



ΠΑΝΕΠΙΣΤΗΜΙΟ  
ΠΑΤΡΩΝ  
UNIVERSITY OF PATRAS

# LECTURE 7- STRATEGY-PRICE DISCRIMINATION

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# Introduction

- What is actually a strategy? Which factors affect firm's strategies?
- Price discrimination is present whenever two or more similar goods are sold at prices that are in different ratios to marginal costs." *Stigler (1987)*
- Necessary conditions for PD:
- Firm must have some market power
- Must have ability to sort consumers (consumers with varying elasticities of demand)
- Must be able to prevent resale, prevent or limit arbitrage.
- The basic theory of price discrimination is the theory of monopoly, applied to more than one market or group (McAfee, 2008)

# Defining Strategy

- Business strategy describes the way in which a firm addresses its fundamental challenges over the medium and long term. Usually, is applied to the decision making processes of the senior management team but it can be also applied at all levels.
- Series of actions, decisions and obligations which lead to the firm gaining a competitive advantage and exploit its core competencies.
- Five P's of business strategy (Mintzber, 1987)
  1. A plan
  2. A ploy
  3. A pattern of behavior
  4. A position with respect to others
  5. A perspective

# Strategic Management-Analysis

- 1.Strategic analysis
- 2.Strategic choice
3. Strategic implementation

Big vs Small business

Manufacturing vs Service

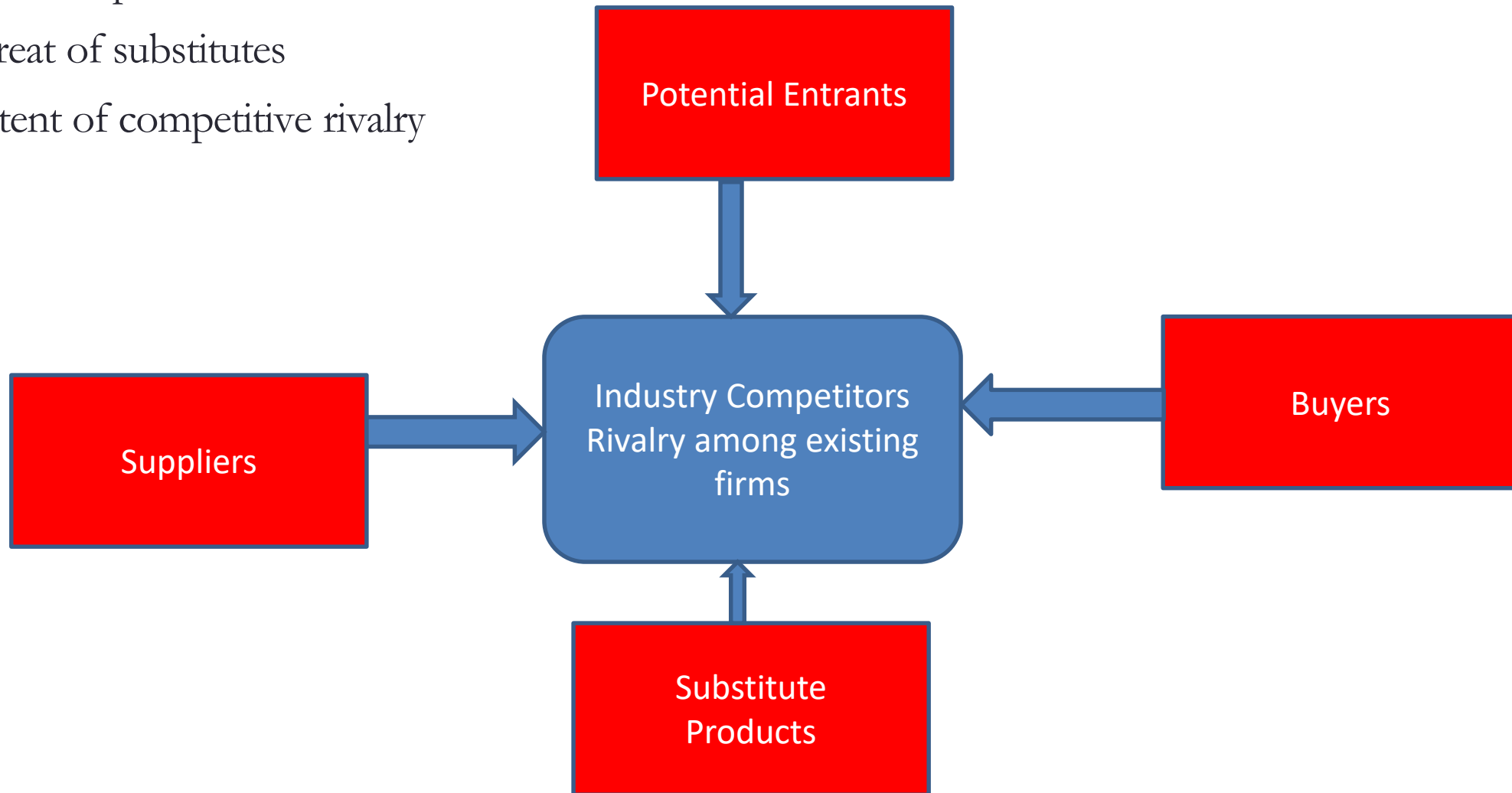
Domestic vs Multinational

Private vs public



# Strategic Analysis-5P's (Porter)

- The bargaining power of suppliers
- The bargaining power of buyers
- The threat of potential new entrants
- The threat of substitutes
- The extent of competitive rivalry



