



EC1101E:

Introduction to Economic Analysis

Lecture 6

Market Power

- Monopoly
- Monopolistic Competition
- Oligopoly

Monopoly

Monopoly

- A **monopoly** is a market in which only one firm sells a product with *no close substitutes*.
- A **monopoly** also refers to the single firm that sells in that market.
- A monopoly has **market power** — the ability to influence the market price of the product it sells.
A competitive firm has no market power.

Bargaining Strength Comes through Scarcity

Why Monopolies Arise

- The main cause of monopolies is **barriers to entry** – other firms cannot enter the market.
- Three sources of barriers to entry:
 - A single firm owns a key resource.
E.g., DeBeers owns most of the world's diamond mines.
 - The government gives a single firm the exclusive right to produce the good.
E.g., patents, copyright laws.
 - A **natural monopoly** occurs when a single firm can produce the entire market Q at lower cost than several firms.
E.g., electricity, gas, telecommunications.

Monopoly:

The Monopolist's Revenue

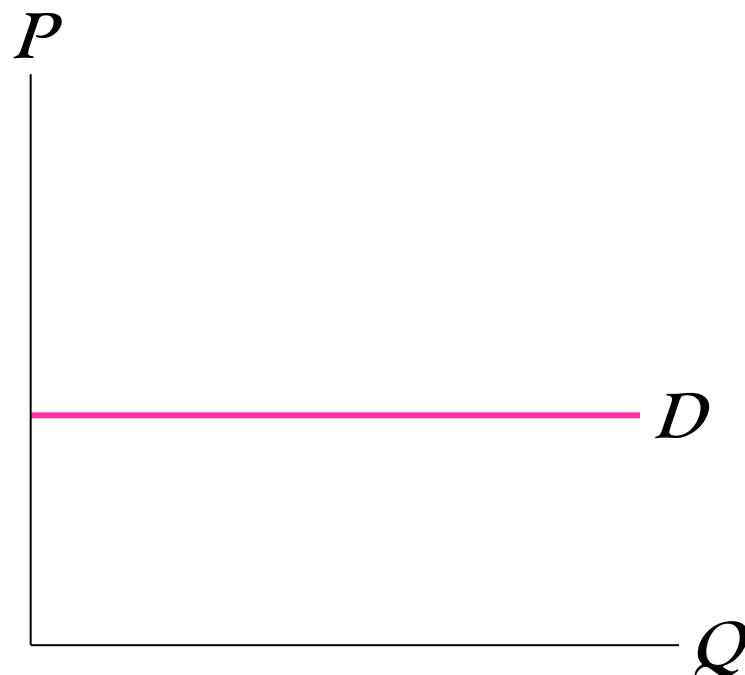
Monopoly vs. Competition: Demand Curves

In a competitive market,
the market demand curve
slopes *downward*.

But the demand curve
for any individual firm's product
is *horizontal* at the market price.

The firm can $\uparrow Q$
without $\downarrow P$,
so $MR = P$ for the competitive
firm.

A competitive firm's
demand curve

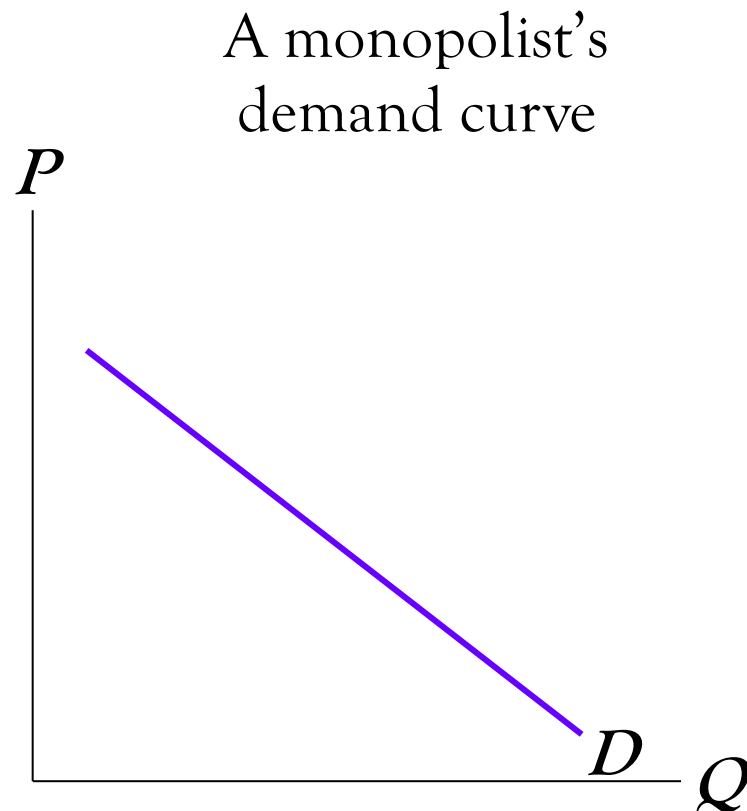


Monopoly vs. Competition: Demand Curves

A monopolist is the only seller, so it faces the market demand curve.

To $\uparrow Q$, the monopolist must $\downarrow P$.

Thus $MR \neq P$.



