Pricing with Market Power

EE311

Chayun Tantivasadakarn

Faculty of Economics, Thammasat University

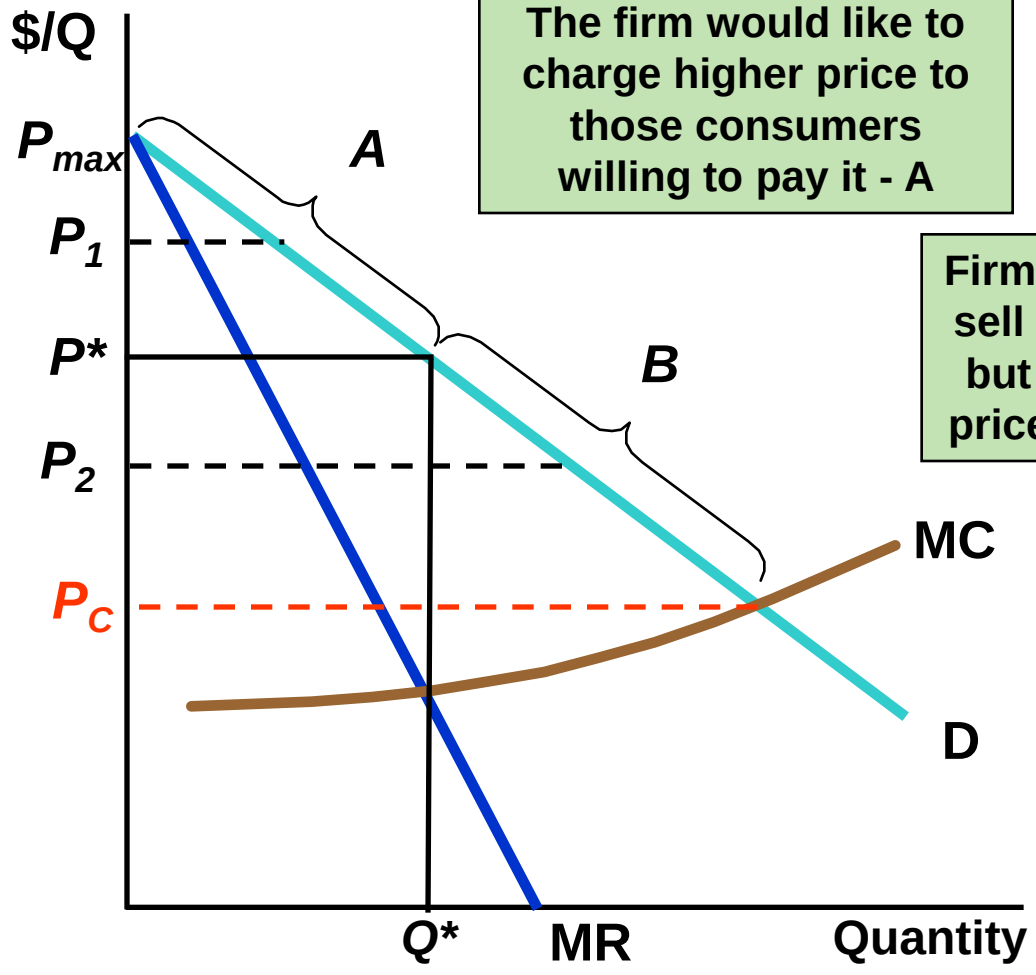
Topics to be Discussed

- Capturing Consumer Surplus
- Price Discrimination
- Peak-Load Pricing
- All-or-nothing pricing
- The Two-Part Tariff
- Bundling
- Tying
- Advertising

Capturing Consumer Surplus

- All pricing strategies we will examine are meant of capturing consumer surplus and transferring it to the producer
- Profit maximizing point of P* and Q*
  - But some consumers are willing to pay more than P* for a good.
    - Raising price will lose some consumers, leading to smaller profits
    - Lowering price will gains some consumers, but lower profits

Capturing Consumer Surplus



The firm would like to charge higher price to those consumers willing to pay it - A

Firm would also like to sell to those in area B but without lowering price to all consumers

Both ways will allow the firm to capture more consumer surplus

Capturing Consumer Surplus

- Price discrimination is the practice of charging different prices to different consumers for similar goods even though their marginal costs are the same.

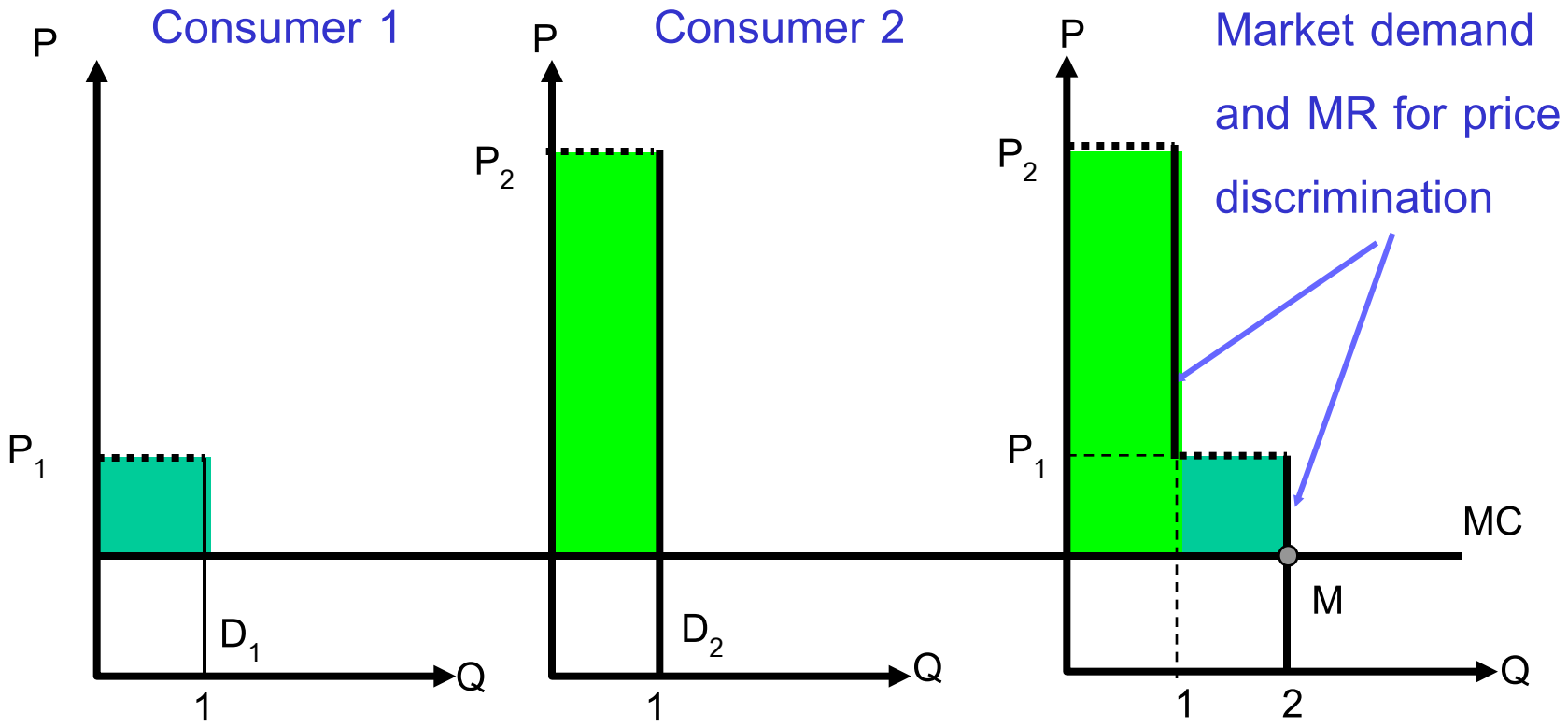
Capturing Consumer Surplus

- Necessary conditions: the firm must
  - face a downward sloping demand or have some market power
  - be able to identify the different consumers and get them to pay different prices
  - be able to prevent the consumers who buy low prices to resell to the consumers who are charged high prices or prevent arbitrage

Price Discrimination

- First Degree Price Discrimination
  - Charge a separate price to each customer or to each unit
  - Charge the maximum or reservation price they are willing to pay.
  - It is also called perfect price discrimination
- Examples: medical services, legal consultation, key money

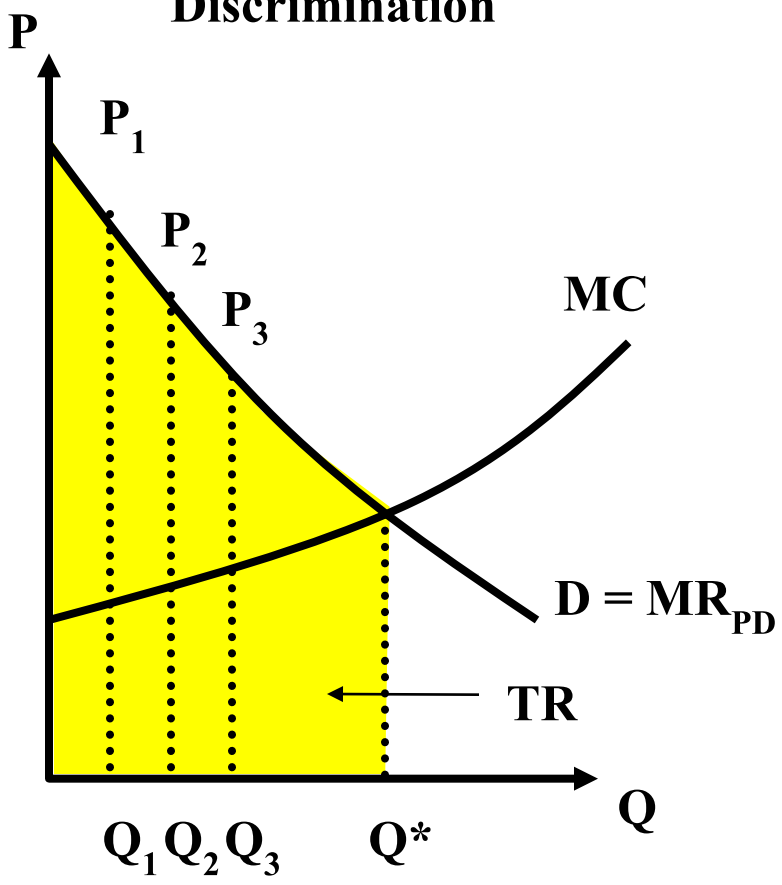
Perfect First-Degree Price Discrimination: simplified case



