11. Pricing Strategies

Simple Pricing Strategies

Monopoly

If estimates of demand and cost functions are unavailable, managers have a crude estimate for

- marginal cost
- price elasticity of demand E_F for a representative **F**irm in the market.

∑ **Monopoly profit-maximizing price**

$$\boxed{MC = P\left(\frac{1+E_F}{E_F}\right)}$$

$$\boxed{MR = P\left(\frac{1+E_F}{E_F}\right)}$$

$$\boxed{P = \frac{E_F}{1+E_F}MC}$$

Oligopoly

- N firms **including yourself** competing in the market
- Cournot oligopoly with similar products

∑ **Cournot oligopoly profit-maximizing price**

$$\boxed{P = \left(\frac{N \cdot E_M}{1+N \cdot E_M}\right)MC}$$

where E_M is the market elasticity of demand.

Strategies that yield even Greater Profits

3 categories in terms of pricing strategies:

1. extract surplus from customers
2. special cost and demand structures
3. markets with intense price competition

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1. Surplus Extraction

Price Discrimination

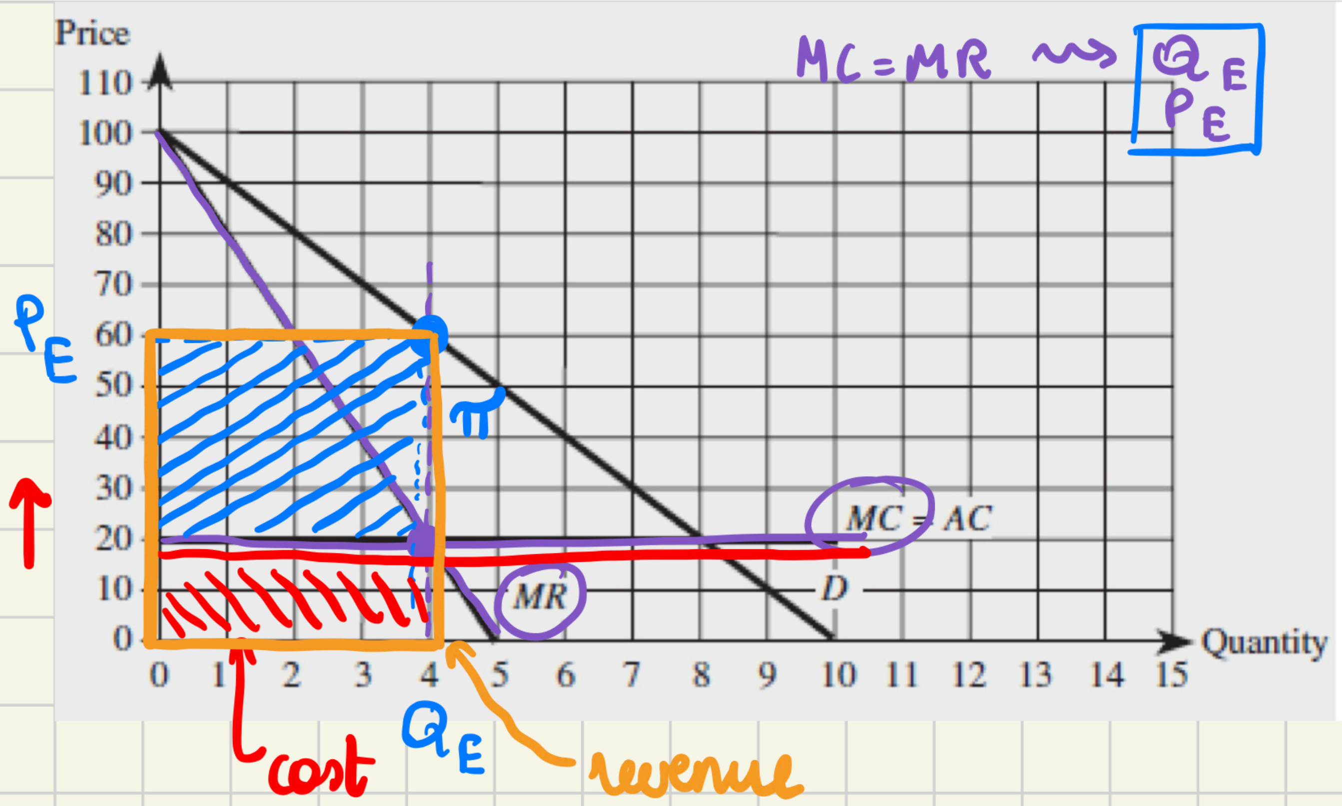
Charging different prices to different customers for the same good or service.

No Price Discrimination

Rule

1. Find the **profit-maximizing quantity** Q^* by setting $MR = MC$.
2. Set price according to demand curve at Q^* to find equilibrium price P^*
3. Profit is the area of the rectangle with height $P^* - MC$ and width Q^*.
4. $\pi =_0^{Q^*} (P(Q) - MC)dQ$

Why isn't inverse demand $P = MC$ here? Because when there is no price discrimination, the firm must set a single fixed price for all customers.