ACTIVE LEARNING 6.1

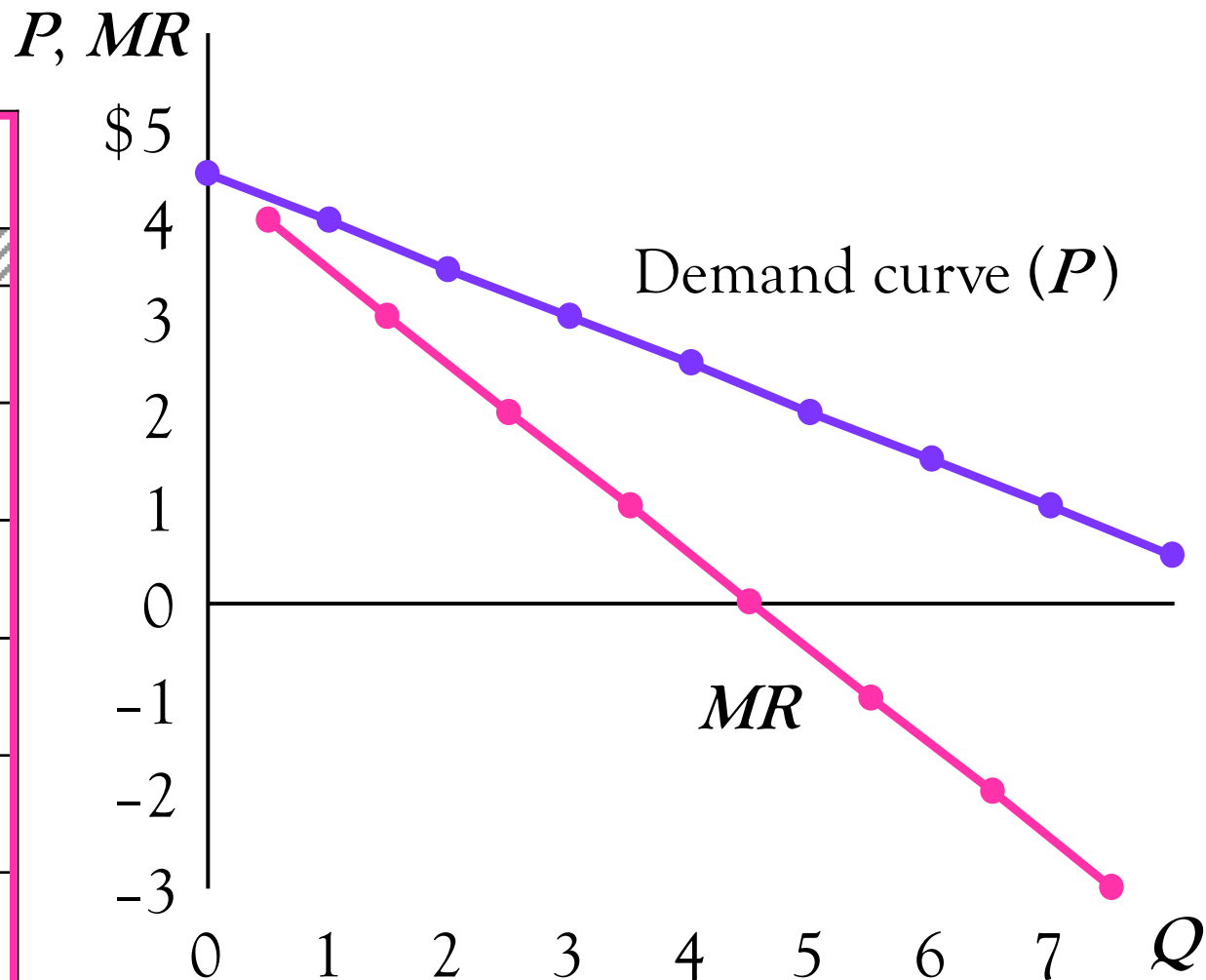
A Monopoly's Revenue

Barstucks is the only seller of cappuccino in town. The table shows the market demand for cappuccino. Fill in the blank spaces in the table. What is the relationship between P and MR ?

Q	P	TR	MR
0	\$4.50		–
1	\$4.00		
2	\$3.50		
3	\$3.00		
4	\$2.50		
5	\$2.00		
6	\$1.50		

Barstucks' D & MR Curves

Q	P	MR
0	\$4.50	
1	4.00	\$4
2	3.50	3
3	3.00	2
4	2.50	1
5	2.00	0
6	1.50	-1



Understanding the Monopolist's MR

- $\uparrow Q$ has two effects on revenue:
 - **Output effect:** $Q \uparrow \Rightarrow \text{Revenue} \uparrow$
 - **Price effect:** $P \downarrow \Rightarrow \text{Revenue} \downarrow$
- To sell more units,
the monopolist must \downarrow the price on *all* the units it sells.
- Hence $MR < P$.
- MR could even be *negative*
if the price effect dominates the output effect
(e.g., when Barstucks increases Q from 5 to 6).

