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Finance & Pricing Strategy

7. Price discrimination - Tutorial

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Price discrimination

- **Third-degree price discrimination**: charging different prices to different (identifiable) groups of customers.
  - Charge different price to different group, according to inverse-elasticity rule. Group with more elastic demand (more price-sensitive customers) gets lower price.
  - Types:
    - Based on demographics, e.g., senior or student discounts.
    - Location based, e.g., Taylor Swift concerts.
    - Behaviour based, e.g., loyalty discounts.
- **Second-degree price discrimination**: each customer pays her own price, depending on characteristics of purchase. Firm charges different price depending on characteristics of the purchase.
  - Used when firm cannot distinguish between different types of consumers.
  - Firm designs specific product for each type of consumer, and prices them so that consumers "self-select" into different products and hence pay different prices.

3rd degree price discrimination

2nd degree price discrimination

Scenario: Pricing MSX software

- The company first charged £12.99 monthly subscription fees, but soon started experimenting with price to find more information about consumer behaviour.
- Specifically, during certain periods, MSX would charge £9.99 or £14.99.
- It gathered data about new subscriptions as well as subscription renewals by old customers under different price points.

The data was carefully examined and the following monthly sales estimates were generated depending on price:

Price Point	Sales (in thousands)
£9.99	15,000
£12.99	13,100
£14.99	10,500

1. Based on the estimated sales data, which of the three price points will maximise the firm's profit?
2. Based on the sales data, what inferences can you make about the number of customers with WTP above £14.99, in the range £12.99–14.99 and £9.99–12.99?
3. Customers with WTP below £14.99 tend to be international, while customers with WTP above £14.99 are mainly domestic. Managers are now thinking whether to adjust their prices for international customers. What should be the domestic price and what is the optimal international price?
4. How would your answer be affected if 50% of consumers with WTP above £14.99 were international?

3rd degree price discrimination

2nd degree price discrimination

Example

- Fulton sells security software for computers.
- Its market research provides data about consumers' WTP for different product attributes

Consumer segments (types)	Type I	Type II
Segment size (thousands)	1200	800
Consumers' WTP per attribute		
Antivirus, anti-spyware and malware	£12	£12
Password manager	£1	£4
PC Cloud backup – 20GB	£5	£7
PC Cloud backup – Unlimited	£5	£10
VPN	£5	£5

Table: Willingness to Pay (WTP) by Consumer Segment and Feature.

Design two products:

- Product 1 is the **standard** product intended for type I consumers.
- Product 2 is the **premium** product intended for type II consumers.
- Must have more/better features than product 1

We want to maximise profit:

$$\max_{p_1, p_2} \quad \Pi = p_1 q_1 + p_2 q_2 - \underbrace{C(q_1, q_2)}_{=0}$$

(variable costs are assumed to be null)

subject to the following constraints:

- **Individual Rationality (IR)**

  (1) $p_1 \leq$ WTP(Type I, Product 1)

  (2) $p_2 \leq$ WTP(Type II, Product 2)

- **Incentive Compatibility (IC)**

$$(1) \quad \underbrace{\text{WTP(Type I, Product 1)} - p_1}_{\text{Consumer Surplus(Type I, Product 1)}} \geq \underbrace{\text{WTP(Type I, Product 2)} - p_2}_{\text{Consumer Surplus(Type I, Product 2)}}$$

$$(2) \quad \underbrace{\text{WTP(Type II, Product 2)} - p_2}_{\text{Consumer Surplus(Type II, Product 2)}} \geq \underbrace{\text{WTP(Type II, Product 1)} - p_1}_{\text{Consumer Surplus(Type II, Product 1)}}$$

- **Additionally:**

  $\text{WTP(Type I)} < \text{WTP(Type II)}$

  $\text{WTP(Type II, Product 1)} < \text{WTP(Type II, Product 2)}$

If $p_1 = \text{WTP(Type I, Product 1)}$:

$$(1)\ 0 = \text{WTP(Type I, Product 1)} - \overbrace{\text{WTP(Type I, Product 1)}}^{=p_1} \geq \text{WTP(Type I, Product 2)} - p_2$$

$$\longrightarrow p_2 \geq \text{WTP(Type I, Product 2)}\ \&\ p_2 \leq \text{WTP(Type II, Product 2)}\ (\text{IR}(2))$$

$$\implies \text{WTP(Type I, Product 2)} \leq \text{WTP(Type II, Product 2)} \quad \checkmark$$

$$(2)\ \text{WTP(Type II, Product 2)} - p_2 \geq \text{WTP(Type II, Product 1)} - p_1$$

$$\longrightarrow p_2 \leq p_1 + \underbrace{\text{WTP(Type II, Product 2)} - \text{WTP(Type II, Product 1)}}_{>0}$$

If $p_2 = \text{WTP(Type II, Product 2)}$:

$$(1)\ \text{WTP(Type I, Product 1)} - p_1 \geq \text{WTP(Type I, Product 2)} - \text{WTP(Type II, Product 2)}$$

$$p_1 \leq \text{WTP(Type I, Product 1)} + \underbrace{\text{WTP(Type II, Product 2)} - \text{WTP(Type I, Product 2)}}_{>0}$$

$$(2)\ 0 = \text{WTP(Type II, Product 2)} - \text{WTP(Type II, Product 2)} \geq \text{WTP(Type II, Product 1)} - p_1$$

$$\longrightarrow p_1 \geq \text{WTP(Type II, Product 1)}\ \&\ p_1 \leq \text{WTP(Type I, Product 1)}$$

$$\implies \text{WTP(Type II, Product 1)} \leq \text{WTP(Type I, Product 1)} \quad \times$$

Thus, set $p_1 =$ WTP(Type I, Product 1):

$$(1)\ 0 = \text{WTP(Type I, Product 1)} - \text{WTP(Type I, Product 1)} \geq \text{WTP(Type I, Product 2)} - p_2$$
$$\longrightarrow p_2 \geq \text{WTP(Type I, Product 2)} \ \& \ p_2 \leq \text{WTP(Type II, Product 2)}$$
$$\implies \text{WTP(Type I, Product 2)} \leq \text{WTP(Type II, Product 2)} \quad \checkmark$$
$$(2)\ p_2 \leq p_1 + \text{WTP(Type II, Product 2)} - \text{WTP(Type II, Product 1)}$$

And making IC (2) bind:

$$\begin{cases} p_1 = \text{WTP(Type I, Product 1)} \\ p_2 = p_1 + \text{WTP(Type II, Product 2)} - \text{WTP(Type II, Product 1)} \end{cases}$$

- **Standard** product captures entire surplus from low-valuation consumers (type I).
- **Premium** product leaves some surplus to high-valuation consumers (type II). Otherwise type II consumers will not pay the price premium...

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Thank you.
Questions?

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