# Strategic Choice

- Theories of strategic choice falls in two main categories: market based and resource based.
- **Market based theories:** Porter extended its five forces incorporating three fundamental “generic” strategies that a firm might adopt
  1. **Cost Leadership**-A firm that it is a cost leader is able to manufacture and deliver its product more cheaply than its rivals, there by gaining competitive advantage.
  2. **Differentiation**-Aims to emphasize and promote the uniqueness of the firm’s product. Moreover, product characteristics such as quality, design and reliability are the basis of the firm’s competitive advantage.
  3. **Focus strategy**-Involves identifying market niches and designing and promoting products for them.
- **Resource Based :** Focuses on exploiting a firm’s internal organization and production processes in order to develop its competitive advantage (firm’s distinctiveness). The role of core competencies (rare, valuable, costly to imitate, non-substitutable, Prahalad, and Hamel,(1990))

# PRICING STRATEGIES

- **Cost-plus pricing:** Set the price above the production costs per unit (mark up pricing)
- **Absorption pricing:** Slightly different than before the firm the variable cost.  
Definition of contribution
- **Psychological pricing:** Humans respond to different prices in different ways and for some reasons, may, as a results, behave differently.
- **Penetration pricing:** Is a tactic in order to gain some market share.
- **Market skimming:** Is a tactic that can be used to exploit some advantage a firm has which allows it to sell its products at a high price.
- **Destroyer or predatory pricing:** A tactic design to drive out competition.
- **Loss leader:** A loss is a product deliberately sold below cost.
- **Premium or value pricing:** The type of the market can be a pricing determinant
- **Competition pricing:** A firm notes the price policy of its rivals and charges at the same or slightly lower level
- **Price leadership:** A firm can have the dominance of the market and act as a price leader.
- **Marginal cost pricing:** Typically occurs when a firm faces a situation where the marginal cost of producing an extra unit is very low and where the bulk of the costs are fixed costs

## How to prevent resale

- For some goods, difficult to resell (services, utilities)
- Barriers imposed by tariffs, taxes, transport costs (international price differences)
- Legal restrictions (computer software, educ. discount)
- Change the product (student versions)



# Examples

- When telephone companies charge a fixed tariff independently of the number of calls. It is a quantity discount since those that make more calls pay less per call.
- Doctor in a small village
- Doctor that charges different fees to insured and uninsured patients – **the same service is sold to different consumers at different prices.**
- Geographical Discrimination– “The Economist” Netherlands 1.69 Euros, Spain 1.46 Euros

# More Examples

- Student Discounts
- Tariffs varying with the time of the day (telephone, electricity, etc)
- “Speedy boarding” at EASYJET or low cost firms
- Price of meals at restaurants (lunch is *much* cheaper than dinner).
- Frequent flyer programs
- Coupons and programs at laundry, hairdresser e.t.c
- ... a true example from The NY times blog:  
<http://freakonomics.blogs.nytimes.com/2008/05/08/to-discriminate-you-need-to-separate/>
- <http://www.freakonomics.com/2011/02/14/a-gullible-american/>



### Barber Magic

Now you can give yourself and your family a safe, easy haircut at home. Just adjust the blade for the proper length, and this precision haircutting tool will trim, taper and style any length hair like a pro! Ideal for men and women, it will save you hundreds of dollars a year on expensive haircuts. Made of durable stainless steel to last a lifetime. No batteries or electricity needed for these hair care products.

Refill Blades come in a package of 3.

Item:		Qty
96115	Barber Magic	<input type="checkbox"/>
	\$12.99	
96123	Refill Blades	<input type="checkbox"/>
	\$2.99	

[See All Hair Products](#)

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More Great Values...



### Barber Magic Trim-A-Pet™

Give your pet the perfect haircut with this safe, easy-to-use precision trimmer. Just adjust the blade for the proper length, and this precision pet grooming tool will trim, taper and style any length hair just like a pro. These pet products quickly get out burrs, mats and tangles, too. Ideal for dogs, cats, horses and other long-haired pets. No batteries or electricity needed - no frightening noise or vibrations to ensure safe pet care.