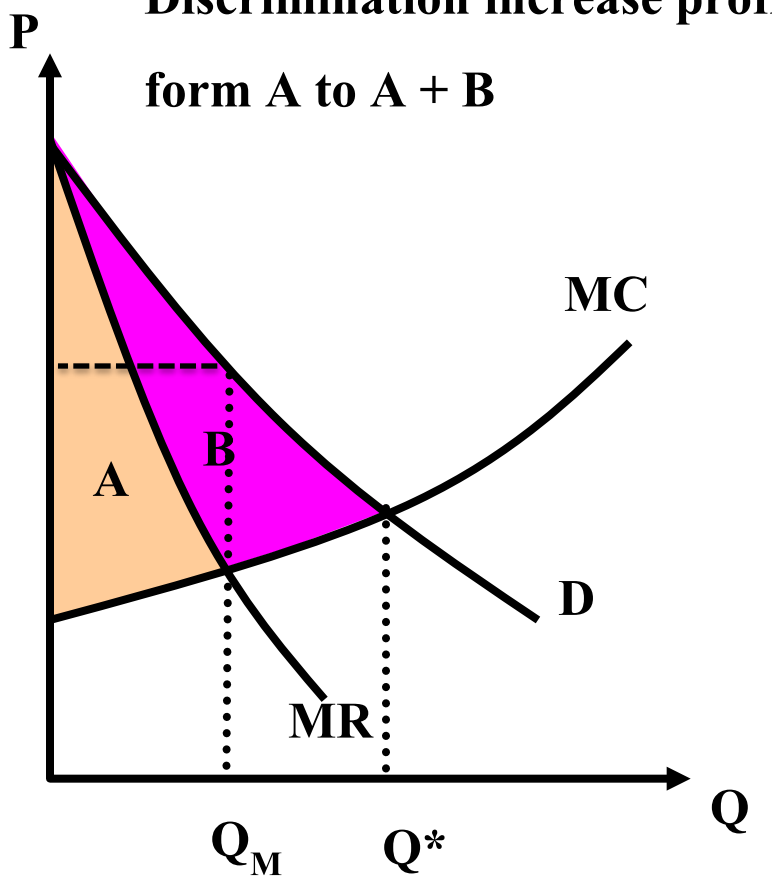
Price Discrimination

- If the firm can perfectly price discriminate, each consumer is charged exactly what they are willing to pay.
  - Old MR curve is no longer part of output decision
  - Incremental revenue (MR with price discrimination) is exactly the price at which each unit is sold – the demand curve
  - Additional profit from producing and selling an incremental unit is now the difference between demand and marginal cost

First Degree Price Discrimination



First Degree Price Discrimination increase profits form A to A + B



No consumer surplus left for consumer

First-Degree Price Discrimination

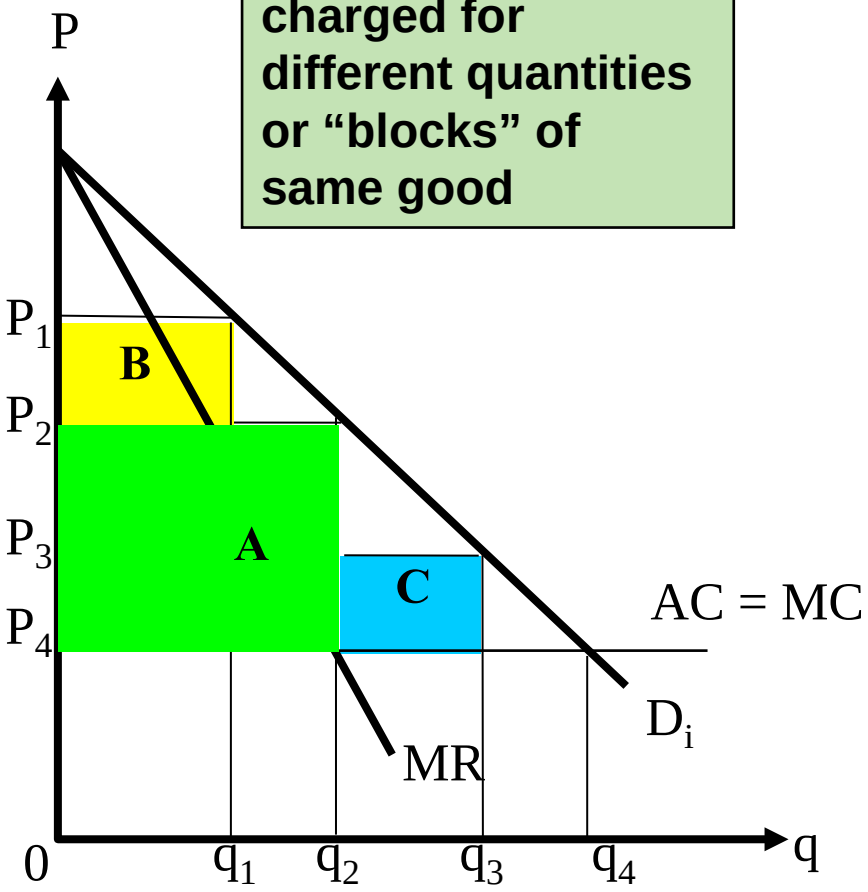
- In practice perfect price discrimination is almost never possible
  - Impractical to charge every customer a different price (unless very few customers)
  - Firms usually does not know reservation price of each customer
- Firms can discriminate imperfectly
  - Can charge a few different prices based on some estimates of reservation prices

Second-Degree Price Discrimination

- Practice of charging different prices per unit for different quantities of the same good or service
  - All customers are facing the same price structure
  - They are charged according to the block of quantity they buy --> Block pricing
- Quantity discounts are not 2-degree price discrimination: all units are charged the same. Since 2-degree price discrimination: the first block is still high price
- Examples: Buy one get another one at a half price

Second-Degree Price Discrimination

Different prices are charged for different quantities or "blocks" of same good



Without discrimination: $P = P_2$ and $q = q_2$. With second-degree discrimination there may be four blocks with prices P_1, P_2, P_3, & P_4.

Profit increase from A to A + B + C
Consumers still have some consumer surplus left

Third-Degree Price Discrimination

- Practice of dividing consumers into two or more groups with separate demand curves and charging different prices to each group

1. Each group has its own demand function and price elasticity.
2. The market with lower E_D is charged higher price.
3. The firm must be able to prevent arbitrage