Monopoly: Profit Maximization

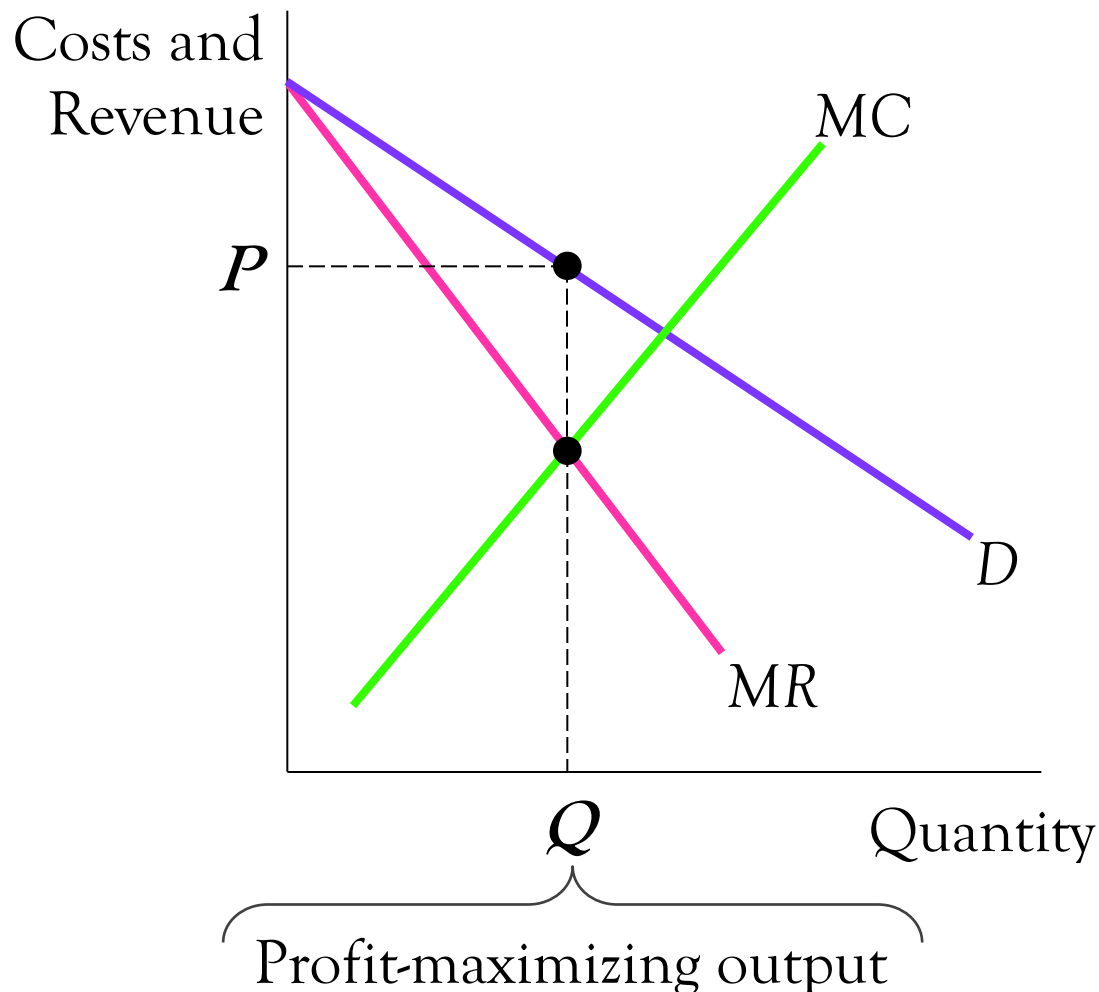
Profit Maximization

- Like a competitive firm, a monopolist maximizes profit by producing the quantity where $MR = MC$.
- Once the monopolist identifies this quantity, it sets the *highest* price consumers are willing to pay for that quantity.
- The monopolist determines this price from the **demand** curve.

Profit Maximization

The profit-maximizing Q is where $MR = MC$.

Find P from the demand curve at this Q .



ACTIVE LEARNING 6.2

A Monopoly's Equilibrium P and Q

A monopoly's demand curve is given by $P = 20 - 4Q$.

Marginal revenue is $MR = 20 - 8Q$.

Marginal cost is $MC = Q^2$.

A. How many units should the monopolist produce?

B. What price should the monopolist charge?

ACTIVE LEARNING 6.2

A Monopoly's Equilibrium P and Q

Monopoly: Welfare Economics

The Welfare Cost of Monopoly

- In a competitive market equilibrium,
 $P = MR = MC$ and total surplus is maximized.
- In the monopoly equilibrium,
 $P > MR = MC$.
- The value to buyers of an additional unit (P) exceeds the cost of the resources needed to produce that unit (MC).
- The monopoly Q is too *low*; total surplus could be increased by increasing Q .
- Thus monopoly results in a **deadweight loss**.

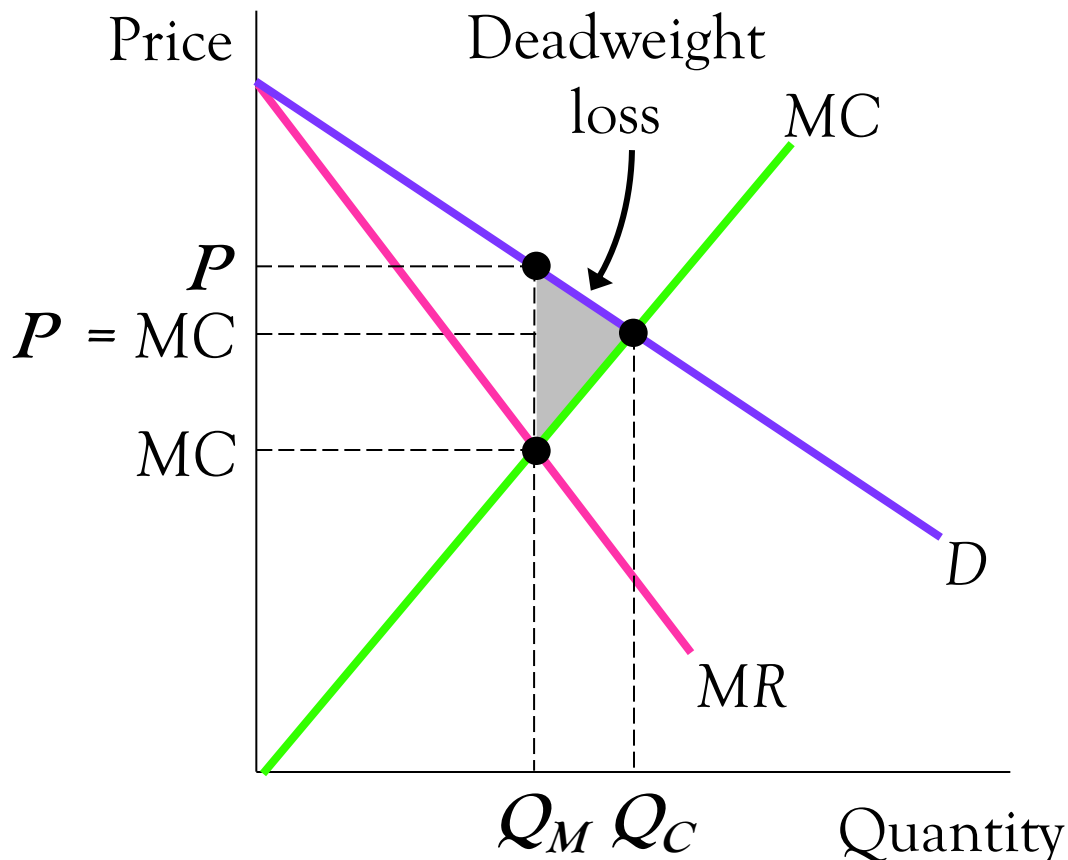
The Welfare Cost of Monopoly

Competitive equilibrium:

- quantity = Q_C
- $P = MC$
- total surplus is maximized

Monopoly equilibrium:

- quantity = Q_M
- $P > MC$
- deadweight loss



Monopoly: Price Discrimination

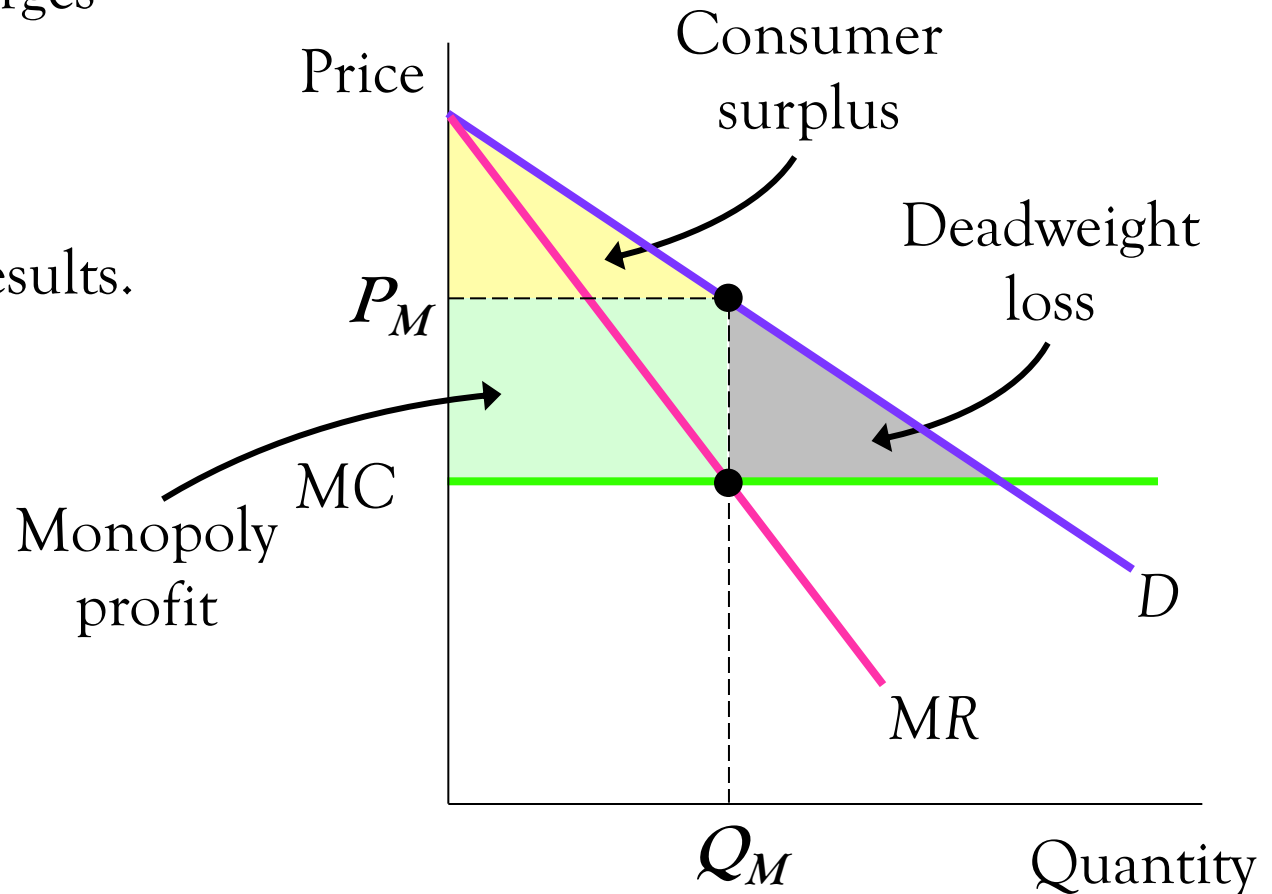
Price Discrimination

- Discrimination: treating people differently based on some characteristic, e.g., race, gender.
- **Price discrimination:** selling the same good at different prices to different buyers.
- The characteristic used in price discrimination is *willingness to pay (WTP)*.
 - A firm can increase profit by charging a *higher* price to buyers with higher *WTP*.

Single-Price Monopoly

The monopolist charges the same price (P_M) to all buyers.

A deadweight loss results.



Perfect Price Discrimination

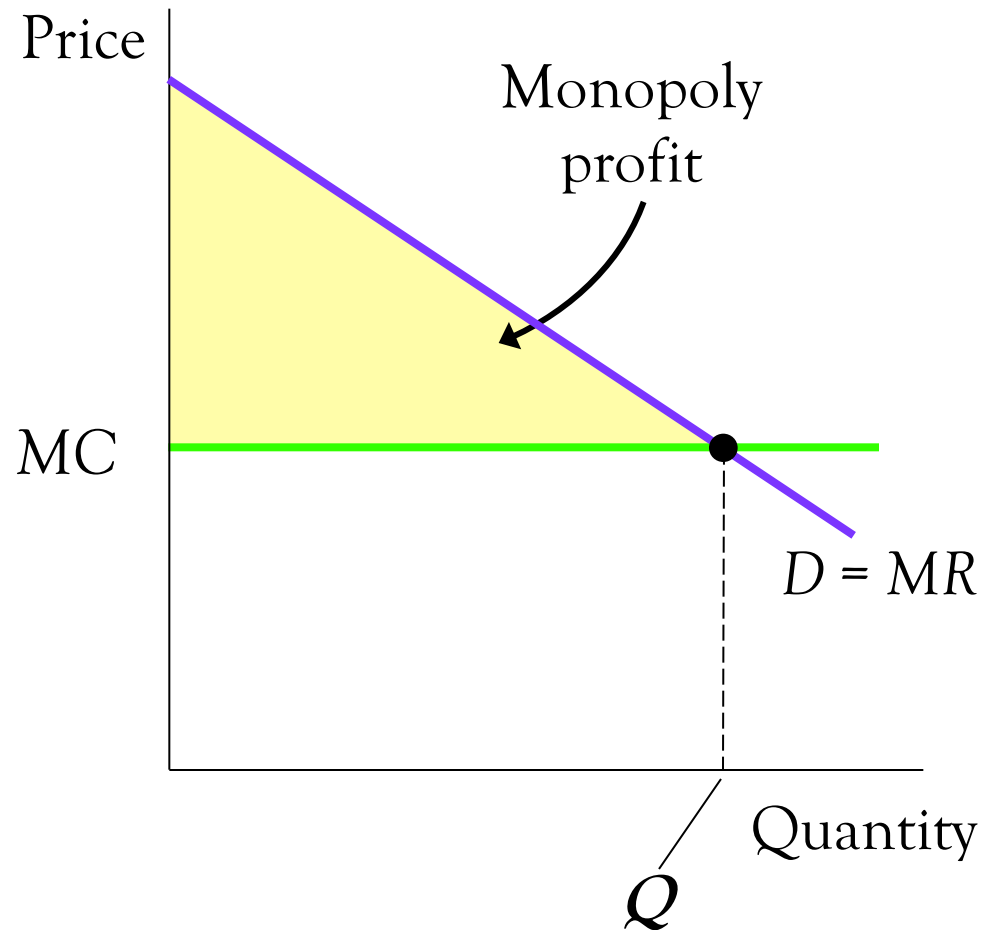
The monopolist produces the competitive quantity, but charges each buyer his *WTP*.