Why is $FC = 0$ here? Because in a perfectly competitive market structure, **firms produce at the minimum of their average total cost curve** (long-run equilibrium).

$$AC = (FC + VC)/Q = (0 + VC)/Q = MC$$

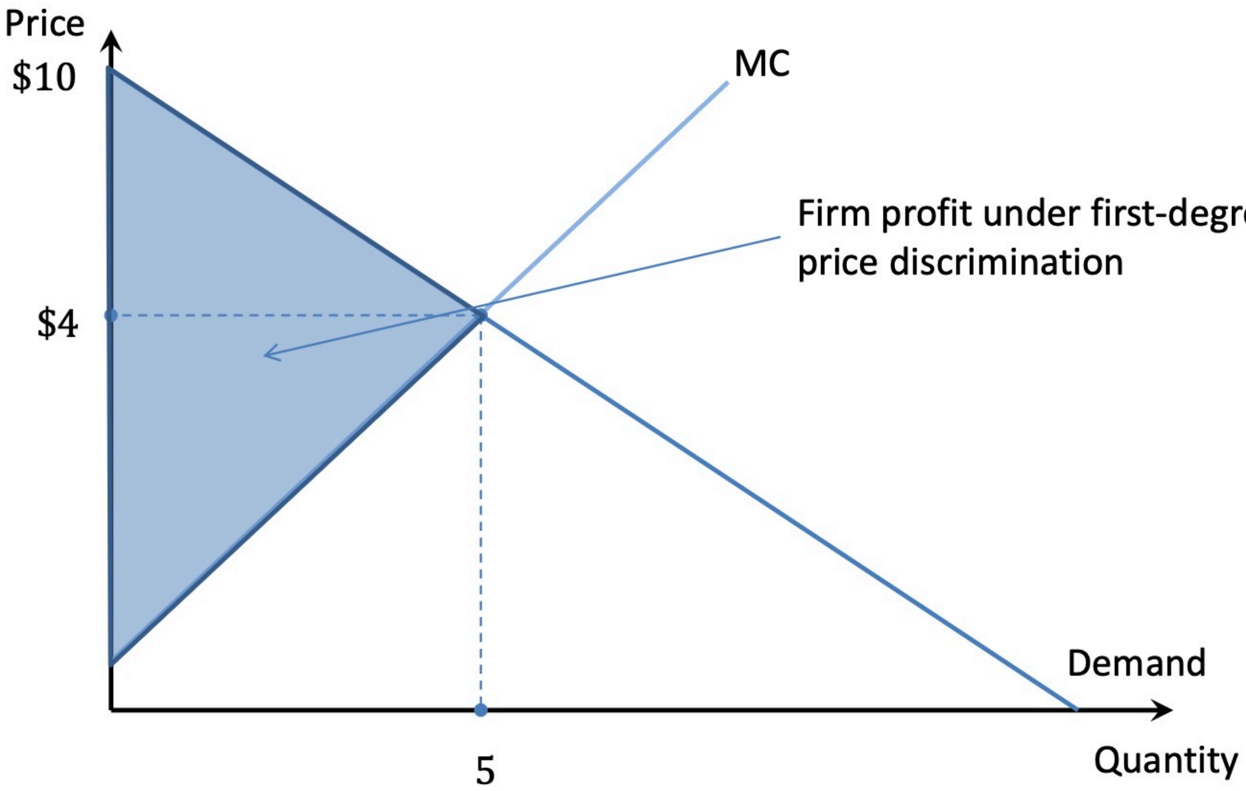
First-Degree Price Discrimination (WTP)

First-Degree Price Discrimination

Charging each customer their **maximum willingness to pay**.

$\Longrightarrow$ the firm **extracts all surplus from consumers**

$\Longrightarrow$ the firm earns the **highest possible profit**.



Problem: managers rarely know each customer's willingness to pay.

Rule

With first-degree price discrimination

$$P = \text{(Inverse) Demand}$$

because each unit is sold at the maximum willingness to pay.