Price Discrimination

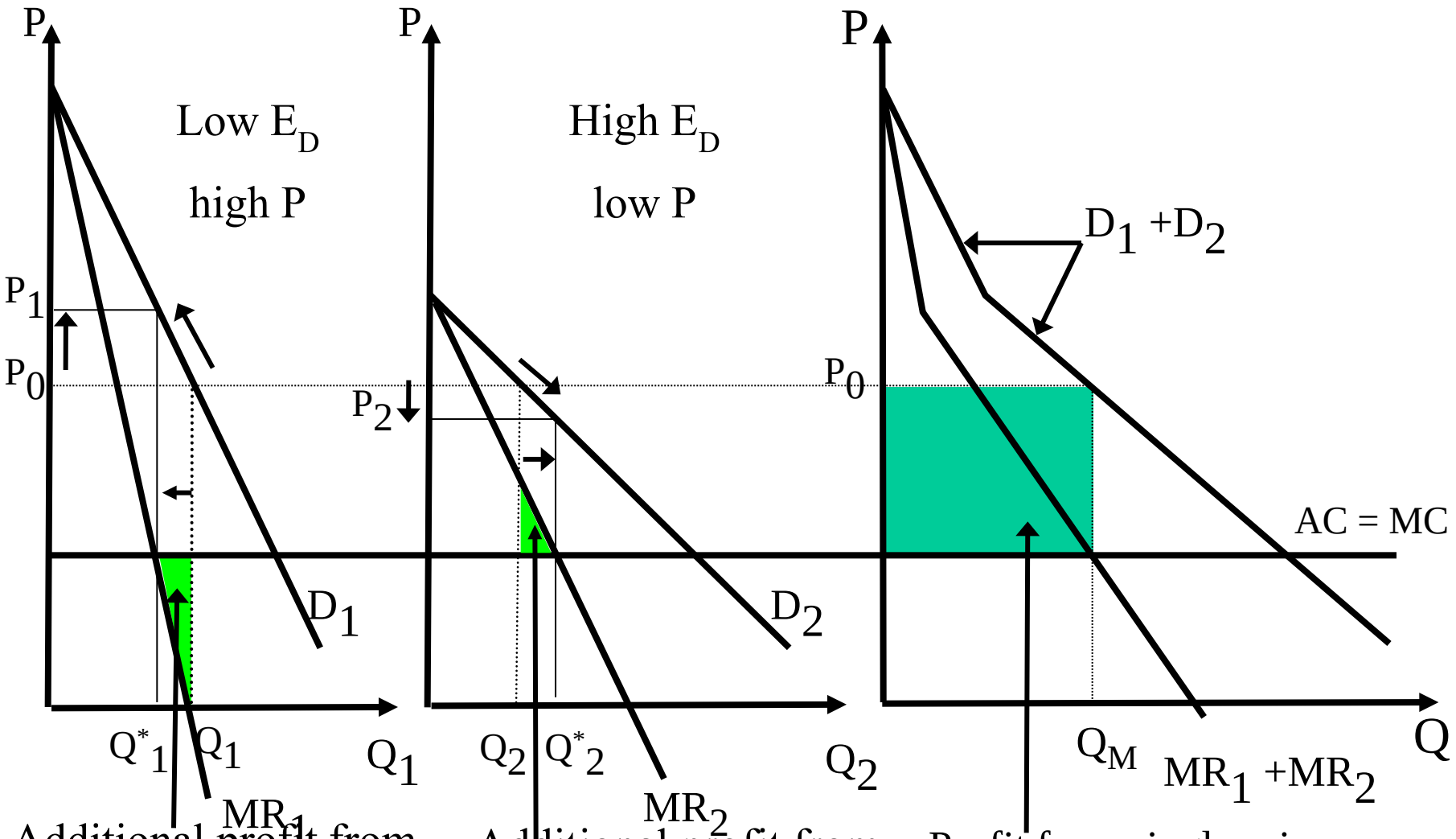
- Most common type of price discrimination.
- Examples: airlines, discounts to students and senior citizens, premium price for foreigners.
- Some characteristic is used to divide the consumer groups
- Typically elasticities of demand differ for the groups
  - College students and senior citizens are not usually willing to pay as much as others because of lower incomes
  - These groups are easily distinguishable with ID's

Creating Consumer Groups

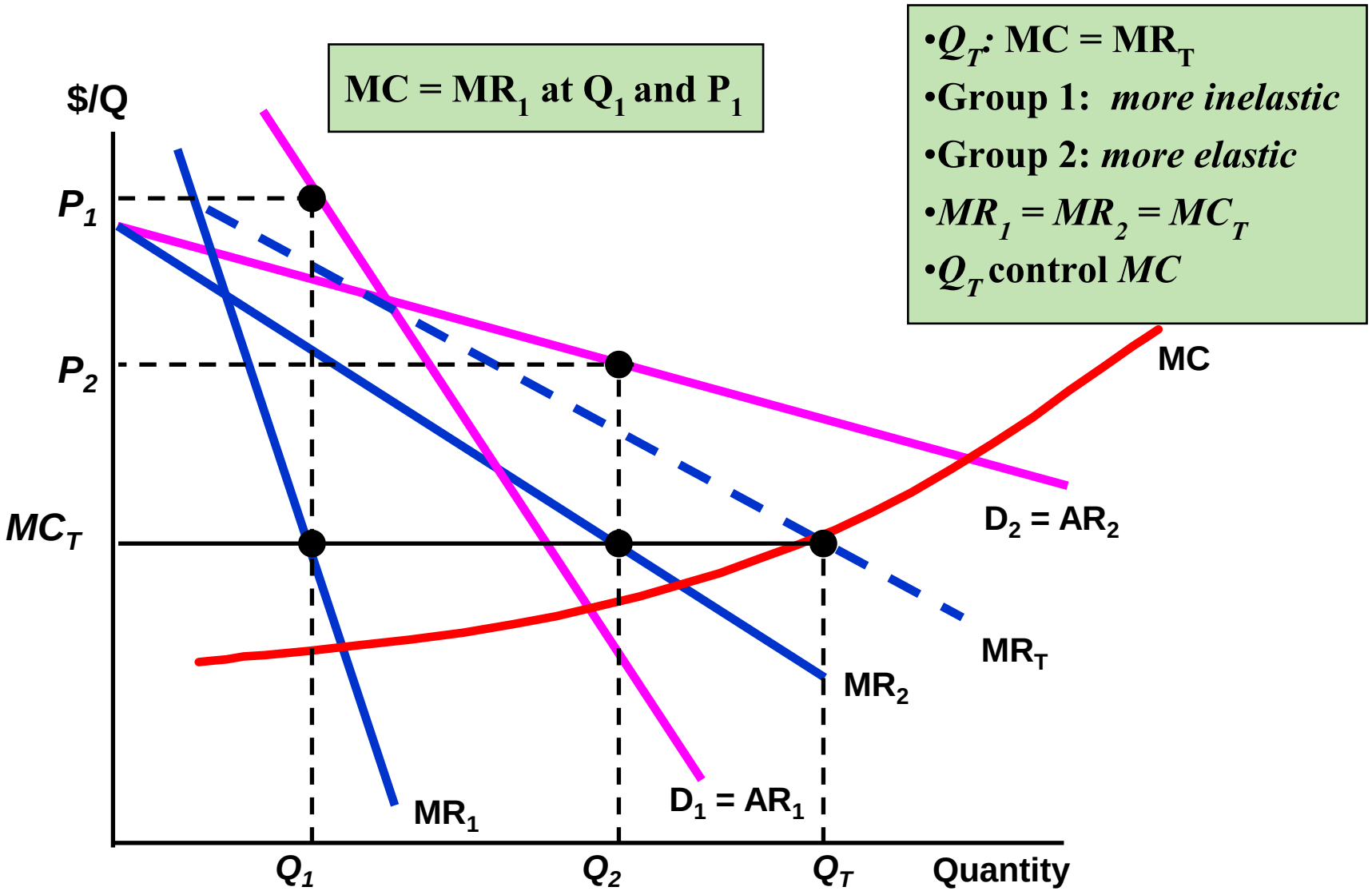
- If third degree price-discrimination is feasible, how can the firm decide what to charge each group of consumers?

1. Total output should be divided between groups so that MR for each group are equal.
2. Total output is chosen so that MR for each group of consumers is equal to the MC of production

Third Degree Price Discrimination



Third-Degree Price Discrimination



Third-Degree Price Discrimination

- Algebraically
  - P_1: price first group
  - P_2: price second group
  - $C(Q_T)$ = total cost of producing output

    $Q_T = Q_1 + Q_2$
  - Profit: $\pi = P_1Q_1 + P_2Q_2 - C(Q_T)$

Third-Degree Price Discrimination

- Firm should increase sales to each group until incremental profit from last unit sold is zero
- Set incremental Δ for sales to group 1 = 0

$$\frac{\Delta\pi}{\Delta Q_1} = \frac{\Delta(P_1 Q_1)}{\Delta Q_1} - \frac{\Delta C}{\Delta Q_1} = 0$$

$$\frac{\Delta(P_1 Q_1)}{\Delta Q_1} = MR_1 \qquad \frac{\Delta C}{\Delta Q_1} = MC$$

Third-Degree Price Discrimination

- First group of consumers:
  - $MR_1 = MC$
- Can do the same thing for the second group of consumers
- Second group of customers:
  - $MR_2 = MC$
- Combining these conclusions gives
  - $MR_1 = MR_2 = MC$

Third-Degree Price Discrimination

- Recall that $MR = P(1+1/E_d)$
  - $MR_1 = P_1(1+1/E_{d1})$
  - $MR_2 = P_2(1+1/E_{d2})$
  - $MR_1 = MR_2$ or $P_1(1+1/E_{d1}) = P_2(1+1/E_{d2})$

$$\frac{P_1}{P_2} = \frac{(1+1/E_2)}{(1+1/E_1)}$$

Price is higher for the market with lower E_d and price is lower for the market with higher E_d