$CS = WTP - \text{Price}$,
and $\text{Price} = WTP$.

Therefore $CS = 0$.

Monopoly Profit
= Price - Cost.

There is *no deadweight loss*.



Price Discrimination in the Real World

- In the real world, **perfect price discrimination** is not possible.
 - No firm knows every buyer's *WTP*.
 - Buyers do not announce their *WTP* to sellers.
- So, firms divide customers into groups based on some observable trait (e.g., age) that is likely related to *WTP*.

A Single Price?

- In Harford (TUE) Chapter 2: *What Supermarkets Don't Want You to Know*.
- Firms charge different prices for essentially the same product:
 - “Unique target” (first-degree price discrimination)
 - “Group target” (third-degree price discrimination)
 - “Self-incrimination”

The Prevalence of Monopoly

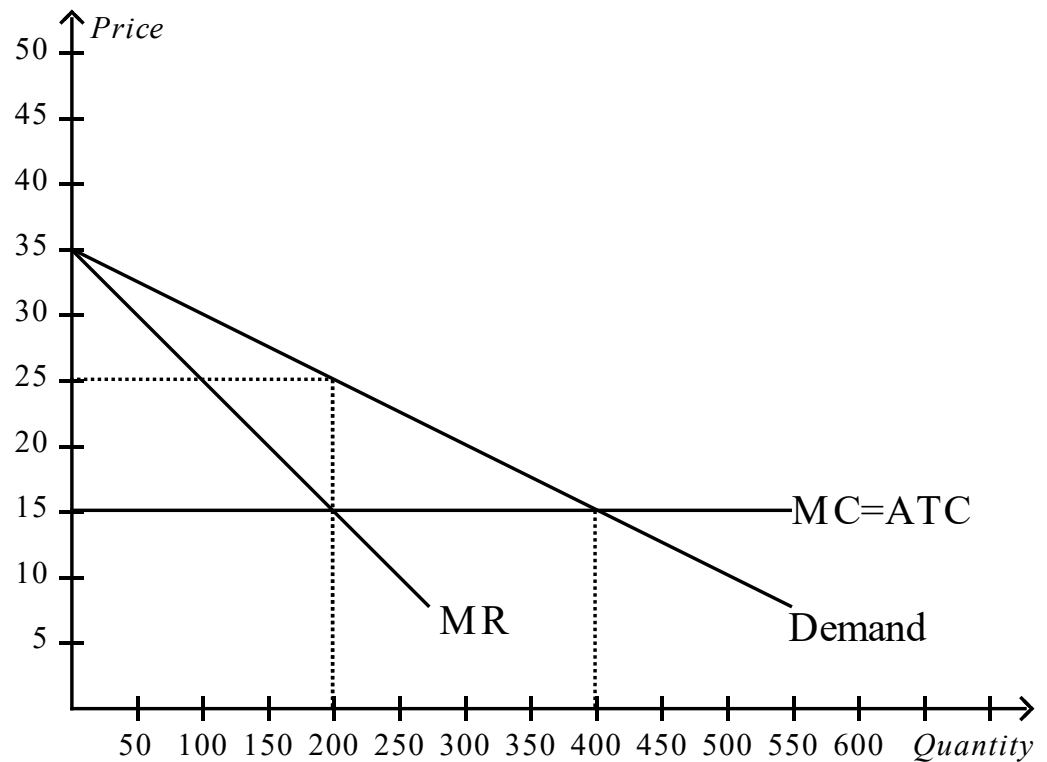
- In the real world, *pure* monopoly is rare.
- Yet, many firms have **market power** due to:
 - selling a unique variety of a product
 - having a large market share and few significant competitors
- In many such cases, the consequences apply:
 - *mark-up* of price over marginal cost
 - *deadweight loss*