• A Must-Have as an Addition to Your Pet Supplies

Item:		Qty
31991	Trim-A-Pet™	<input type="checkbox"/>
	\$7.99	
32189	Refill Blades (Package of 3)	<input type="checkbox"/>
	\$2.99	

[See All Pet Favorites](#)

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# Types of Discrimination

- *First degree (perfect)* – seller charges a different price for each good exactly equal to willingness to pay of buyer (The monopolist manages to extract all consumer surplus.)
- *Second degree* (nonlinear, quantity discount) – prices differ by amount of good purchased, not by consumer. The monopolist has incomplete information, he knows that there are different types of consumers and knows their tastes but cannot tell them apart ex-ante, i.e. before purchase. He must use self-selection devices to set the right price quantity or price-quality packages.
- *Third degree* – different consumers charged different prices. The monopolist can separate the markets, he uses some signal (e.g. age, profession, location) in order to set different prices

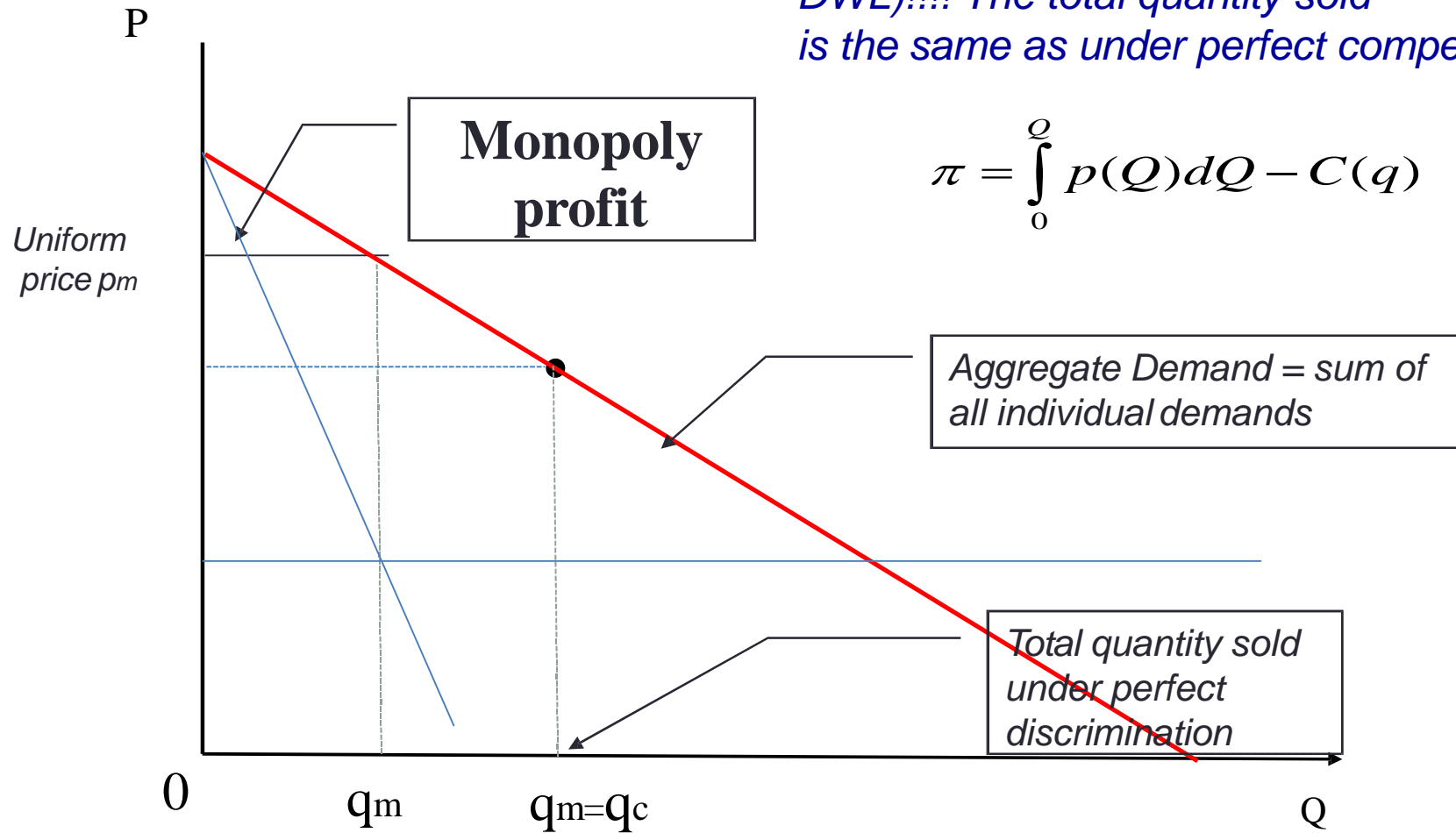
# Price Discrimination-First Degree I

## 1st case: the doctor in a small village

- The monopolist sets different prices for each consumer and for each unit they buy.
- Information: The monopolist is able to identify each consumer
- Arbitrage: not possible
- Transactions costs from haggling-Welfare enhancing
- Prices: will be different to each consumer and each unit
- Unit demand  $\{0,1\}$ ,  $v_i$  is consumer  $i$  willingness to pay for 1 unit of the good. Hence  $p_i = v_i$
- Each consumer pays a different price. The price each consumer pays is their maximum willingness to pay for the good. The consumer is left without surplus, the monopolist is able to extract all the surplus. Perfect discrimination leads to an efficient level of output in the market (the same as in perfect competition)