Third-Degree Price Discrimination

- Example
  - $E_1 = -2$ & $E_2 = -4$
  - P_1 should be 1.5 times as high as P_2

$$\frac{P_1}{P_2} = \frac{(1-1/4)}{(1-1/2)} = \frac{3/4}{1/2} = 1.5$$

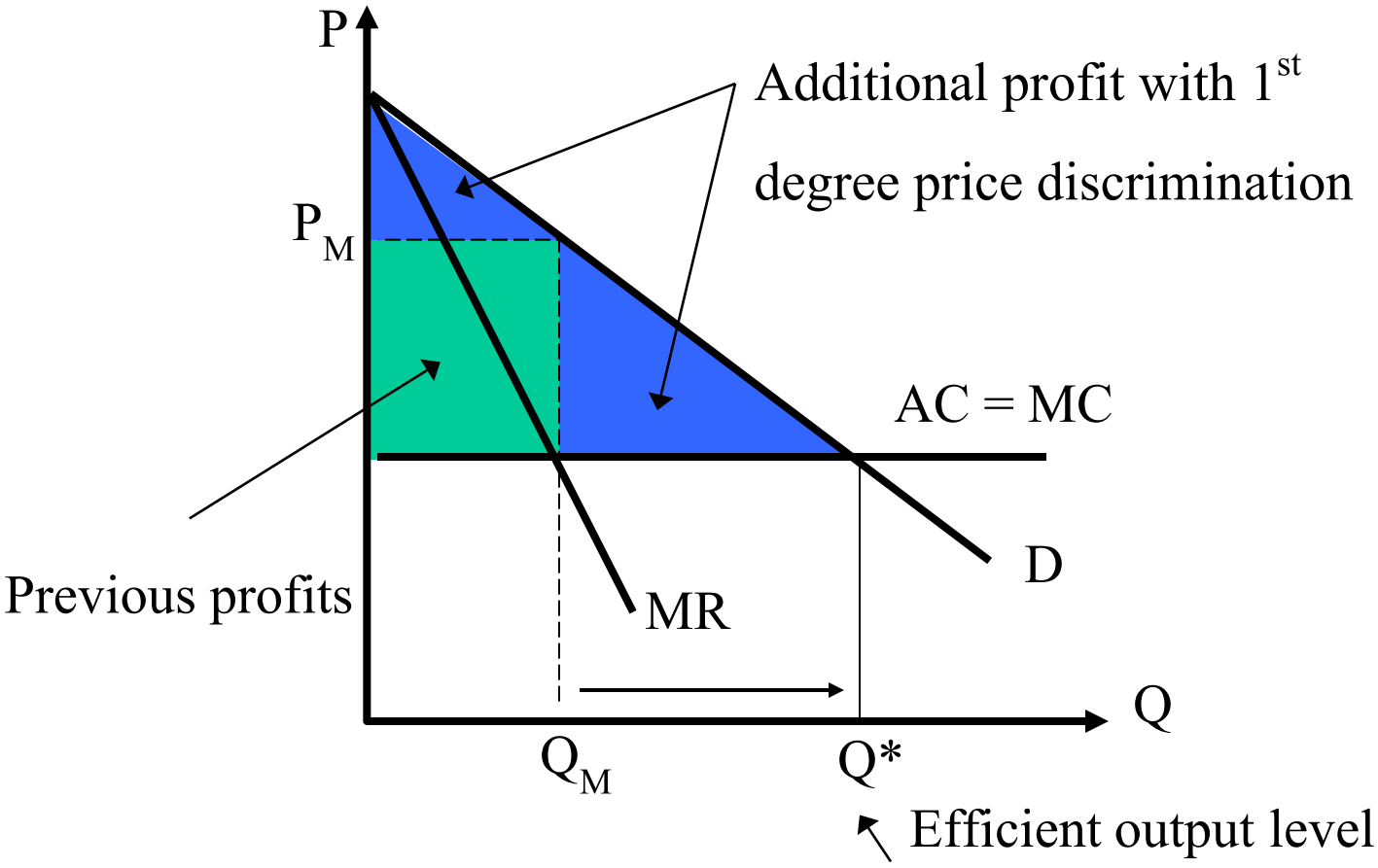
The Economics of Coupons and Rebates

- Those consumers who are more price elastic will tend to use the coupon/rebate more often when they purchase the product than those consumers with a less elastic demand.
- Coupons and rebate programs allow firms to price discriminate.
- About 20 – 30% of consumers use coupons or rebates.

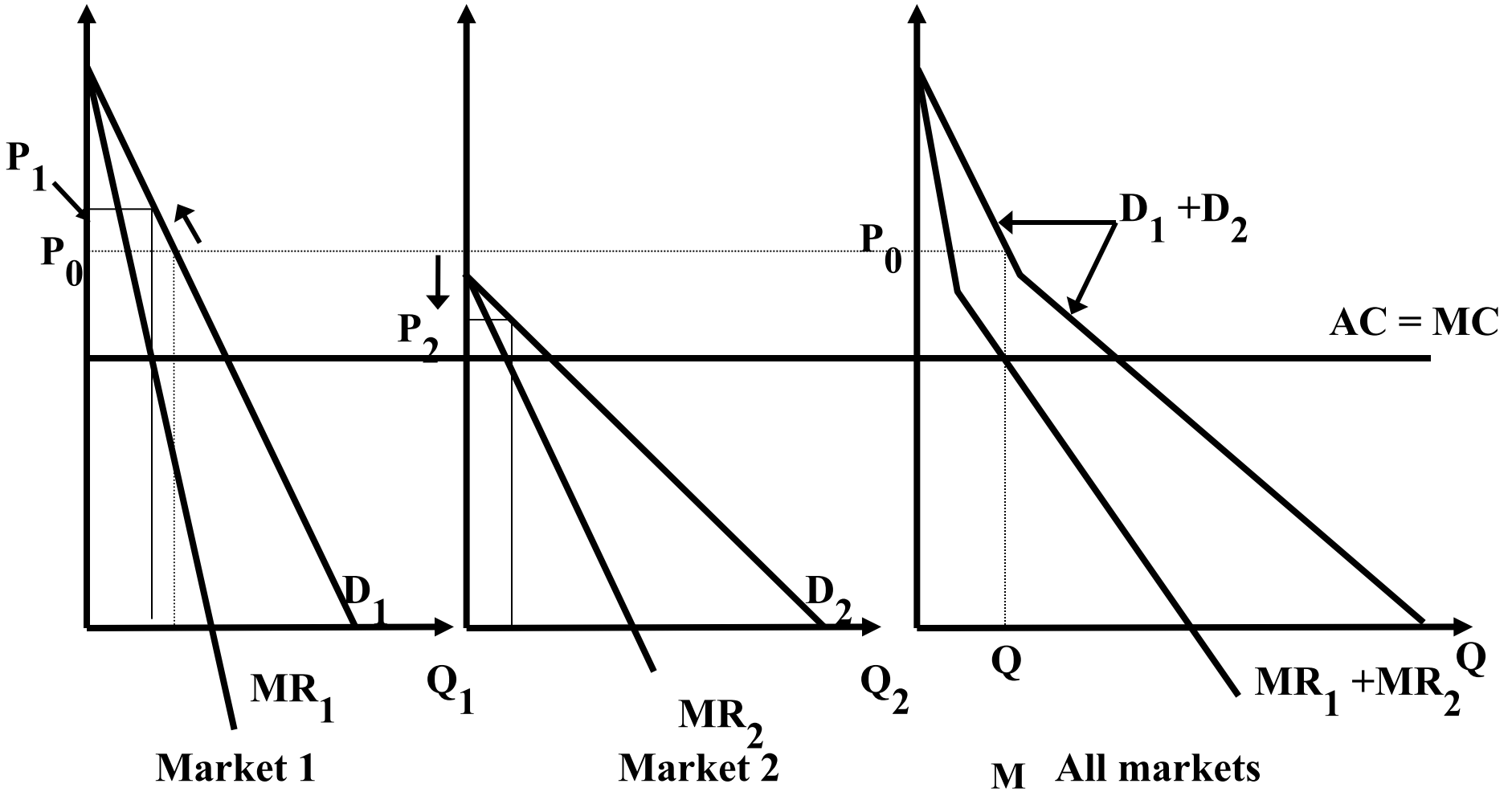
Impacts of Price Discrimination

- Producers may intentionally lower the quality of the product in the cheaper market
- Worsen distribution of income because consumer surplus is less
- Improve economic efficiency because output is closer to the point where D = MC
- Consumer in the lower income group may be able to afford the good
- help to recover losses from high fixed costs