ACTIVE LEARNING 6.3

All About Monopolies

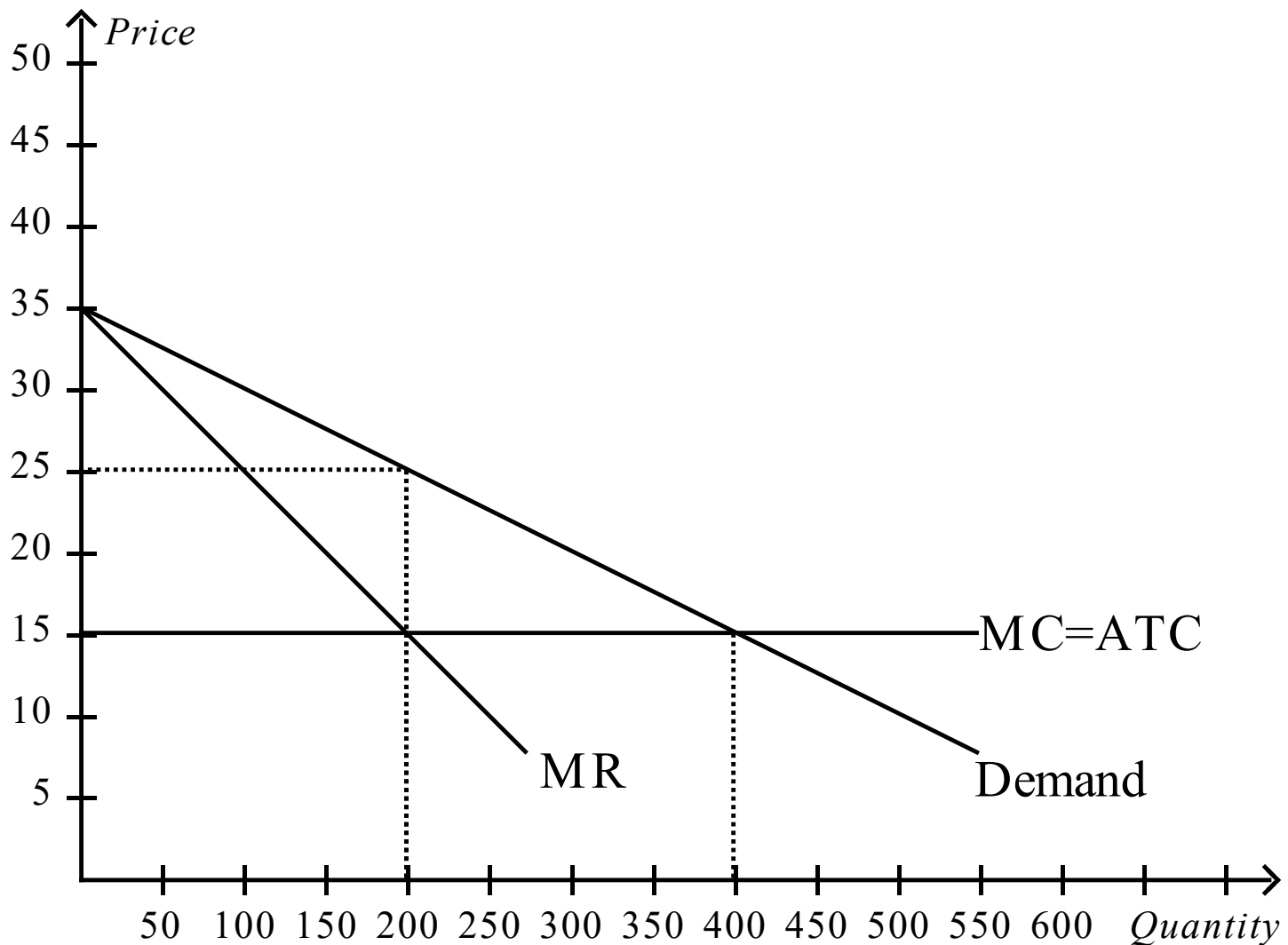
Indicate the equilibrium P and Q , as well as consumer surplus (CS), producer surplus (PS), monopoly profit, and deadweight loss (DWL) for each of the following:

- A. Perfect competition
- B. Monopoly *without* price discrimination
- C. Monopoly *with* perfect price discrimination.