Rule

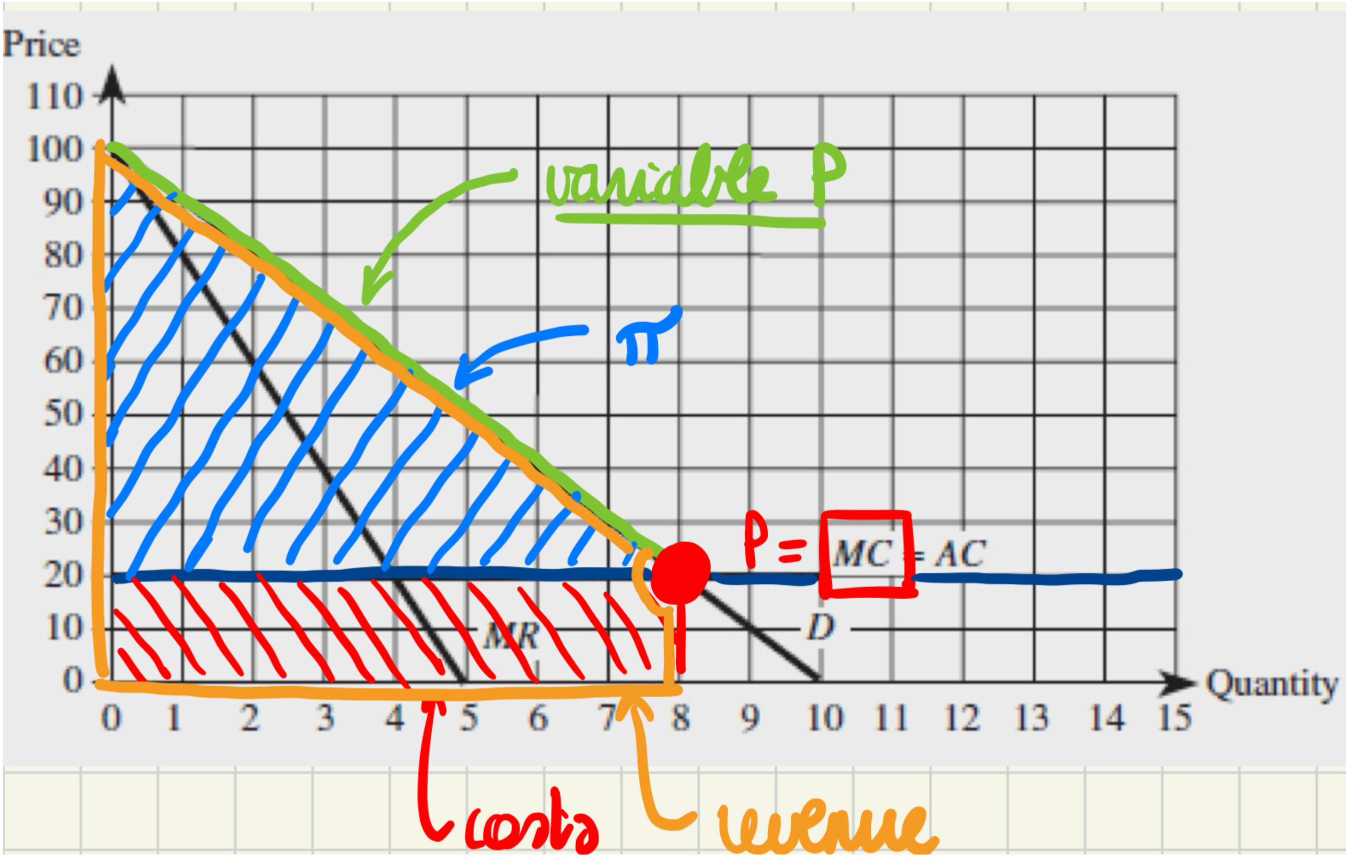
The firm sells units until $\boxed{P = MC}$.

Why? Per sold unit, the firm makes a profit of $P - MC$. So the firm will keep selling until $P = MC$, where profit per sold unit is zero.

Rule

1. Set $P = MC$ to find quantity Q_{PD}.
2. Profit is the area under the demand curve up to Q_{PD} minus total costs.

$$\pi = \int_0^{Q_{PD}} P(Q)dQ - MC \cdot Q_{PD}$$



Note that on the graph above, we integrate the area under the demand curve from $Q = 0$ to $Q = Q_{PD}$, where Q_{PD} is the quantity where inverse demand $P = MC$.

This is **not** the same as for the case where we have **no price discrimination**, where the profit is the area of the rectangle with height $P_E - MC$ and width Q_E. To find this equilibrium quantity Q_E, we set $MR = MC$. In the First-Degree PD case, we set $P = MC$ instead of $MR = MC$.

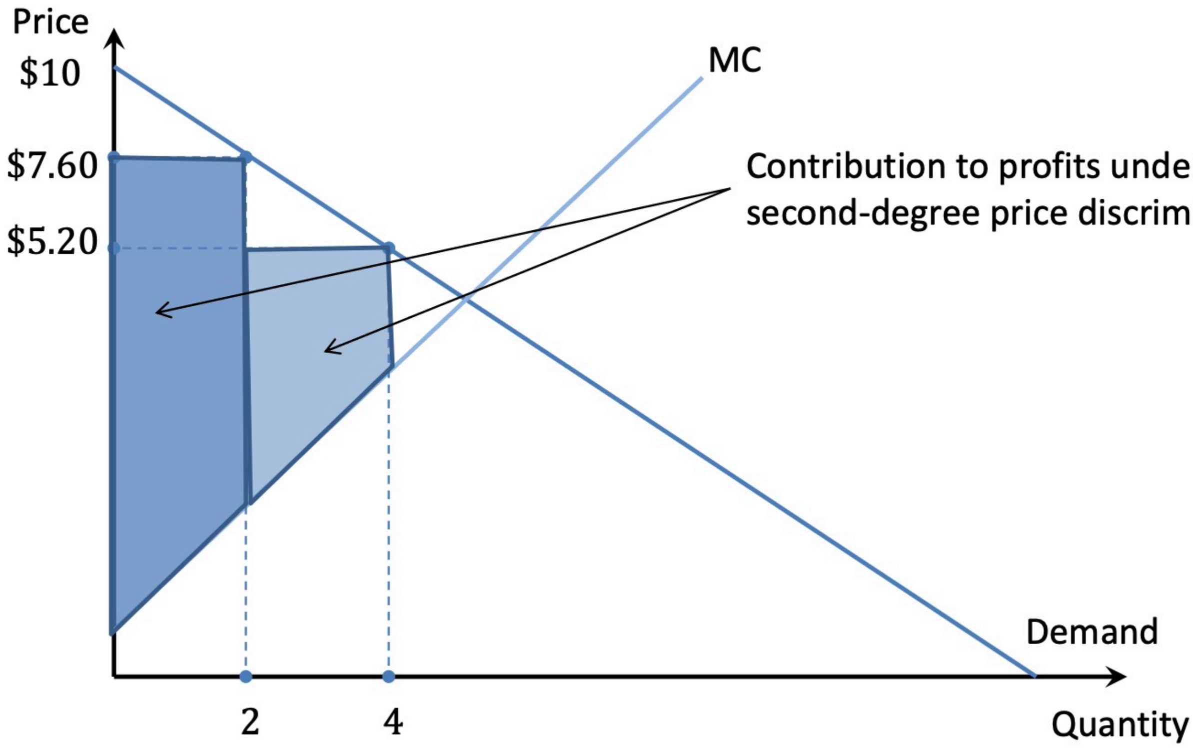
Second-Degree Price Discrimination (quantity)

Second-Degree Price Discrimination

Charging different prices according to a **discrete schedule** of **declining prices** for different ranges of quantity purchased.

