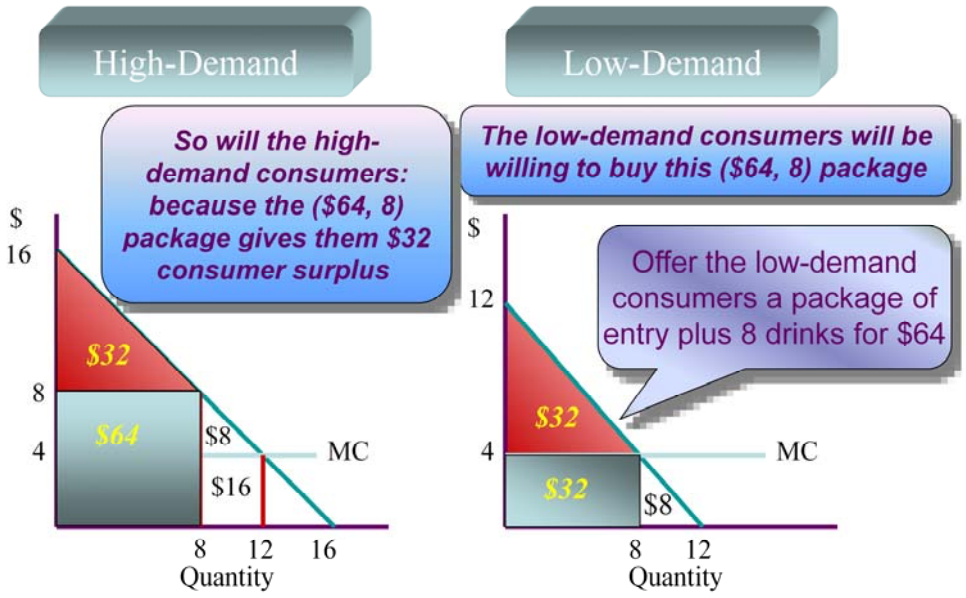


The limitation of demand could be done by making only the block pricing offers from above.