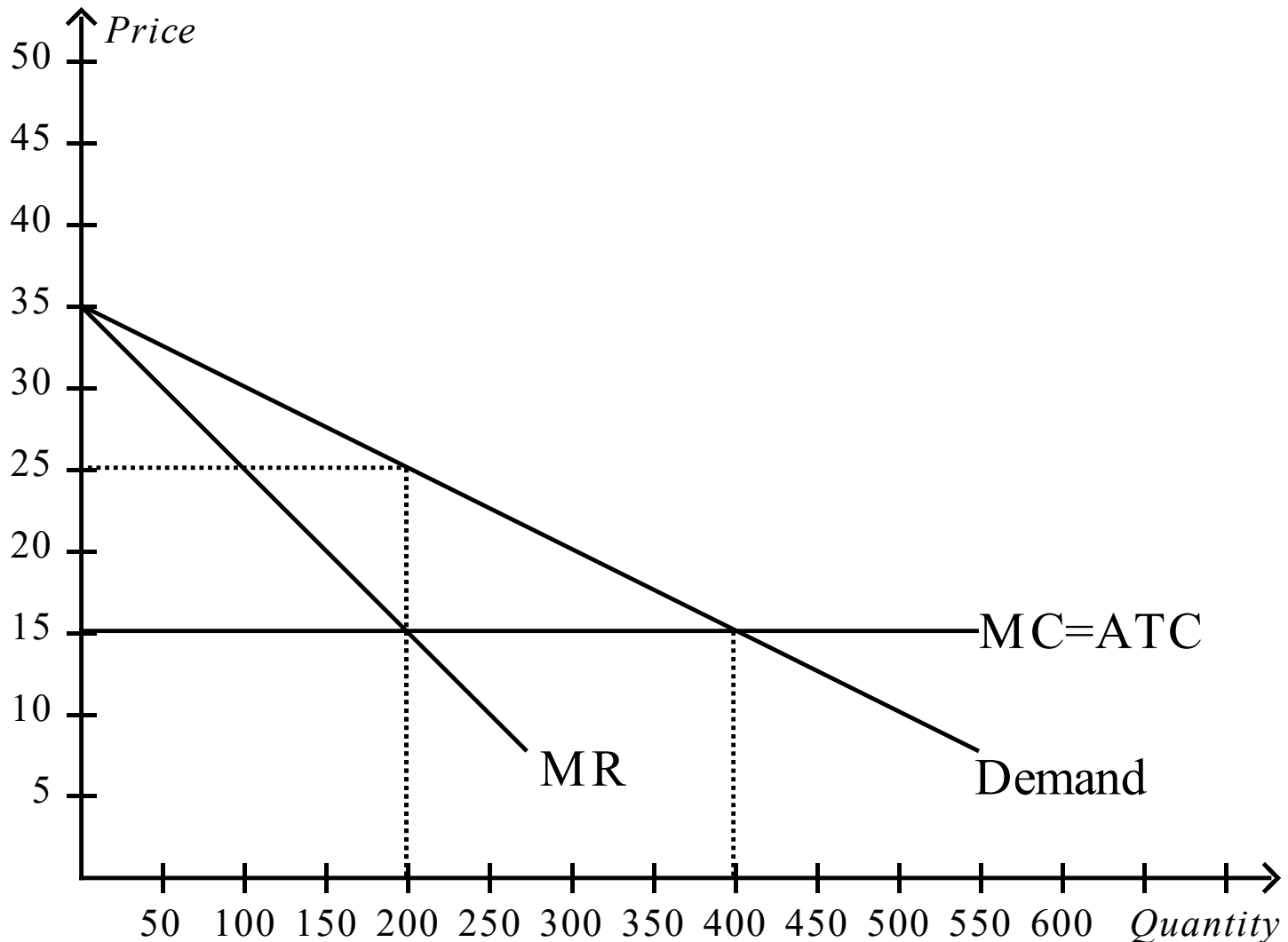
ACTIVE LEARNING 6.3

A. Perfect Competition



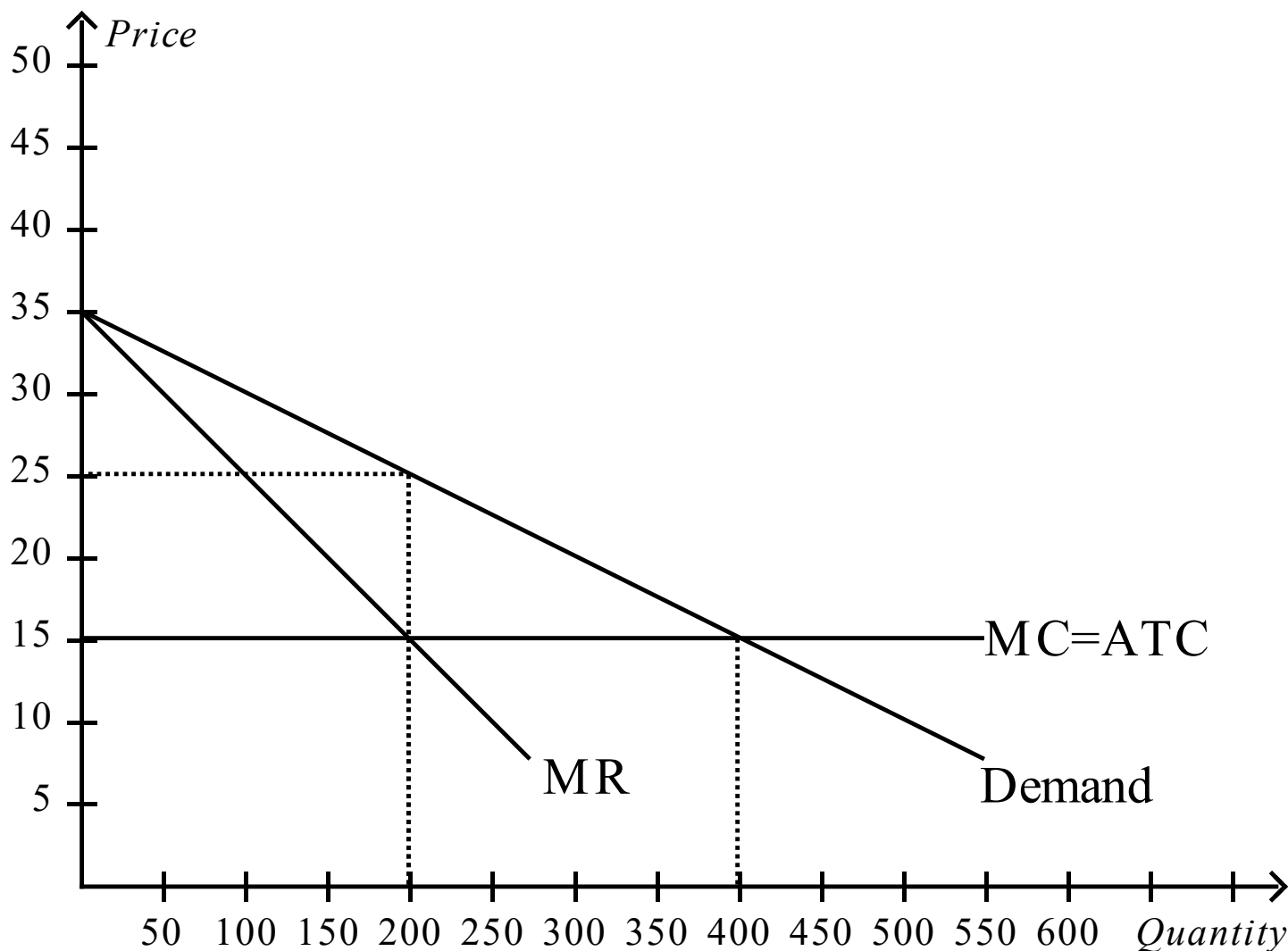
ACTIVE LEARNING 6.3

B. Monopoly Without Price Discrimination



ACTIVE LEARNING 6.3

C. Monopoly With Perfect Price Discrimination



ACTIVE LEARNING 6.4

Market Structure

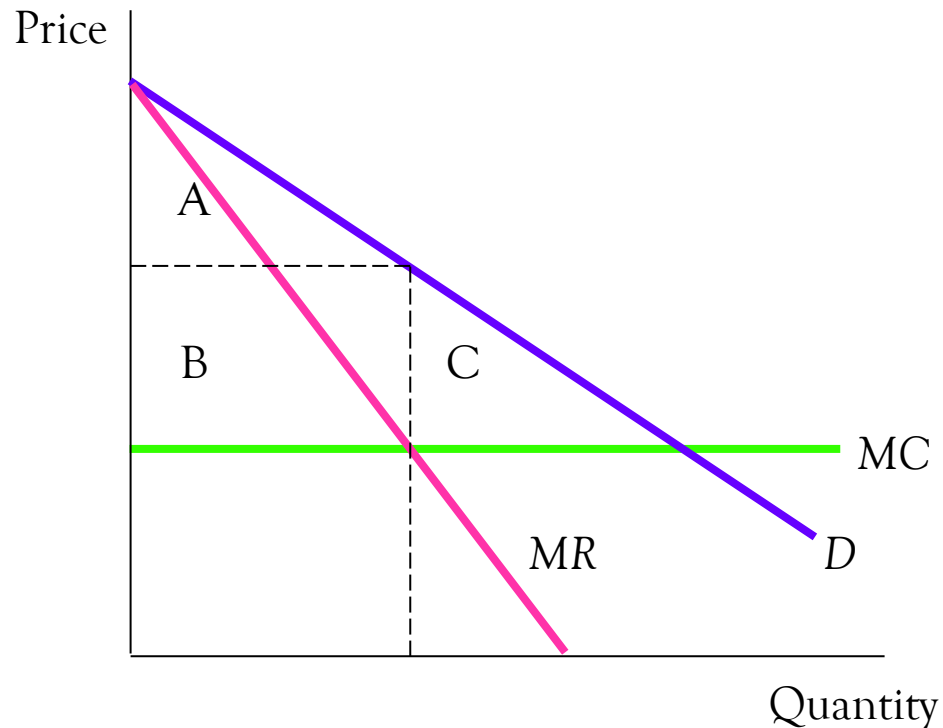
Suppose Colin Firth is a competitive firm producing colins, and Meryl Streep is a non-price discriminating monopolist producing meryls. Which of the following is true?

- I. If Colin Firth sells one more colin, his revenue will increase by some amount that is less than the price.
 - II. If Meryl Streep sells one more meryl, her revenue will increase by some amount that is less than the price.
 - III. For Colin Firth, average revenue always equals price.
 - IV. For Meryl Streep, average revenue always equals price.
- A. I and III.
 - B. I and IV.
 - C. II and III.
 - D. II and IV.
 - E. II, III, and IV.
 - F. I, II, III, and IV.

Test Yourself

- Because a monopoly is the sole producer in its market, it faces a _____-sloping demand curve, and MR ____ P .
- A monopoly produces where MR ____ MC , and prices according to the _____.
- Relative to perfect competition, the monopoly Q is _____ and the monopoly P is _____ (P ____ MC).
- Thus, monopoly results in a _____.

Test Yourself



	Perfect Competition	Monopoly (Single Price)	Monopoly (Perfect Price Discrimination)
Consumer surplus			
Producer surplus			
Deadweight loss			

Between Monopoly & Perfect Competition

Two extremes

- **Monopoly:** One firm.
- **Perfect competition:** Many firms, *identical* products.

In between these extremes: imperfect competition

- **Oligopoly:** A few firms, *identical/similar* products.
- **Monopolistic competition:** Many firms, *differentiated* products.

Monopolistic Competition

Monopolistic Competition

- In a **monopolistically competitive market**:
 - There are *many* buyers and sellers.
 - Sellers offer *differentiated* products.
 - Sellers can *freely* enter or exit the market.
 - *Examples*: laptops, jeans, shampoo, restaurant meals, movies, chocolate

Perfect Competition vs. Monopolistic Competition

	Perfect Competition	Monopolistic Competition
number of sellers	many	many
free entry/exit	yes	yes
LR economic profit	zero	zero
products firms sell	identical	differentiated
D curve facing firm	horizontal	downward-sloping
firm has market power?	none; price-taker	yes

Monopoly vs. Monopolistic Competition

	Monopoly	Monopolistic competition
number of sellers	one	many
free entry/exit	no	yes
LR economic profit	positive	zero
close substitutes	none	many
D curve facing firm	downward-sloping (market demand)	downward-sloping
firm has market power	yes	yes

Monopolistic Competition and Monopoly