$\implies$ the firm extract **some** surplus

$\implies$ the firm doesn't need to know the identity of various consumers' demand



Third-Degree Price Discrimination (elasticity)

Third-Degree Price Discrimination

Charging different prices based on systematic differences in demand across **demographic consumer groups**

$\implies$ MR will be different for each group

$\implies$ for two groups, $MR_1 > MR_2$

Use in combination with the Elasticity and Markup Factor.

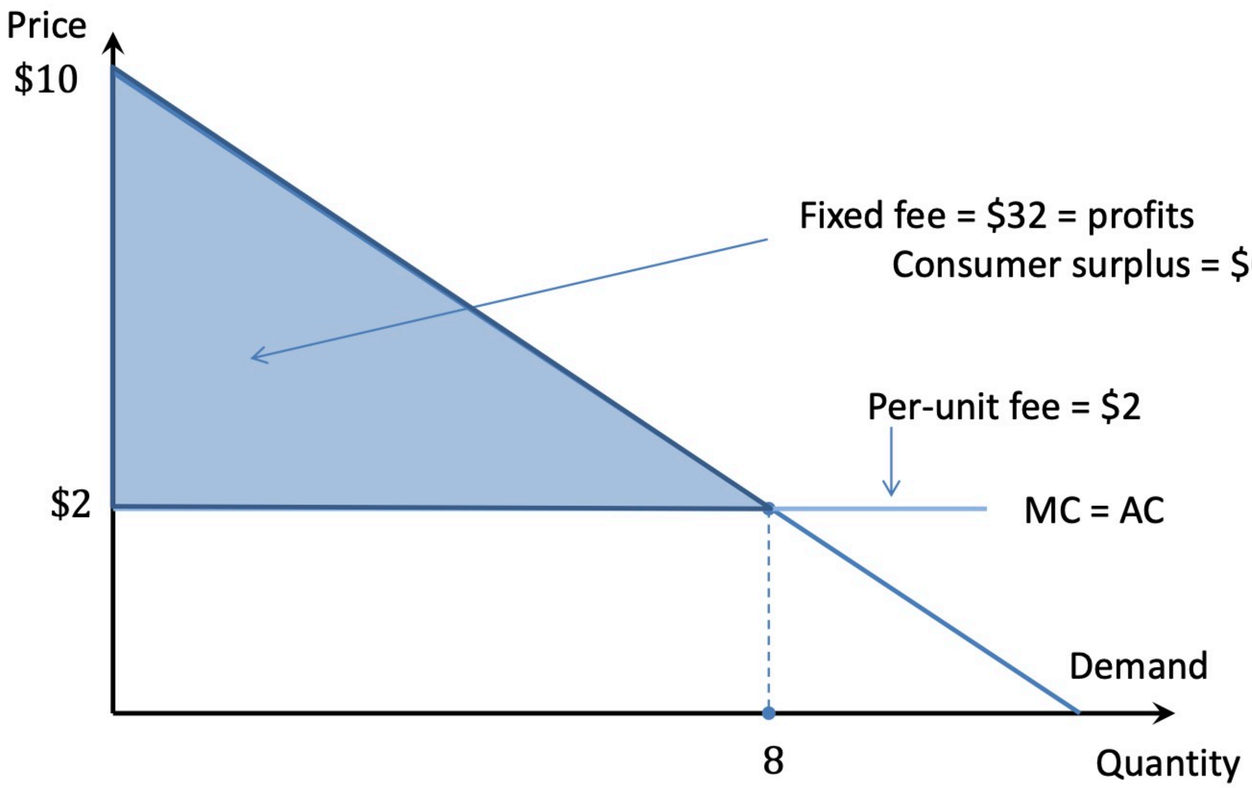
Two-Part Pricing

Two-Part Pricing

Charging both

- a **fixed fee** for the right to purchase the good or service
- a **per-unit price** for each unit purchased.

By setting **fixed fee** = consumer surplus, the firm can **extract all consumer surplus.**