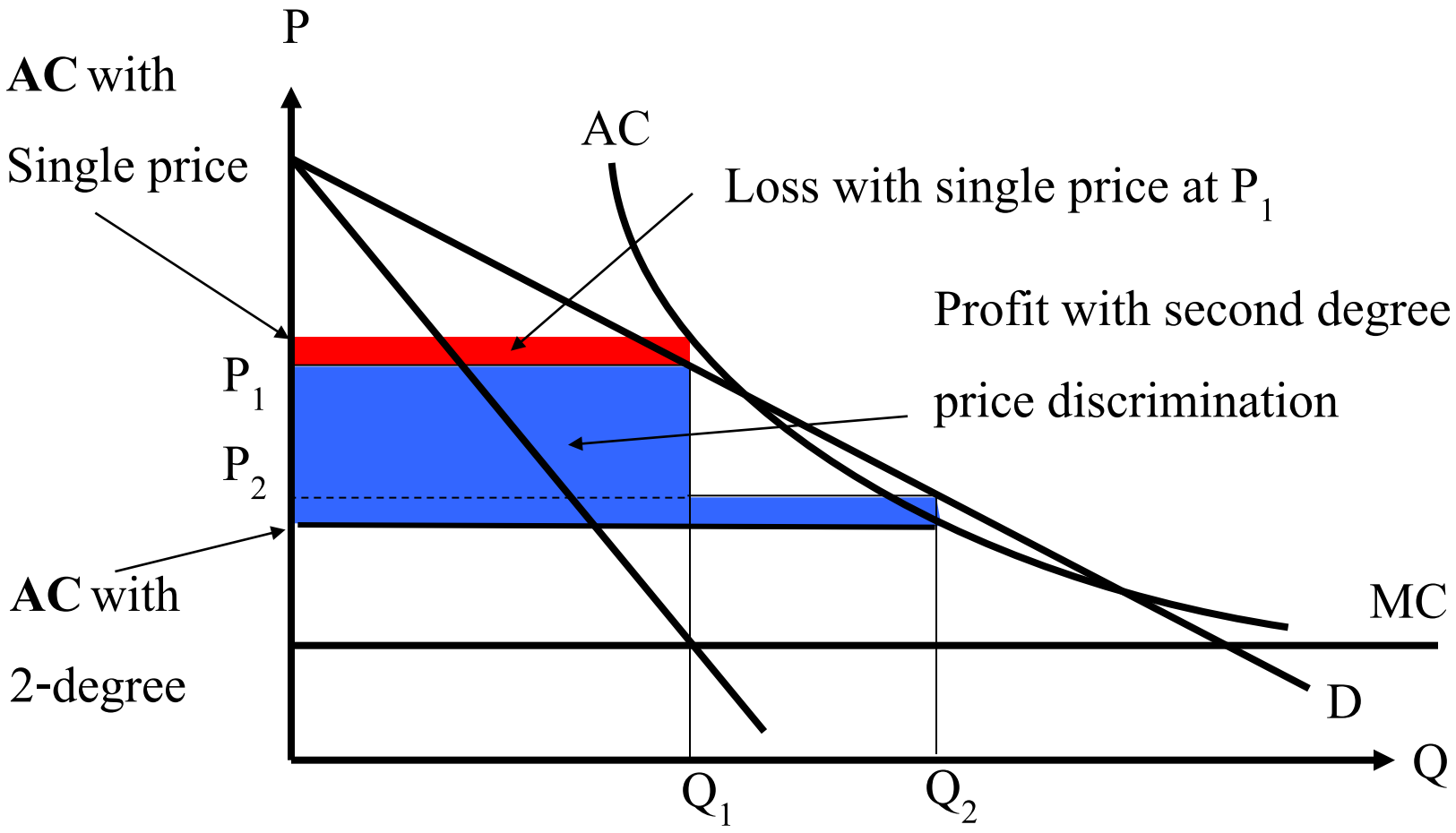
Improve efficiency but more inequality



Consumers in market 2 have higher welfare; firm has higher profit



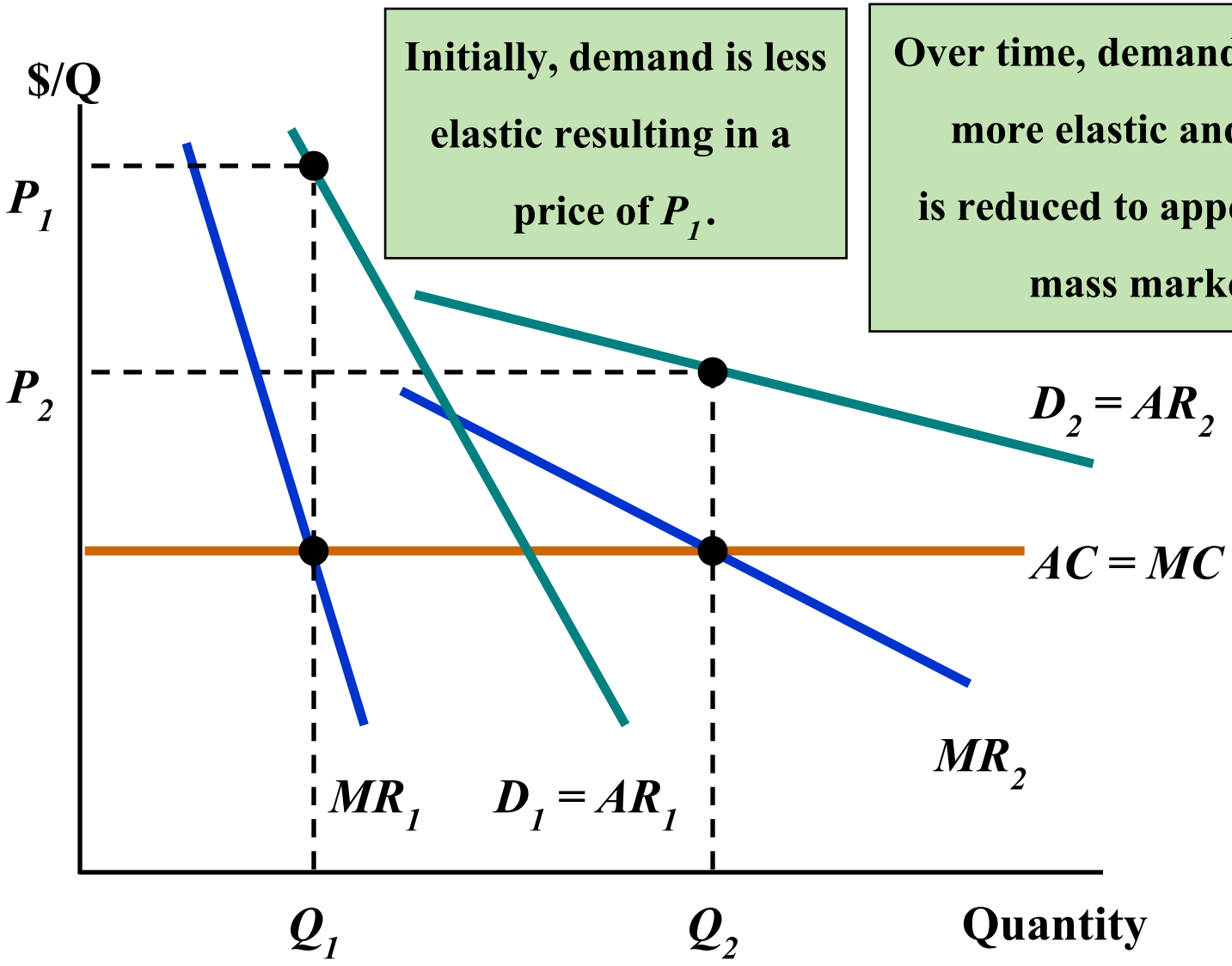
Price Discrimination and Economies of Scale



Other Types of Price Discrimination

- Intertemporal Price Discrimination
  - Practice of separating consumers with different demand functions into different groups by charging different prices at different points in time
  - It is a kind of 3-degree price discrimination
  - Initial release of a product, the demand is inelastic
    - Hard back v. paperback book
    - New release movie
    - Technology: Cellular handset

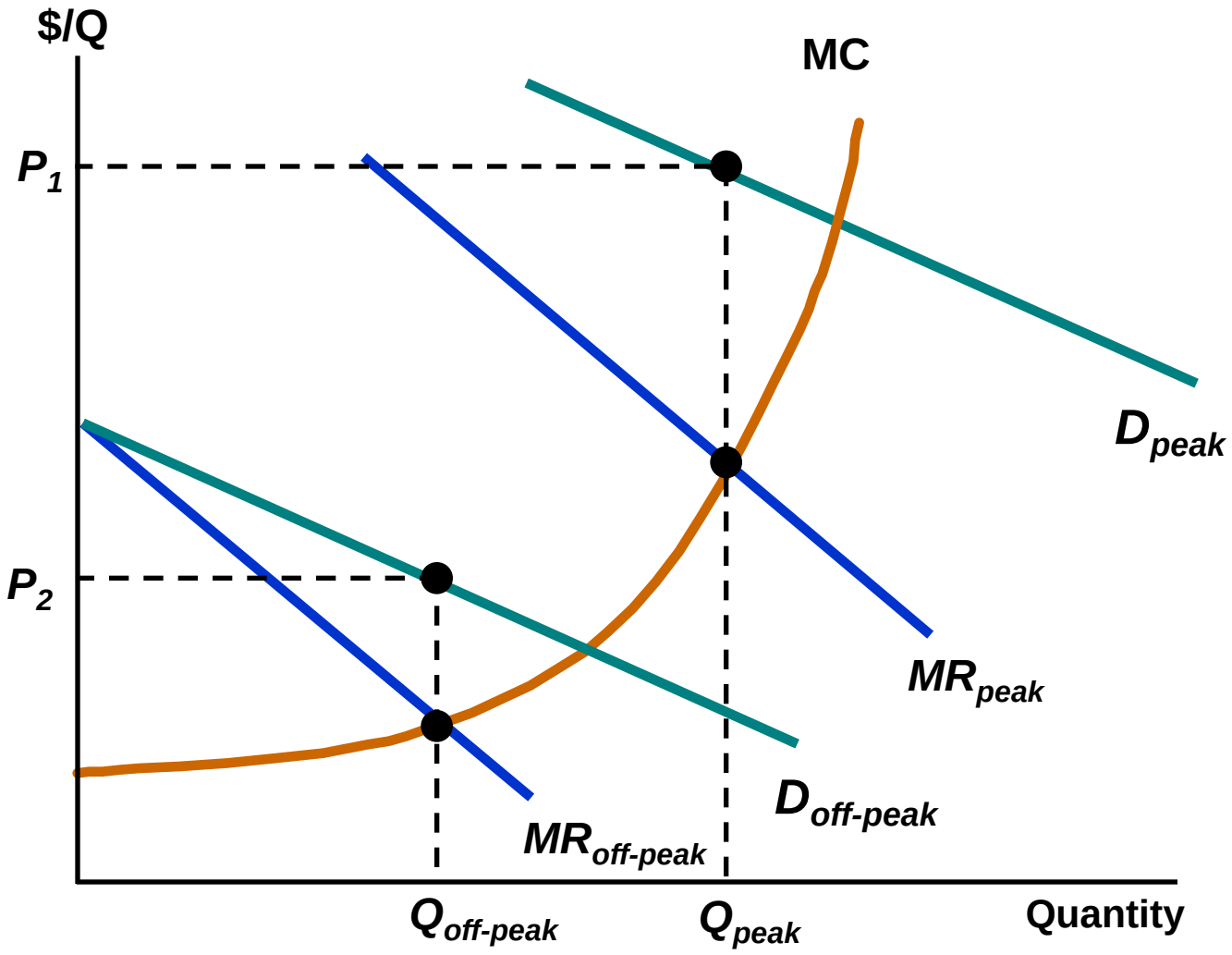
Intertemporal Price Discrimination



Peak-Load Pricing

- Peak-Load Pricing
  - Practice of charging higher prices during peak periods when capacity constraints cause marginal costs to be higher.
- Demand for some products may peak at particular times.
  - Electricity: day time ฿4/unit, night time ฿1/unit
  - Rental rate for resorts during high season is higher than the off season