# Graphical Representation

Note: there are no efficiency losses (no DWL)!!!! The total quantity sold is the same as under perfect competition



# Price Discrimination-First Degree II

## 2nd case: N identical consumers

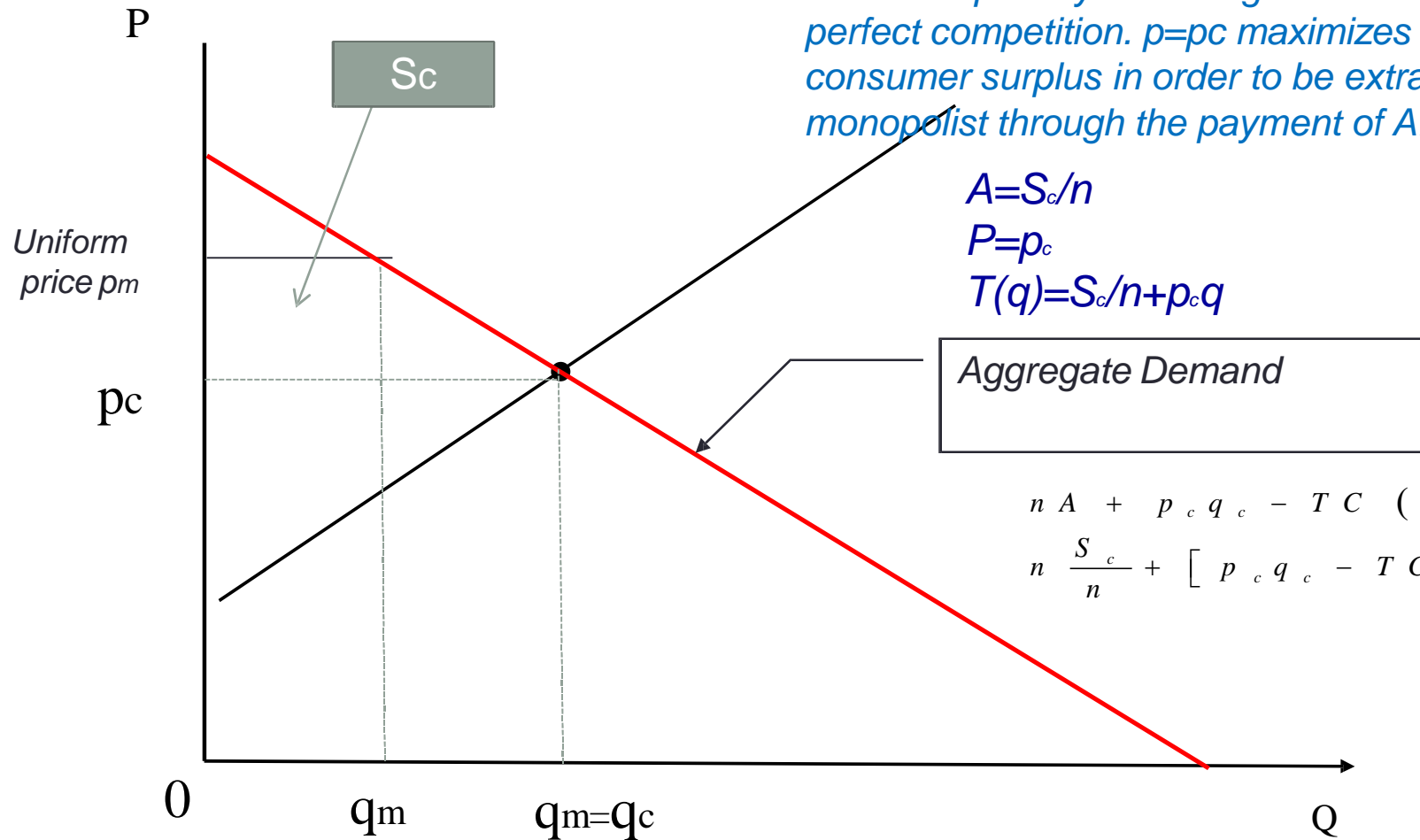
Suppose there are  $n$  identical consumers with individual demand  $D(p)/n$ . In this case the monopolist may also extract all the consumer surplus using what is called two-part tariff.