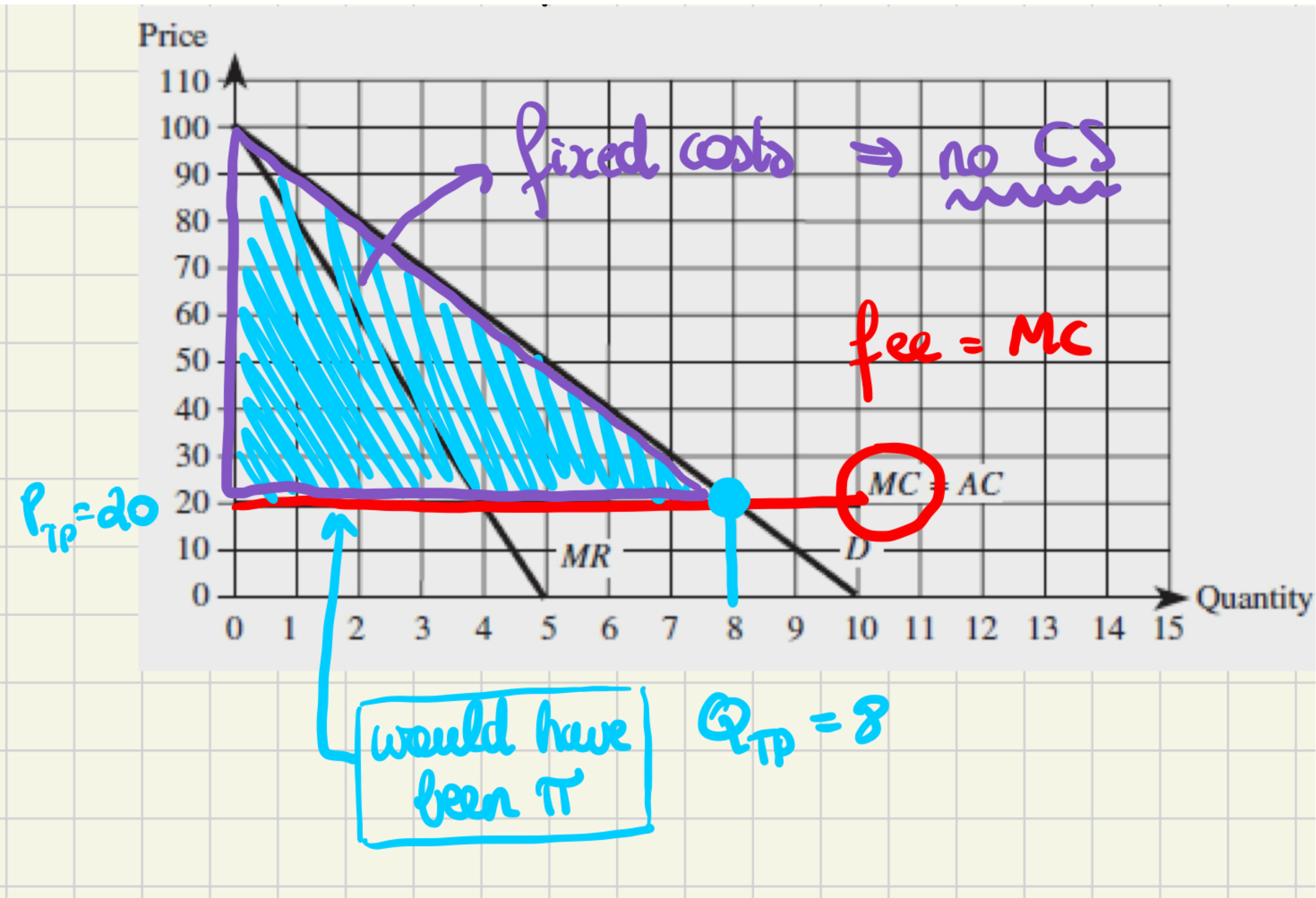


$$
\begin{aligned}
P = 32 + 2Q &= \text{Fixed Fee} + \text{Pernit Price} \cdot Q \\
&= \text{Consumer Surplus} + MC \cdot Q
\end{aligned}
$$

Rule

1. Set $\boxed{\text{perunit price} = MC}$
2. Calculate how many units the consumer will buy at that per-unit price to find Q_{TP}.
3. Calculate consumer surplus at that quantity to find the **fixed fee**:

$$\text{Fixed Fee} = \int_0^{Q_{TP}} (P(Q) - MC)dQ$$



In this way, consumer surplus is 0, and the firm extracts all surplus as profit (assuming $FC = 0$).

Rule

For a two-part pricing scheme with per-unit fee = MC and fixed fee = what would have been consumer surplus,