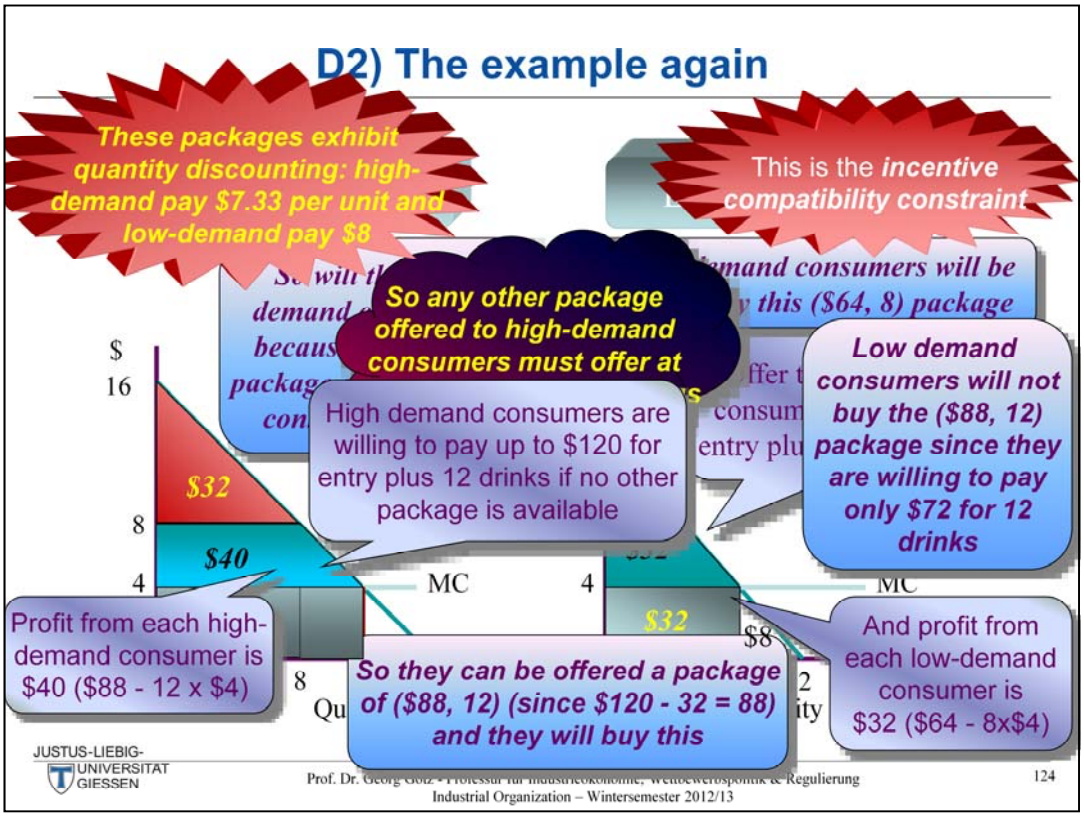
D2) Second-Degree Price Discrimination

- The seller has to compromise
- A pricing scheme must be designed that makes buyers
  - ***reveal their true types***
  - ***self-select*** the quantity/price package designed for them
- This is the essence of ***second-degree price discrimination***
- It is "like" first-degree price discrimination
  - The seller knows that there are buyers of different types
- *But*
  - the seller is not able to identify the different types
- A two-part tariff (with different fixed fees) is ineffective
  - allows deception by buyers
- Use ***quantity discounting***

D2) The example again



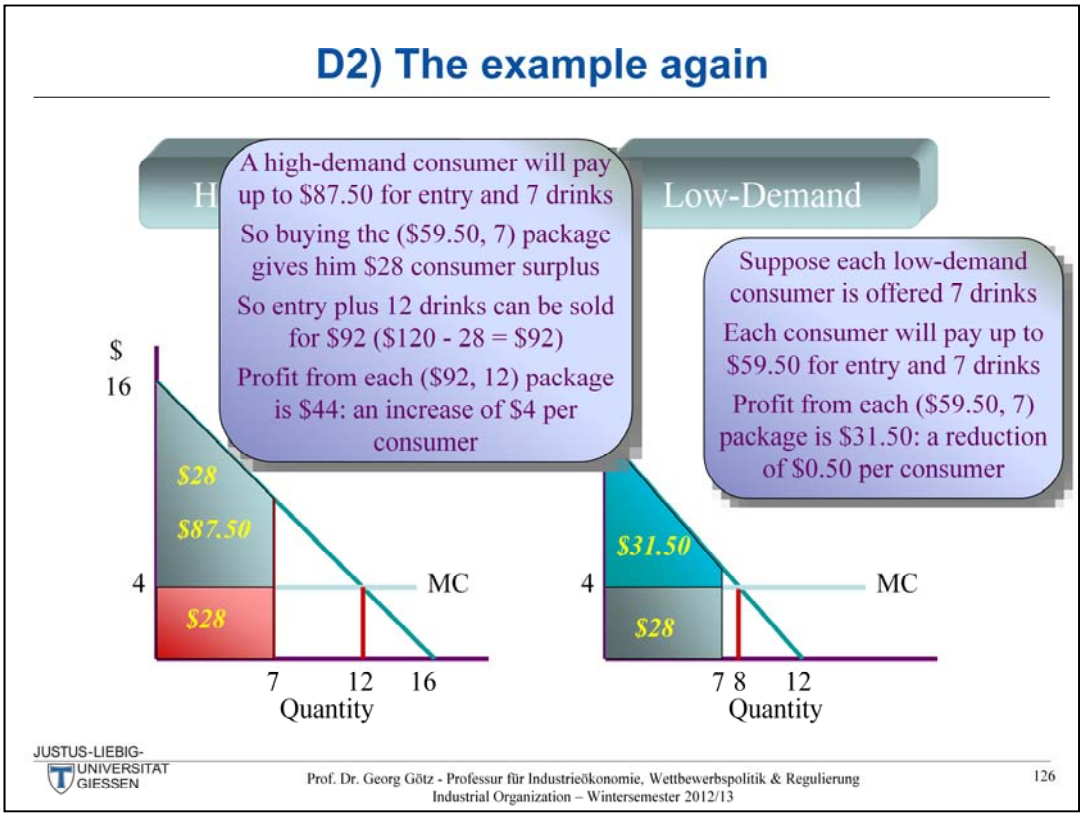
So any other package offered to high-demand consumers must offer at least $32 consumer surplus.