$T(q) = A + pq$  (total paid for  $q$  units) where  $A$  is fixed and paid independently of the quantity consumed and  $p$  is the variable part.

Examples	A	p
Photos	Camera	Film
Electricity, water	Fixed fee	consumption
Amusement park	entry fee	each attraction
Disco-Pub	Entry	Drink

# Graphical Representation

Note: There are no efficiency losses, no DWL!  
The total quantity sold is again the same as in perfect competition.  $p=p_c$  maximizes the consumer surplus in order to be extract by the monopolist through the payment of  $A$ .



$$A = S_c/n$$

$$P = p_c$$

$$T(q) = S_c/n + p_c q$$

Aggregate Demand

$$n A + p_c q_c - T C ( q_c ) =$$

$$n \frac{S_c}{n} + [ p_c q_c - T C ( q_c ) ]$$

How do we compute the net consumer surplus in order to set  $A$ ?

$$S^c = \int_0^{q_c} [ p ( q ) - p_c ] d q$$



# Price Discrimination-First Degree III

## 3rd case: individual tariffs- continuous demands

- Consumers are not identical
- The monopolist knows each consumer's individual demand (not unit demand) and sets two-part tariffs specific to each consumer. Thus,  $T_i(q) = A_i + p_c q$
- where  $p_c = MC$  and  $A_i = S_i$ ,  $c$  (consumer's surplus when  $p = p_c$ )
- The net consumer surplus is equal to zero as well in this case.

*The information needed is too demanding and costly!*

*The possibility of arbitrage in many markets hinders the chances of perfect discrimination even further.*

# Price Discrimination-Second Degree I

- Information: The monopolist knows the tastes or types of consumers but cannot differentiate them ex-ante i.e. does not observe the willingness to pay of each consumer nor can he tell which type of consumer it is. The monopolist however must know the aggregate characteristics of the market (e.g. demand- elasticity of each type, size of the markets, etc).
- Product arbitrage: not possible.
- Consumers are heterogeneous
- Now if the monopolist wants to charge different prices he must either offer quantity discounts (price-quantity packages) or differentiate the product a bit (price-quality packages, e.g. business class, economy class, speedy boarding, etc.)
- Not possible to perfect discriminate but the monopolist may set self selection mechanisms for consumers
- Prices: may be different across consumers. Prices will change according to the quantity (or quality) the consumer buys.

<http://economics.about.com/b/2008/01/02/real-life-price-discrimination-an-example.htm>

# Examples

- Insurance: Insurance companies usually offer a menu of contracts whereby high-risk types select the complete coverage contract and low-risk types the partial cover (Rothschild & Stiglitz, 1976).
- Bundling – prices are not proportional
- Fixed Menus at restaurants vs “a la carte”
- Transport companies offer: one way tickets at more than half the price of roundtrip tickets.
- Season tickets versus individual tickets

# A mathematical illustration

Let us assume a monopolist who faces  $N$  identical high-income consumers and  $n$  identical low-income consumers with demand functions:  $P_H = A - Q$ ,  $P_L = a - Q$ ,  $A > a > 0$

The monopolist faces a cost function  $T C = c Q$ ,  $0 < c < a$

Let the willingness to pay of the low and high consumer be as:

$$W_H = \int_0^Q P_H(x) dx = A Q - \frac{Q^2}{2}, W_L = \int_0^Q P_L(x) dx = a Q - \frac{Q^2}{2}$$

Suppose that the monopolist wants to sell packages  $(Q, V)$  so:

Offer to high income

Offer one type  
for both high-low

Offer two types  
for both  
separately

# Digging more I

- Because  $V > W_L(Q), V < W_H(Q)$ ,  $\text{charge } V = W_H(Q)$

$$\Pi(Q) = N [W_H(Q) - TC(Q)] = N \left( A Q - \frac{Q^2}{2} \right)$$

$$\frac{d\Pi(Q)}{dQ} = 0 \Leftrightarrow Q_H^* = A - c, V_H^* = W_H(A - c) = \frac{A^2 - c^2}{2}$$

$$\Pi_H^*(Q) = N \frac{(A - c)^2}{2}$$

# Digging more II

- In this case the monopolist may charge as  $V = W_L(Q)$

$$\Pi_{H,L}(Q) = (N + n) \left[ W_L(Q) - TC(Q) \right] = (N + n) \left( aQ - \frac{Q^2}{2} - cQ \right)$$

$$\frac{d\Pi_{H,L}(Q)}{dQ} = 0 \Leftrightarrow Q_{H,L}^* = a - c, V_{H,L}^* = W_L(a - c) = \frac{a^2 - c^2}{2}$$

$$\Pi_{H,L}^*(Q) = (N + n) \frac{(a - c)^2}{2}$$

## Digging more III

In this case the monopolist offer two types: a package targeted to high-income  $(Q_H, V_H)$  and a package aimed to low-income  $(Q_L, V_L)$ . We can have the following cases:

$$1. V_L \leq W_L(Q_L)$$

$$2. W_L(Q_L) - V_L \geq W_L(Q_H) - V_H$$

$$3. V_H \leq W_H(Q_H)$$

$$4. W_H(Q_H) - V_H \geq W_H(Q_L) - V_L$$

$$\Pi_{HL}(Q) = N(V_H - cQ_H) + n(V_L - cQ_L) =$$

$$N \left[ A Q_H - \frac{Q_H^2}{2} - (A - a) Q_L - c Q_H \right] + n \left[ a Q_L - \frac{Q_L^2}{2} - c Q_L \right]$$

$$\frac{d\Pi_{HL}(Q)}{dQ_H} = 0 \Leftrightarrow Q_H^* = N(A - Q_H - c) = 0 \Leftrightarrow Q_H^* = A - Q_H - c$$

$$\frac{d\Pi_{HL}(Q)}{dQ_L} = 0 \Leftrightarrow Q_L^* = -N(A - a) + n(A - Q_L - c) = 0 \Leftrightarrow Q_L^* = a - c - \frac{N}{n}(A - a) = 0$$

# Price Discrimination-Third Degree III

- Information: Monopolist may distinguish between groups of consumers. The most typical form of price-discrimination
- Product Arbitrage: Only possible within each consumer group not across groups e.g. a middle-age person cannot own a discount card aimed for the elderly.
- Prices: May be different across consumer groups but must be the same within each group. That is, within each market, the monopolist cannot price-discriminate.
- The seller is able to distinguish across different types of consumers ex- ante and therefore is able to charge them different prices.
- The monopolist can distinguish consumer groups through a signal (location, age, gender, etc.)
- There is no arbitrage across groups
- Examples: student discounts, senior discounts, different prices according to the location



# A mathematical illustration I

- We may write the monopolist's problem as *(the problem may be interpreted as a multi-product Monopolist)*:

$$\max \sum_{i=1}^m p_i D_i(p_i) - c \sum_{i=1}^m D_i(p_i)$$

$$\frac{d\Pi}{dp_i} = 0 \Leftrightarrow D_i(p_i) + p_i D_i'(p_i) - c \sum_{i=1}^m D_i(p_i) D_i'(p_i) = 0 \Leftrightarrow$$

$$p_i D_i'(p_i) - c \sum_{i=1}^m D_i(p_i) D_i'(p_i) = -D_i(p_i) \Leftrightarrow$$

$$D_i'(p_i) \left[ p_i - c \sum_{i=1}^m D_i(p_i) \right] = -D_i(p_i) \Leftrightarrow D_i'(p_i) [p_i - c'(Q)] = -D_i(p_i) \Leftrightarrow$$

$$[p_i - c'(Q)] = \frac{-D_i(p_i)}{D_i'(p_i)} \Leftrightarrow \frac{[p_i - c'(Q)]}{p_i} = \frac{1}{\varepsilon_i [D_i(p_i)]}$$

# A mathematical illustration I

- Alternatively 
$$c'(Q) = p_i \left[ 1 - \frac{1}{\varepsilon_i [D_i(p_i)]} \right]$$

This condition means that the monopolist decides on prices (or quantities) such that marginal revenues are identical across markets