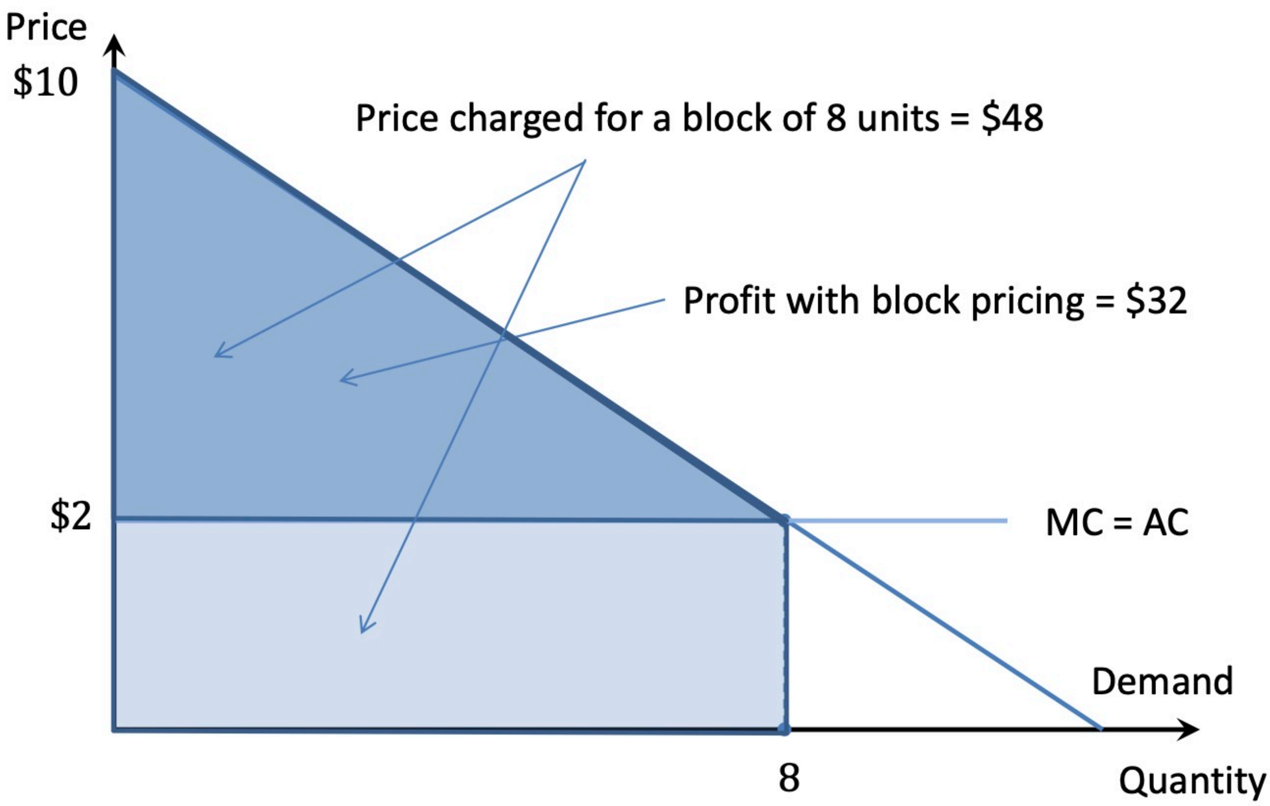
$$\boxed{\text{profits } \pi = \text{Fixed Fee} - \text{Fixed Costs}}$$

Block Pricing

Block Pricing

Identitical products are **packaged together** in order to enhance profits by **forcing customers to make an all-or-none decision** to purchase.

$\implies$ the profit-maximizing price on a package is the total value the consumer receives for the package.



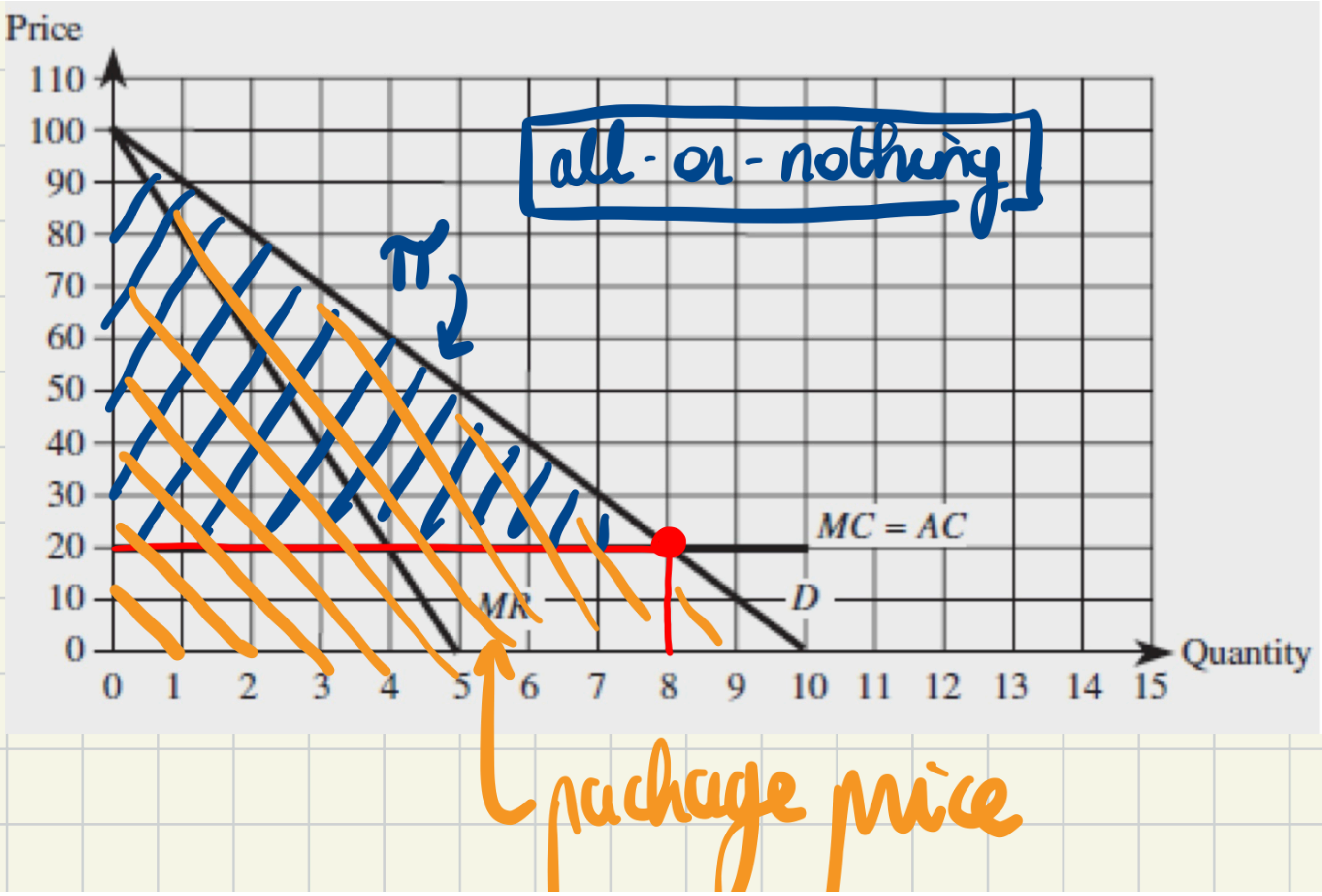
Rule

1. Determine the maximum quantity Q_{BP} where $P(Q) \geq MC$.
2. Set the package price to be the total value the consumer receives from purchasing Q_{BP} units.