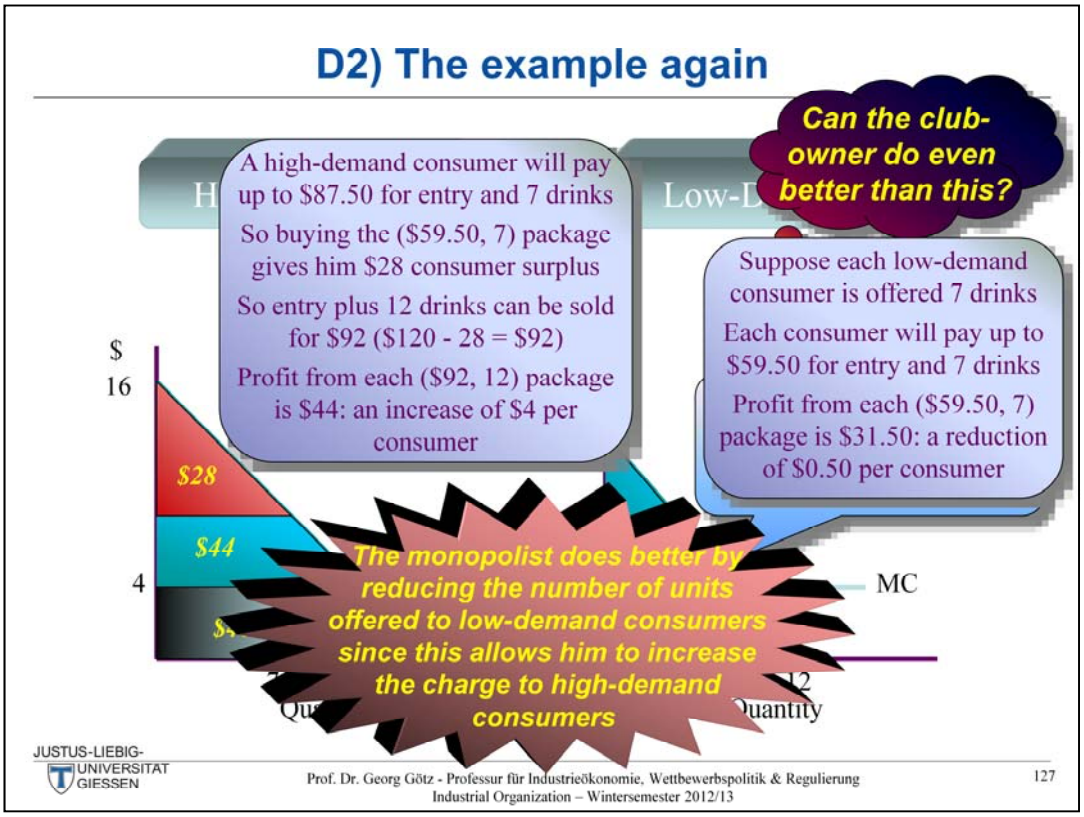
Rather complicated slide: See previous slide for explanations

D2) The incentive compatibility constraint

- ***Any offer made to high demand consumers must offer them as much consumer surplus as they would get from an offer designed for low-demand consumers.***
- This is a common phenomenon
  - performance bonuses must encourage effort
  - insurance policies need large deductibles to deter cheating
  - piece rates in factories have to be accompanied by strict quality inspection
  - encouragement to buy in bulk must offer a price discount



Optimal packages look different. Reduce the offer to the low demand consumer. This is a second order effect for small changes (monopolist loses small triangle), only the marginal unit is affected, which hardly contributed to the profit. However, the drop from 8 to 7 units does not only marginally affect the utility of the high-demand consumers since the 8th unit contributed quite markedly to consumers surplus and profit.



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D2) Second-degree price discrimination (cont.)