$$c'(Q) = MR_1 = \dots = MR_m$$

implying that  $\varepsilon_i > \varepsilon_j \Leftrightarrow p_i < p_j$

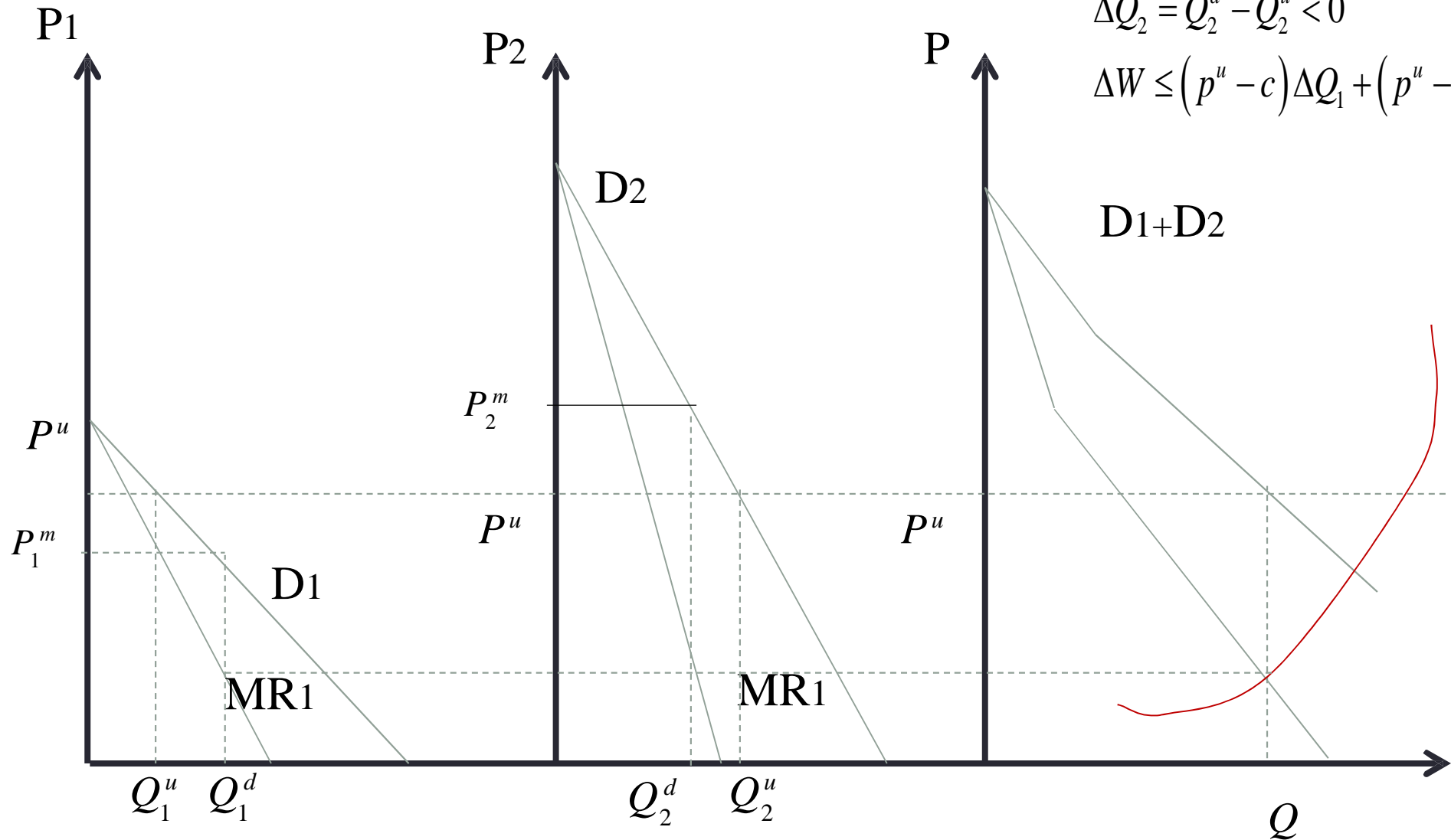
The optimal pricing policy for the monopolist is to charge a lower price to those consumers with the higher demand-elasticity. This explains the typical discounts applied to students, seniors, as well as 1<sup>st</sup> time magazine subscribers. (Intuition: the monopolist may charge a higher price when demand elasticity is low because an increase in price leads to a lower reduction of demand.)

# Welfare Considerations II

$$\Delta Q_1 = Q_1^d - Q_1^u > 0$$

$$\Delta Q_2 = Q_2^d - Q_2^u < 0$$

$$\Delta W \leq (p^u - c)\Delta Q_1 + (p^u - c)\Delta Q_2$$



## Welfare Considerations II

Welfare consequences of the 3rd-degree price discrimination: what happens if the regulator forced the monopolist to set the same price in all its markets?

The monopolist obviously obtains higher profits with 3rd degree price discrimination since uniform pricing is always a particular case.

Consumers in the low-elasticity demand market will be worse off with 3rd-degree price discrimination since the price they face will typically be higher.

Consumers in the high-elasticity demand market benefit from third degree price discrimination because they will face a lower price.

When the 3rd-degree price discrimination allows a new market (e.g. those markets where it would not be profitable for the monopolist to sell if forced to set the same price in all markets) then typically welfare increases.

A necessary condition for welfare to increase under 3rd-degree price discrimination is that production should increase

# Empirical Questions

- Positive: can observed price differentials be explained by cost differences? or is there evidence of price discrimination?
- Normative: what are the welfare consequences of the observed price discrimination? positive or negative?

# Leslie 2004

- Demand and price discrimination for a single Broadway show that ran 199 days (*Seven Guitars*)
- Complex ticket sales:
  - variation in quality
  - discount coupons
  - discount at TKTS (booth) day of performance
  - $\Rightarrow$  second and third-degree price discrimination
- Uses BLP/Nevo style model of demand
- Welfare: increases profits 5%; not much effect on consumer welfare. TKTS does not make the theater money (lose full price customers to discounts)

## Borenstein and Rose 1994

- Price dispersion in airline tickets
- 10% sample of coach airline tickets for city pairs, nonstop only
- Average spread of 36% in ticket prices
  - varies positively with competition in market and congestion
  - negatively with tourist destinations and route density
- distinguish between “monopoly” discrimination and “competitive” horizontal discrimination
  - monopoly – more price discrimination if fewer firms
  - competitive – more price discrimination in more firms
- no welfare analysis
- cannot rule out all cost-based explanations