$$\text{Package Price} = \int_0^{Q_{BP}} P(Q)dQ$$

3. Profit is package price minus total cost.

$$\pi = \text{Package Price} - MC \cdot Q_{BP}$$



Commodity Bundling

Commodity Bundling

Selling **two or more *different* products together** and selling them at a single **"bundle price"**.

$\Longrightarrow$ key assumption: consumers have **different valuations (WTP)** for the products.
$\Longrightarrow$ managers cannot abserve different consumers' valuations.

This can come in handy when different types of consumers value two products differently, but the firm cannot distinguish between the different types of consumers.

Consumer Type	v_X	v_Y
Type 1	$v_{1,X}$	$v_{1,Y}$
Type 2	$v_{2,X}$	$v_{2,Y}$
Type 3	$v_{3,X}$	$v_{3,Y}$

In this case, make another table to **calculate the total revenue from selling products X and Y separately** at prices P_X and P_Y.

Consumer Type	X	Y
Type 1	$n_1 \cdot P_X \cdot \delta_{1,X}$	$n_1 \cdot P_Y \cdot \delta_{1,Y}$
Type 2	$n_2 \cdot P_X \cdot \delta_{2,X}$	$n_2 \cdot P_Y \cdot \delta_{2,Y}$
Type 3	$n_3 \cdot P_X \cdot \delta_{3,X}$	$n_3 \cdot P_Y \cdot \delta_{3,Y}$

where

- n_i is the number of consumers of type i
- $v_{i,X/Y}$ is the valuation of consumer type i for product X or Y

- $P_{X/Y}$ is the price of product X or Y
- $\boxed{\delta_{i,X/Y} = \begin{cases} 1 & \text{if } v_{i,X} > P_X \\ 0 & \text{otherwise} \end{cases}}$ is an indicator function showing whether consumer type i buys product X or Y at price P_X or P_Y

To calculate the total revenue from selling products X and Y **as a bundle at price** P_B, make another table:

Consumer Type	Bundle B
Type 1	$n_1 \cdot P_B \cdot \delta_{1,B}$
Type 2	$n_2 \cdot P_B \cdot \delta_{2,B}$
Type 3	$n_3 \cdot P_B \cdot \delta_{3,B}$

Where $\boxed{\delta_{i,B} = \begin{cases} 1 & \text{if } v_{i,X} + v_{i,Y} > P_B \\ 0 & \text{otherwise} \end{cases}}$

So, customers buy the bundle if their **total valuation for both products exceeds the bundle price.**

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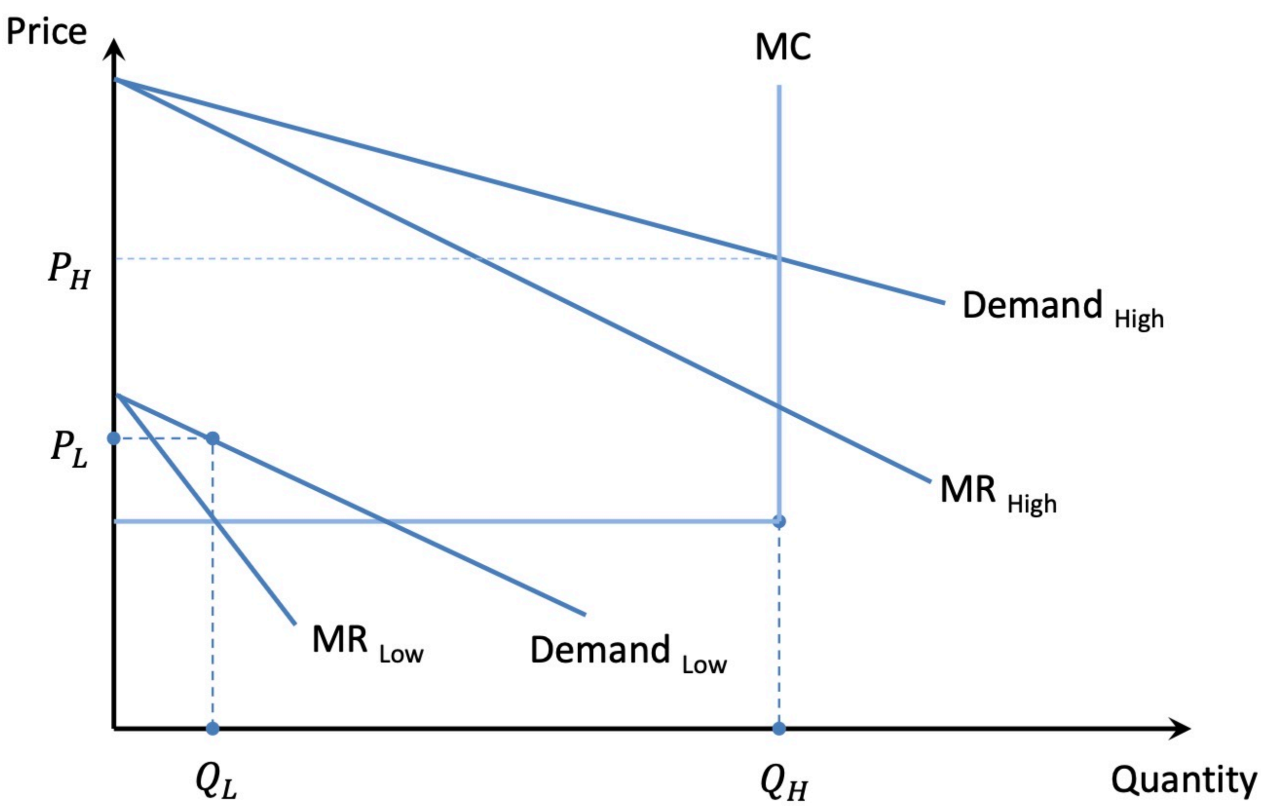
2. Special Cost and Demand Structures