Peak-Load Pricing

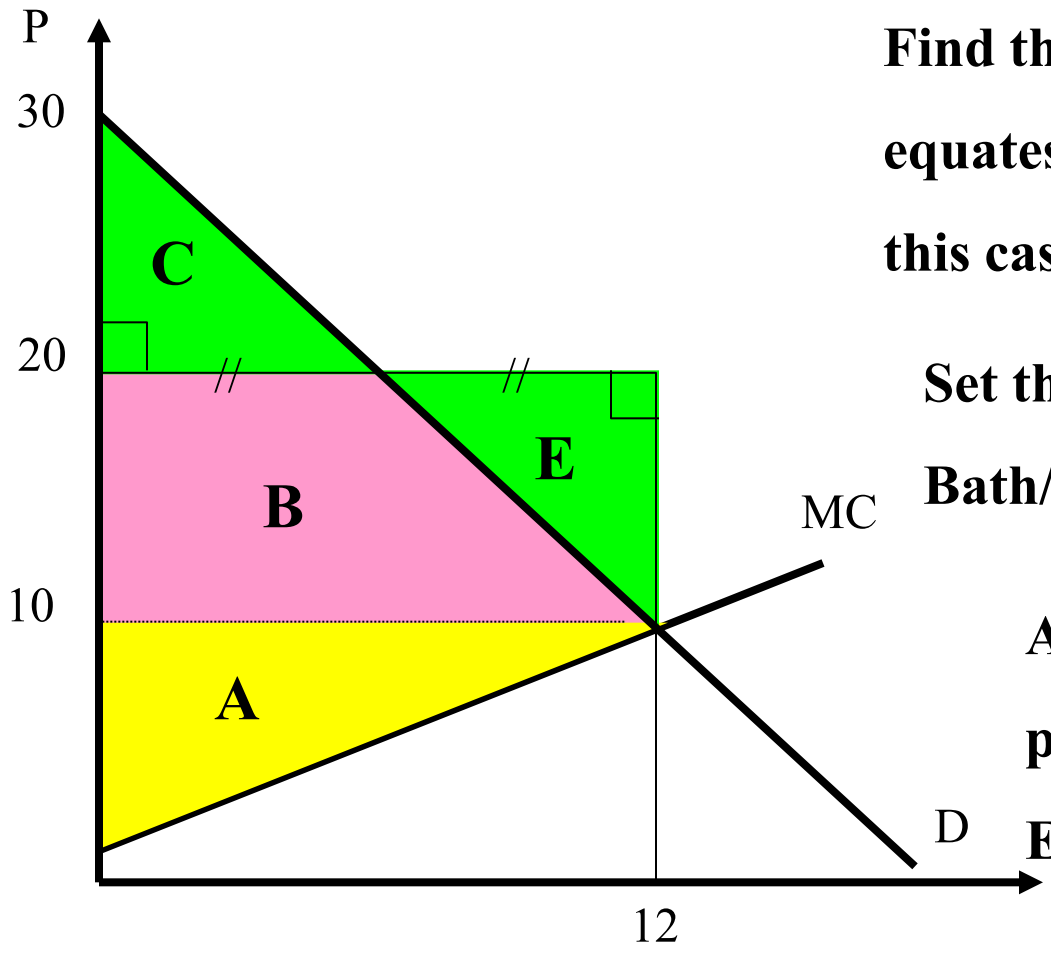


Peak-Load Pricing

- Objective is to increase efficiency by charging customers close to marginal cost
  - Increased MR and MC would indicate a higher price.
- MCs differ for different time periods for peak-load pricing
  - Price and sales in each market are independent
- With third-degree price discrimination, the MR for all markets was equal

All-or-nothing pricing

An alternative way to 1st degree which earns A + B + C



Find the price/unit that equates area C = area E in this case = 20 Baht

Set the price at 20x12= 240 Bath/dozen, whole dozen only

Also earn the same profit = area A + B + E

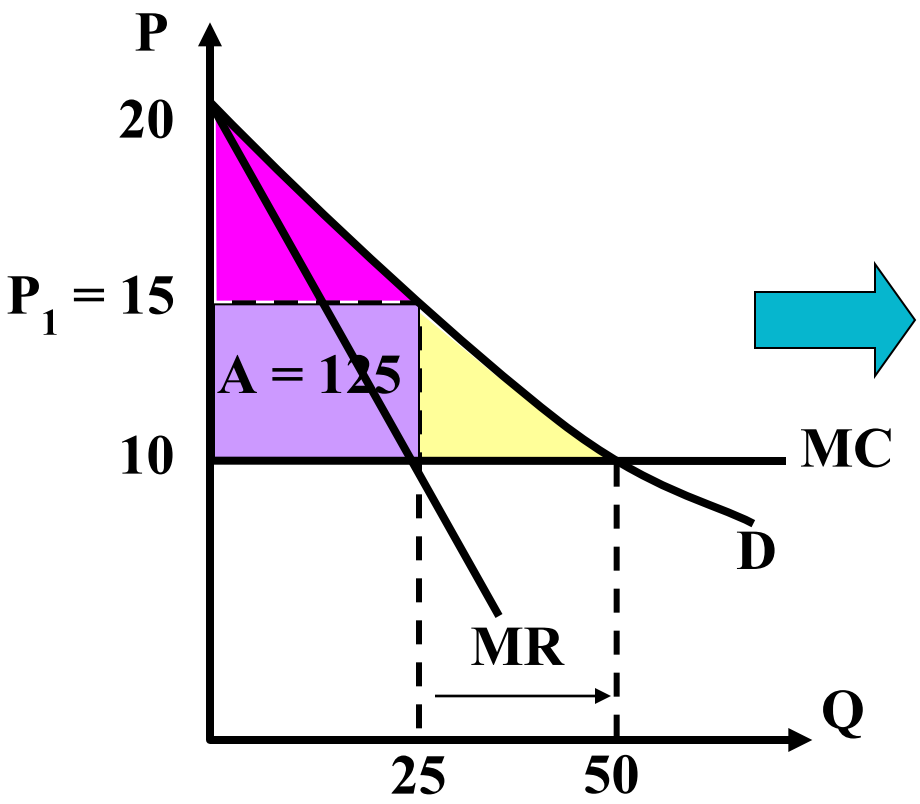
The Two-Part Tariff

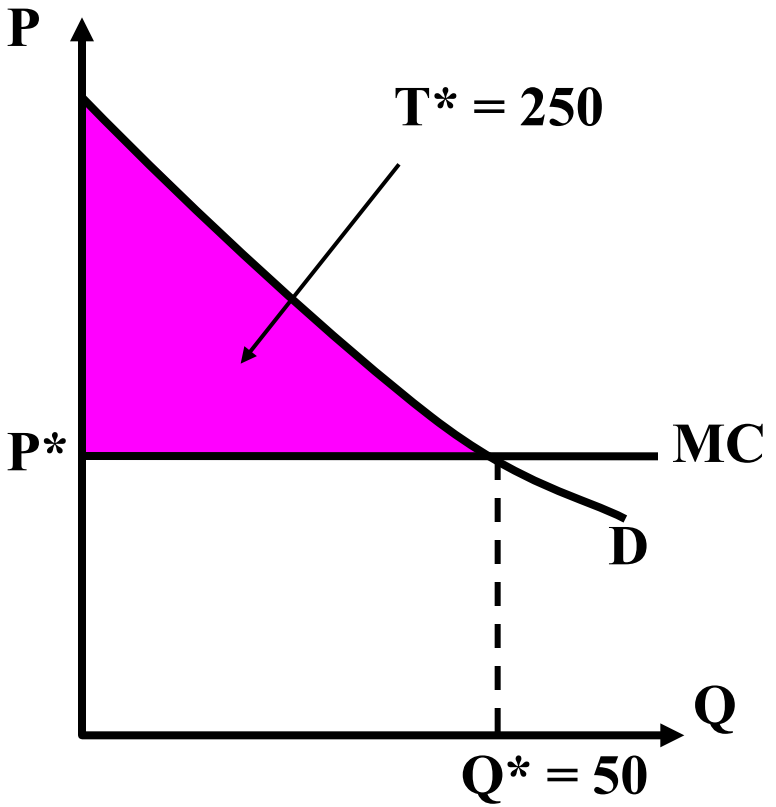
- Form of pricing in which consumers are charged both an entry and usage fee.
  - EX: amusement park, golf course, telephone service, sport club
- An entry fee is charged upfront for right to use/buy the product
- An additional usage fee is charged for each unit the consumer wishes to consume
  - Pay a fee to be a member of a golf course and then pay another fee for each game you play.