# Shepard (1991) I

- distinguish cost-based explanations of variation in price of retail gas from price discrimination
- “quasi-natural” experiment: compare pricing at
  - – multi-product (full and self-serve) stations
  - – single product (full or self-serve) stations
- assume
  - – station choice exogenous conditional on other
- differences between stations (other services offered,
  - location)
    - – demand for full-serve less elastic than demand for
  - self-serve



## Shepard (1991) II

- Retailers face demand for low (self) and high (full) quality gas
- MC of supplying the two goods the same at all types of stations
- alternative demand structures:
  - 1. retailer market power (horizontal diff products) predicts
    - – full-service price: multi-product  $>$  single product
    - – self-service price: multi-product  $<$  single product
  - 2. competitive (no horizontal diff) – no price differentials
  - 3. peak-load pricing, zero profit equilibrium – prices vary because
- some consumers WTP not to wait

# Shepard's model

- Pricing equation:

$$p_{ikgj} = \beta_0 + \beta_1 D_g + \beta_2 D_k + \beta_3 D_g D_k + \gamma_1 M_j + \gamma_2 M_j D_k + X_{ikg} \phi + \varepsilon_{ikgj}$$

- i = station; k = MP or SP; g = full or self; j = market
- X = vector of station characteristics;
- M is market fixed effect
- Price differentials:

$$\beta_1 = \Delta_{SP} = p_f^{SP} - p_s^{SP}, \beta_1 = \Delta_S = p_s^{MP} - p_s^{SP}$$

$$\beta_2 + \beta_3 = \Delta_f = p_f^{MP} - p_f^{SP}$$

$$\beta_3 = \Delta = \Delta_f - \Delta_s = (p_f^{MP} - p_f^{SP}) - (p_s^{MP} - p_s^{SP})$$

- Predictions:
  - – competitive case – all differentials are zero
  - – price discrimination:  $\Delta > 0, \Delta_f \geq 0, \Delta_s \leq 0$

# Shepard 1991 results

TABLE 1  
BRANDED STATION CHARACTERISTICS

	Single-Product Full-Service	Single-Product Self-Service	Multiproduct
Number of stations	1,006	282	239
Number of branded stations	791	136	232
Repair service (%)	89.3	32.4	90.1
Convenience store (%)	3.7	41.9	5.2
Remodeled (%)	44.2	72.8	74.1
Average islands	1.29	2.25	2.11
	(.49)	(1.81)	(.49)
Average fueling places	3.60	5.83	5.51
	(1.64)	(2.09)	(1.89)
Full-service	...	...	2.63
			(1.02)
Self-service	...	...	2.88
			(1.16)
Average monthly sales	48.90	96.91	90.18
(thousands of gallons)	(29.93)	(42.49)	(40.33)
Average capacity utilization	14.50	17.64	17.45
(thousands of gallons)	(8.15)	(7.97)	(7.94)

NOTE —Standard deviations are in parentheses.

TABLE 2  
 PRICE DIFFERENTIALS BY GRADE

	Regular Leaded	Regular Unleaded	Premium Unleaded
Constant	75.47 (1.36)	83.02 (1.48)	97.18 (1.59)
$D_1 (\bar{\Delta}_{sr})$	6.89 (1.45)	7.64 (1.56)	8.04 (1.68)
$D_2 (\bar{\Delta}_s)$	.00 (1.67)	-2.89 (1.79)	-2.03 (1.90)
$D_3 D_4 (\bar{\Delta})$	9.39 (1.58)	11.23 (1.69)	9.22 (1.82)
UNBRANDED	-1.97 (.55)	-4.65 (.53)	-5.44 (.58)
MINI	.19 (.90)	2.96 (1.01)	2.88 (1.07)
SPFCAP	-.89 (.16)	-.72 (.16)	-.70 (.17)
SPSCAP	-.21 (.18)	-.28 (.20)	-.17 (.21)
MPCAP	-.21 (.18)	.25 (.18)	.16 (.19)
REPAIR	1.80 (.55)	.38 (.59)	.11 (.63)
CSTORE	1.43 (.70)	.68 (.76)	-.57 (.81)
NEW	-1.40 (.59)	-1.66 (.41)	-1.64 (.44)
STATIONS	1.052	1.291	1.237
$R^2$	.46	.45	.42

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Note.—Standard errors are in parentheses.

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## Conclusions Shepard

- Differentials:
  - single product stations: full-self = 7 or 8 cents
  - self: multi-single = 0 to -2 cents
  - full: multi-single = 9 to 11 cents
- Controlling for market gets same results
- peak-load model rejected because cost of
- capital higher for multi than single-product stations
- Borenstein 1991 – similar conclusions using leaded/unleaded gas

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