Peak-Load Pricing

Peak-Load Pricing

Charging **higher prices during periods of peak demand** and **lower prices during periods of off-peak demand**.

Assumes **limited resources!**



Cross-Subsidies

Cross-Subsidies

Profits gained from the **sale of one products** are to **subsidize sales of a related product**.

Cross-subsidization principle: Whenever the demands for two products produced by a firm are interrelated through costs or demand, the firm may enhance profits by cross-subsidization: selling one product at or below cost and the other product above cost.

Transfer Pricing

Transfer Pricing

A firm **optimally sets the internal price** at which an **upstream division sells an input to a downstream division**.

- Most division managers are incentivized to maximize their own division's profits $\implies$ double marginalization $\implies$ overall firm profits are suboptimal.
- **Transfer pricing** aligns division managers' incentives with that of the overall firm: **increases overall firm profits**. This **overcomes double marginalization.**

Double Marginalization

Large firm has two divisions:

- **Upstream division**
  - produces at marginal cost MC
  - sells to downstream division at price P
  - has market power and **incentive to maximize its own profits**
  - $\implies$ $\boxed{MR = MC}$ because it maximizes its own profits
  - $\implies$ chooses $\boxed{P > MC}$ because of market power (monopoly pricing)
- **Downstream division**
  - produces final good
  - sells to consumers at price P_D
  - profit-maximization leads to $\boxed{P_D > MC_D}$ because of market power (monopoly pricing)

Both divisions set **prices above marginal cost**, leading to **double marginalization**.

Transfer Pricing Rule

Transfer pricing is used to **overcome double marginalization**.

Transfer Pricing Rule

Set the **internal price** P_T at which an upstream division sells inputs to a downstream division in order to maximize the **overall firm's profits**.

Require upstream division to produce s.t. $MC = NMR_D$, where NMR_D is the downstream division's **net marginal revenue**.

∑ Downstream Division's Net Marginal Revenue

$$\boxed{NMR_D = MR_D - MC_D}$$

Transfer Pricing Rule

Set the internal price P_T such that

$$\boxed{MC = NMR_D} = MR_D - MC_D$$

1. Find Q_T such that $MC = NMR_D$.
2. Set transfer price $\boxed{P_T = MC(Q_T)}$.

Transfer Pricing Rule

In case the downstream division needs n units of the upstream division's product to produce one final good,

$$Q = n \cdot Q_D$$

Set the internal price P_T such that

$$n \cdot MC(Q) = MR_D(Q_D) - MC_D(Q_D)$$

or if we substitute $Q = n \cdot Q_D$ into the equation,

$$\boxed{n \cdot MC(n \cdot Q_D) = MR_D(Q_D) - MC_D(Q_D)}$$

1. Find Q_D such that $n \cdot MC(n \cdot Q_D) = MR_D(Q_D) - MC_D(Q_D)$.
2. Set transfer price $\boxed{P_T = MC(n \cdot Q_D)}$.

Price Matching

Price Matching

A firm advertises a price and a promise to match any lower price offered by a competitor.

- Mitigate the stark outcome associated with firms competing in a homogeneous-product Bertrand oligopoly, where
  - there is price competition
  - homogeneous products are sold
  - reaction functions are based on rivals' prices
- Outcome:
  - All firms can set monopoly price
  - All firms earn monopoly profits
  - Instead of the zero profits it twould earn in the usual one-shot Bertrand oligopoly

Potential issues:

- dealing with false consumer claims of lower prices
- competitors with lower cost structures

Brand Loyalty

Brand Loyalty

Brand loyal customers continue to buy a firms' product even if another firm offers a (slightly) better price.

- To mitigate the tension of **Bertrand competition**. In this oligopoly,
  - there is price competition
  - homogeneous products are sold
  - reaction functions are based on rivals' prices

Methods to introduce brand loyalty:

- Advertising
- Frequent-buyer programs

Randomized Pricing

Randomized Pricing

A firm intentionally **varies its price** in an attempt to "hide" price information from consumers and rivals.

Benefits to firms:

- consumers cannot learn from experience which firm charges the lowest price on the market
- reduces the ability of rival firms to undercut a firm's price

Not always profitable.