The Two-Part Tariff

- Pricing decision is setting the entry fee (T) and the usage fee (P).
- Choosing the trade-off between free-entry and high-use prices or high-entry and zero-use prices.
- Single Consumer
  - Assume firm knows consumer demand
  - Firm wants to capture as much consumer surplus as possible

Two-part Tariff



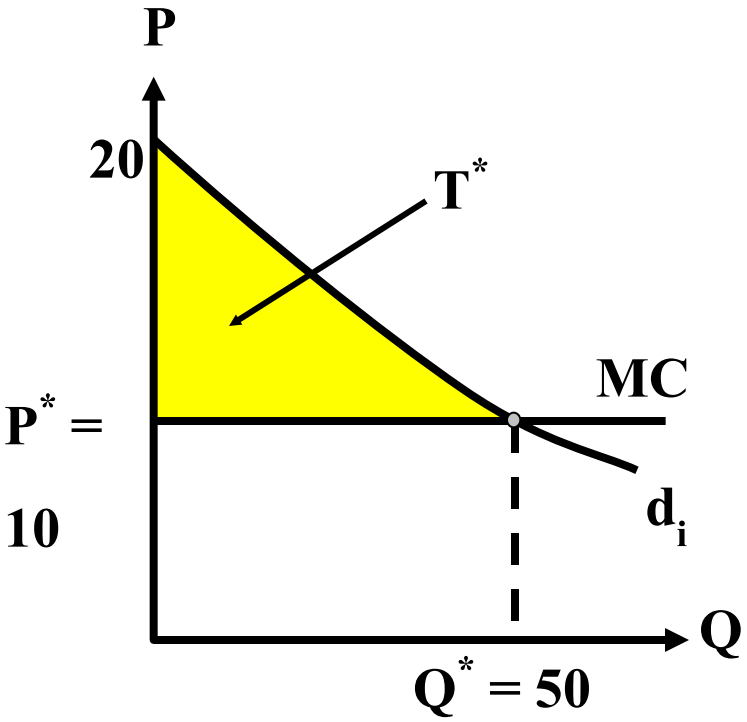


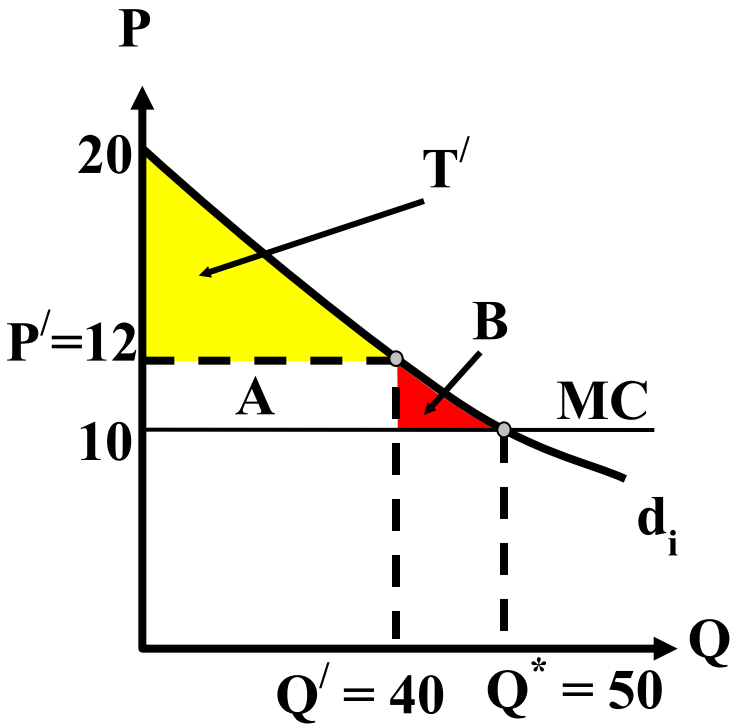
Profits with single price = 125

Profits = T* + (P* - MC)50

= 250 + 0 = 250

Two-Part Tariff with a Single Consumer





$\pi_1 = T^* = 0.5(50)(20\text{-}10) = 250$

$\pi_2 = T^{/} + A = 0.5(40)(20\text{-}12) +$

$(12\text{-}10)(40) = 160 + 80 = 240$

Two-Part Tariff with Two Consumers

- Two consumers, but firm can only set one entry fee and one usage fee.
- Will no longer set usage fee equal to MC.
  - Could make entry fee no larger than CS of consumer with smallest demand
- Firm should set usage fee above MC
- Set entry fee equal to remaining consumer surplus of consumer with smaller demand
- Firm needs to know demand curves

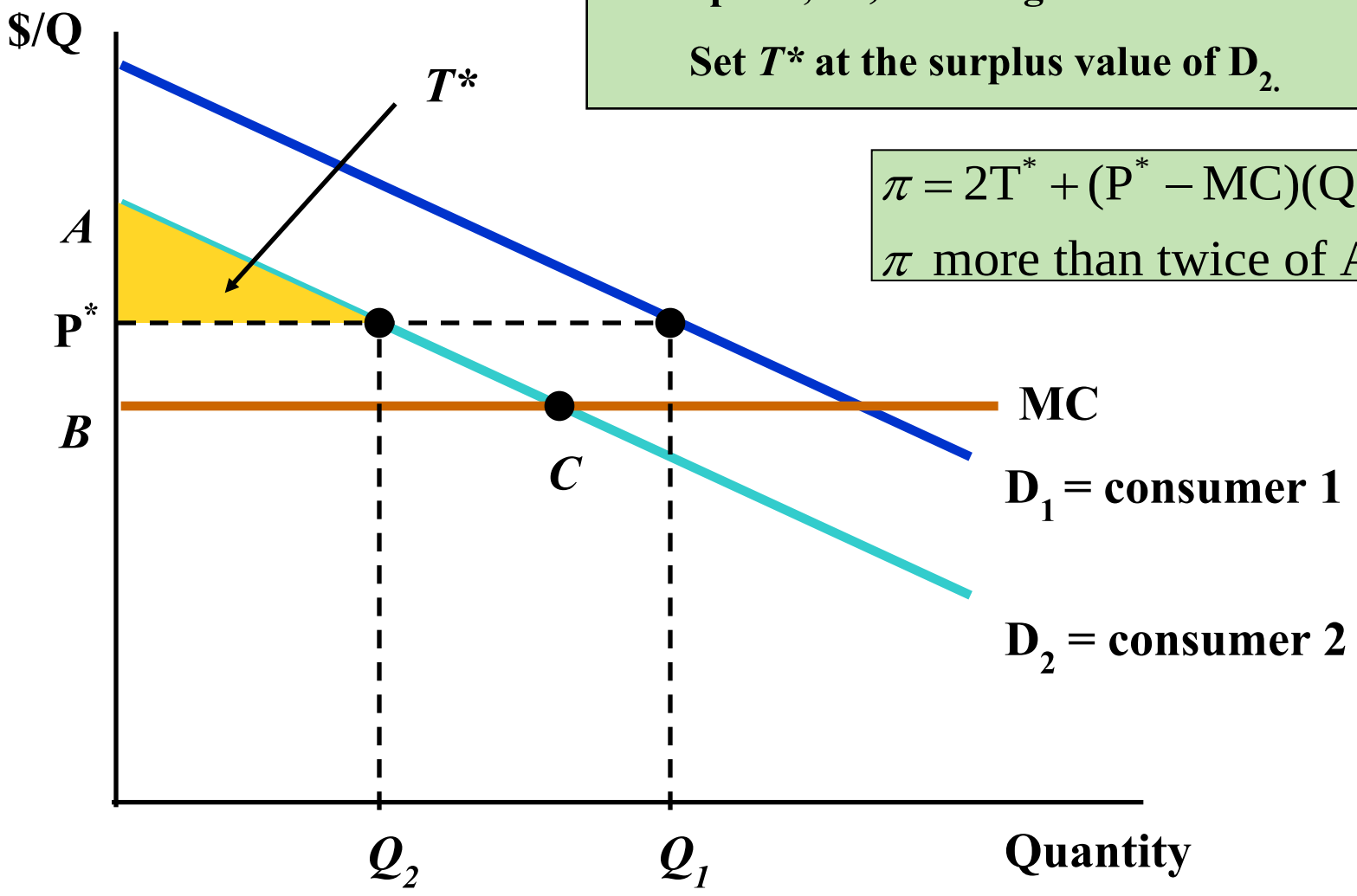
Two-Part Tariff with Two Consumers

The price, P^*, will be greater than MC.

Set T^* at the surplus value of D_2.

$$\pi = 2T^* + (P^* - MC)(Q_1 + Q_2)$$

π more than twice of ABC



The Two-Part Tariff

- Rule of Thumb
  - Similar demand: Choose P close to MC and high T
  - Dissimilar demand: Choose high P and low T.
  - Ex: Disneyland in California and Disney world in Florida have a strategy of high entry fee and charge nothing for ride.

Example: Cellular Rate Plans

- Market power exists because consumers face switching costs
  - When sign up with a firm, must sign a contract with high costs to break
  - Telephone numbers may not be portable
  - Network externalities
- Plans often exists of monthly cost plus free for extra minutes
- Companies can combine third-degree price discrimination with two-part tariff

Bundling

- Bundling is packaging two or more products to gain a pricing advantage.
- Conditions necessary for bundling
  - Heterogeneous customers
  - Price discrimination is not possible
  - Demands must be negatively correlated

Bundling

	Movie 1	Movie 2	Combine
Theater *A*	**$12,000**	**$3,000**	**$15,000**
Theater *B*	**$10,000**	**$4,000**	**$14,000**

- Renting the movies separately would result in each theater paying the lowest reservation price for each movie:
  - Maximum price Movie 1 = $10,000
  - Maximum price Movie 2 = $3,000
- Total Revenue = $26,000

Bundling

- If the movies are bundled:
  - Theater A will pay $15,000 for both
  - Theater B will pay $14,000 for both
- If each were charged the lower of the two prices, total revenue will be $28,000.
- The movie company will gain more revenue ($2000) by bundling the movie

Relative Valuations

- More profitable to bundle because relative valuation of two films are reversed
- Demands are negatively correlated
  - A pays more for Movie 1 ($12,000) than B ($10,000).
  - B pays more for Movie 2 ($4,000) than A ($3,000).