- Will the monopolist always want to supply both types of consumer?
- There are cases where it is better to supply only high-demand
  - high-class restaurants
  - golf and country clubs
- Take our example again
  - suppose that there are N_l low-income consumers
  - and N_h high-income consumers

D2) Second-degree price discrimination (cont.)

- Suppose both types of consumer are served
  - two packages are offered ($57.50, 7) aimed at low-demand and ($92, 12) aimed at high-demand
  - profit is $\$31.50 \times N_l + \$44 \times N_h$
- Now suppose only high-demand consumers are served
  - then a ($120, 12) package can be offered
  - profit is $\$72 \times N_h$
- Is it profitable to serve both types?
  - Only if $\$31.50 \times N_l + \$44 \times N_h > \$72 \times N_h \Rightarrow 31.50N_l > 28N_h$

This requires that $\frac{N_h}{N_l} < \frac{31.50}{28} = 1.125$

There should not be "too high" a proportion of high-demand consumers

D2) Second-degree price discrimination (cont.)

- Characteristics of second-degree price discrimination
  - extract all consumer surplus from the lowest-demand group
  - leave some consumer surplus for other groups
    - the incentive compatibility constraint
  - offer less than the socially efficient quantity to all groups other than the highest-demand group
  - offer quantity-discounting
- Second-degree price discrimination converts consumer surplus into profit less effectively than first-degree
- Some consumer surplus is left "on the table" in order to induce high-demand groups to buy large quantities

D2) Two-part pricing with different consumers and discrimination not possible

- Possible tariff (= pricing scheme): $T = F + p\,q$; uniform fixed fee!
- Two groups of consumers with individual demand functions $q_i = A_i - p$, $i = 1,2$ and $A_1 > A_2$.
- Group sizes: n_1 and n_2; total number of consumers: $n = n_1 + n_2$
- Ingredients:
- consumers surplus for given price p: $CS_i(p) = (A_i - p)^2/2$
- Fixed fee F will always be equal to consumer surplus.
  - Extracts all rents from the consumers (in the one type case)
  - With two types and both served the fee must be equal to the consumer with low WTP (otherwise she would not buy!)

  ⇒ Participation constraint

„Uniform“ two-part tariff!

Constant marginal cost c!

D2) Two-part pricing with different consumers and discrimination not possible

- Case if both types are served.
- $F = (A_2 - p)^2/2$

$$\max_p \Pi = n_1(A_1 - p)p + n_2(A_2 - p)p + nF - c(n_1q_1 + n_2q_2)$$

FOC: $$\frac{d\Pi}{dp} = n_1(A_1 - 2p) + n_2(A_2 - 2p) - n(A_2 - p) + cn = 0$$

$$\Rightarrow \quad p = \frac{n_1}{n_1 + n_2}(A_1 - A_2) + c$$

$$\Rightarrow \quad \Pi = \frac{n_1^2(A_1 - A_2)^2}{2n} + \frac{n(A_2 - c)^2}{2}$$

Determine whether to serve both types by comparing with case in which only high valuation type is served

Check my calculations!

With identical demand functions price equals marginal costs. If consumers differ, the divergence from marginal costs depends on both the difference in the WTP and on the share of high value consumers. Higher share and higher difference in WTP leads to higher mark-up over marginal costs. Both cases lead to higher (aggregate) consumer surplus for the high valuation consumers.

Pattern is similar to the example above. Price above marginal costs! The inframarginal gain from the high valuation consumer is greater than the marginal loss from the low value consumer. Draw a diagram! Assignment 2!

Derivation of whether both types should be served is straightforward, but tedious.

What is the profit if only the high valuation type is served?

Decision whether to serve both types depends on relative number of both types, on difference in WTP (=A_i's) and on c.

D2) Menu-pricing with different consumers: Optimization approach with linear demand

- Price menu: Packages offering a certain quantity q for a total payment T: (T_1, q_1) and (T_2, q_2)
- Two groups of consumers with individual demand functions $q_i = A_i - p$, $i = 1,2$ and $A_1 > A_2$
- Group sizes: n_1 and n_2; total number of consumers: $n = n_1 + n_2$
- Optimization problem:

$$\Rightarrow \max_{T_1,q_1,T_2,q_2} \Pi = n_1(T_1 - c\,q_1) + n_2(T_2 - c\,q_2)$$

Packages 1 and 2 are for the respective type of consumers

D2) Menu-pricing with different consumers: Optimization approach ... Cont.