Relative Valuations

- If the demands were positively correlated (Theater A would pay more for both films as shown) bundling would not result in an increase in revenue.

	Movie 1	Movie 2	Combine
Theater *A*	**$12,000**	**$4,000**	**$16,000**
Theater *B*	**$10,000**	**$3,000**	**$13,000**

Bundling

- If the movies are bundled:
  - Theater A will pay $16,000 for both
  - Theater B will pay $13,000 for both
- If each were charged the lower of the two prices, total revenue will be $26,000, the same as by selling the films separately since (10,000)x2 + (3,000)x2 = 26,000.

Mixed Bundling

- Practice of selling two or more goods both as a package and individually.
- This differs from pure bundling when sell products only as a package.
- Mixed bundling is good strategy when
  - Demands are somewhat negatively correlated
  - Marginal production costs are significant

Mixed Versus Pure Bundling

	Movie 1 (AC = 20)	Movie 2 (AC = 30)
A	10	90
B	50	50
C	60	40
D	90	10

If $P_1 = 10$, $\pi = (10-20)4 = -40$

If $P_1 = 50$, $\pi = (50-20)3 = 90$

If $P_1 = 60$, $\pi = (60-20)2 = 80$

If $P_1 = 90$, $\pi = (90-20)1 = 70$

$P_1 = 50$ gives the highest π

If $P_2 = 40$, $\pi = (40-30)3 = 30$

If $P_2 = 50$, $\pi = (50-30)2 = 40$

If $P_2 = 90$, $\pi = (90-30)1 = 60$

$P_2 = 90$ gives the highest π

Mixed Bundling – Example

- Demands are perfectly negatively correlated but significant marginal costs
- Four customers under three different strategies
  - Selling good separately, P1 = \$50, P2 = \$90, profit = 150
  - Selling goods only as a bundle, P_B = \$100, profit = (100-50)4 = \$200
  - Mixed bundling:
    - Sold individually with $P_1 = P_2$ = \$89.95
    - Sold as a bundle with P_B = \$100
    - Profit =(89.95-20)+(89.95-30)+(100-50)2 = 129.9+100 = 229.9

Bundling in Practice

- Car purchasing
  - Bundles of options such as electric locks with air conditioning
- Vacation Travel
  - Bundling hotel with air fare
- Cable television
  - Premium channels bundled together

Tying or Tie-in-sales

- Practice of using monopoly power on one good (Tying product) to force customers to purchase another (Tied product).
  - Xerox machines and the paper
  - IBM mainframe and computer cards
- Allows the seller to meter the customer's demand and discriminate against the heavy user.
- Extract surplus by selling expensive tied products

Tying

- McDonald's
  - requires franchisees to buy material
  - Allows them to protect their brand name.
- Microsoft
  - tying Internet Explorer with Windows
  - to extend market power

Advertising

- It is one of the non-price competition strategies.
- Successful advertising will increase demand and may lower the price elasticity.
- Advertising increase the fixed cost.
- It may have a short term effect, but less effective in the long run.

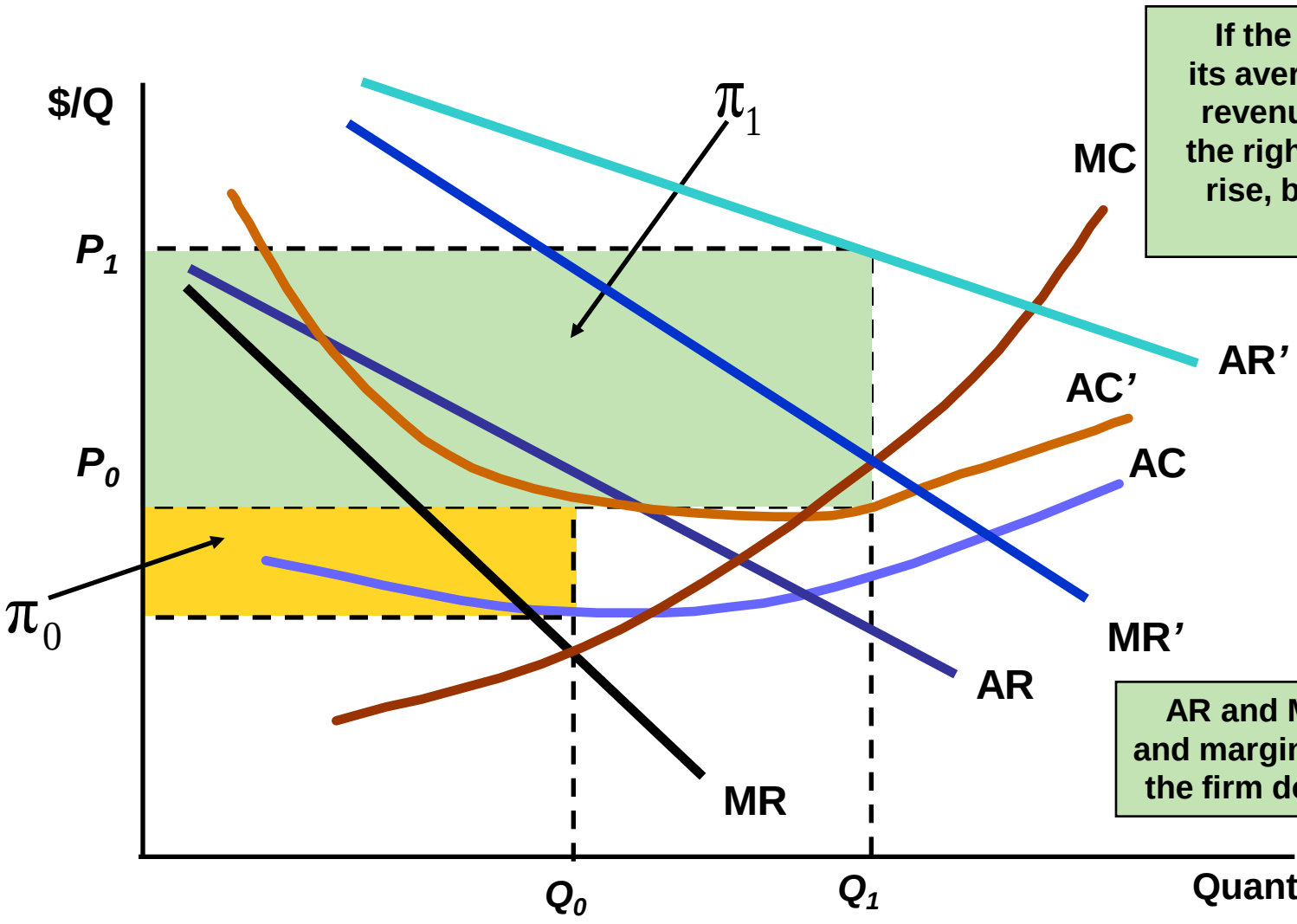
Advertising

- Assumptions
  - Firm sets only one price for product
  - Firm knows quantity demanded depends on price and advertising expenditure dollars, A

$$Q(P,A)$$

  - We can show the firm's cost curves, revenue curves, and profits under advertising and no advertising

Effects of Advertising



If the firm advertises, its average and marginal revenue curves shift to the right -- average costs rise, but marginal cost does not.

AR and MR are average and marginal revenue when the firm doesn't advertise.

Advertising

- Choosing Price and Advertising Expenditure

$$\pi = PQ(P,A) - C(Q) - A$$

$$\frac{\Delta\pi}{\Delta A} = P\frac{\Delta Q}{\Delta A} - MC\frac{\Delta Q}{\Delta A} - 1 = 0$$

$$[P - MC]\frac{\Delta Q}{\Delta A} = 1$$

Full marginal cost of Ad.

Advertising

- A Rule of Thumb for Advertising

$$(P - MC)\frac{\Delta Q}{\Delta A} = 1$$

$$\frac{P - MC}{P}\left[\frac{A}{Q}\frac{\Delta Q}{\Delta A}\right] = \frac{A}{PQ}$$

Ad. to sales ratio

Advertising

- A Rule of Thumb for Advertising

$$\frac{A}{Q}\frac{\Delta Q}{\Delta A} = E_A = \text{Adv. elasticity of demand}$$

$$\frac{(P - MC)}{P} = -\frac{1}{E_P}$$

$$\frac{A}{PQ} = -\frac{E_A}{E_P} = \text{Rule of Thumb}$$

advertising-to-sales ratio should be equal to minus the ratio of the advertising and price elasticities of demand.

Advertising

- An Example
  - TR(Q) = $1 million/yr
  - $10,000 budget for A (advertising--1% of revenues)
  - E_A = .2 (increase budget $20,000, sales increase by 20%
  - E_P = -4 (markup price over MC is substantial)
- The firm in our example should increase advertising
  - A/PQ = -(.2/-4) = 5%
  - Increase budget to $50,000

Advertising – In Practice

- Estimate the level of advertising for each of the firms
  - Supermarkets
    - E_P = -10; E_A = 0.1 to 0.3
  - Convenience stores
    - E_P = -5; E_A very small
  - Designer jeans
    - E_P = -3 to –4; E_A = 0.3 to 1
  - Laundry detergents
    - E_P = -3 to –4; E_A very large