- Constraints:
- Participation constraint:
  - Gross consumers surplus low valuation type $\geq T_2$
  - $GCS_2 = q_2^2/2 + (A_2 - q_2)\, q_2 = A_2\, q_2 - q_2^2/2 \geq T_2$
- Incentive compatibility constraint:
  - High valuation type must not have an incentive to choose package (T_2, q_2) : CS_1(package 1) $\geq CS_1$(package 2)
  - $A_1\, q_1 - q_1^2/2 - T_1 \geq A_1\, q_2 - q_2^2/2 - T_2$
- Optimality requires that the constraints are binding!

$\Rightarrow$ T_1 and T_2

$\Rightarrow$ Substitute in profit function

Consumer surplus now in terms of quantity q and gross, ie inclusive of „expenditure“. Remember that consumers do not pay a price per unit!

D2) Menu-pricing with different consumers: Optimization approach ... Cont.

- Result (Check!):

$\Rightarrow$ $q_1 = A_1 - c$

$\Rightarrow$ $q_2 = A_2 - c - (A_1 - A_2)\,(n_1/n_2)$

$\Rightarrow$

$$\Pi = \frac{nn_1\left(A_1 - A_2\right)^2}{2n_2} + \frac{n\left(A_2 - c\right)^2}{2}$$

$\Rightarrow$ High valuation consumers obtain first best quantity and a surplus.

$\Rightarrow$ Low valuation consumers get less than first best and no surplus. Deviation in quantity depends on relative number of both types

$\Rightarrow$ Profit is greater than with two-part tariff but smaller than with first degree price discrimination

Check the result: Derive first order conditions (=differentiate w.r.t. quantities) and solve for optimum quantities!

Compare with the general principles stated above: High valuation consumer obtains first best quantity and a surplus. Low valuation consumers get less than first best and no surplus.

What is the profit under first degree price discrimination?

To compare take the case where $n_1 = n_2$!

Note: Menu pricing can be implemented by offering a menu of two-part tariffs (Telecoms!)

How would these have to look like?

Price straighforward => inverse demand function. High valuation type p=c!

Fixed fee: t – p q!

D2) Welfare and Public Policy

- Welfare effects: First- and second- degree: do “not necessarily” reduce welfare
  - because output is at or near to the efficient level
- Policy: Uneven
  - Robinson-Patman makes price discrimination illegal if it is intended to create a monopoly
  - One defense is if discriminatory prices are intended to “meet the competition”
- Enforcement has been spotty
  - weak in recent years
  - but note the pharmaceutical case
  - private actions are possible: see http://lawmall.com
- International restrictions also exist
  - anti-dumping regulations
  - these are currently pursued very actively

See 2nd edition PRN, Section 3.2 and 3.3!

Welfare: Distribution!

Pharmaceutical case: Pharmaceutical firms charged higher prices to drugstores than to institutional pharmacies and HMOs! Settlement with payment of 350 Million $ and stop of discrimination.

Policy in Europe: Quantity discounts vs. loyalty or fidelity discounts. Later may be deemed anti-competitive.

PRESS RELEASE No 80/03

30 September 2003

Judgment of the Court of First Instance in Case T-203/01

Manufacture Française des Pneumatiques Michelin v Commission of the European Communities

Michelin enjoys a dominant position on the French market for replacement tyres for trucks and buses, a market which includes both new replacement tyres and retreaded tyres. In 2001 the Commission adopted a decision[1] by which it found that Michelin had abused its dominant position, in that, in France, Michelin's commercial and pricing policy towards its dealers was based on a complex system of discounts, refunds and/or other financial advantages. The main objective of the policy was to tie dealers to the company and to maintain the company's market share and consequently to undermine competition in the common market. The Commission fined Michelin EUR 19.76 million.