- **Short run:** Under monopolistic competition, firm behavior is very similar to *monopoly*.
- **Long run:** In monopolistic competition, entry and exit drive economic profit to *zero*.
 - Suppose firms are making profits in the short run. New firms *enter* the market, taking some demand away from existing firms, prices and profits ↓.
 - Suppose firms are making losses in the short run. Some firms *exit* the market, remaining firms enjoy ↑ demand and prices.

Monopolistic Competition and Welfare

- The number of firms in the market may not be optimal due to external effects from the entry of new firms.
 - **The product-variety externality:**
the surplus that consumers get from the introduction of new products.
 - **The business-stealing externality:**
the losses incurred by existing firms when new firms enter the market.
- The inefficiencies of monopolistic competition are subtle and hard to measure. There is no easy way for policymakers to improve the market outcome.

The Prevalence of Monopolistic Competition

- Differentiated products are everywhere; examples of monopolistic competition abound.
- The theory of monopolistic competition describes many markets in the economy, yet offers little guidance to policymakers looking to improve the market's allocation of resources.

Test Yourself

- A monopolistically competitive firm has _____ market power, and faces a _____-sloping demand curve. Therefore MR ____ P .
- A monopolistically competitive firm produces where MR ____ MC , and prices according to the _____.
- In the long run, firms earn _____ profit due to free entry and exit.

Test Yourself

- Relative to perfect competition,
the monopolistically competitive Q is _____ and
the monopolistically competitive P is _____
(P ____ MC).
- Relative to a monopoly,
the monopolistically competitive Q is _____ and
the monopolistically competitive P is _____.

Oligopoly

Measuring Market Concentration

- **N-Firm Concentration Ratio:**

the percentage of the market's total output supplied by the N largest firms.

- E.g., four-firm concentration ratio, five-firm concentration ratio, eight-firm concentration ratio.

- The *higher* the concentration ratio,
the *less* competition there is.

Oligopoly

- An **oligopoly** is a market structure in which only *a few* sellers offer similar or identical products.
- A firm's decisions about P or Q can affect other firms and cause them to react.
 - The firm will consider these reactions when making decisions.
- **Game theory:** the study of how people behave in strategic situations.

EXAMPLE: Cellphone Duopoly in Lion City

P	Q
\$0	140
5	130
10	120
15	110
20	100
25	90
30	80
35	70
40	60
45	50

- Lion City has 140 residents.
- The “good”:
cellphone service with 200 minutes and
20GB data per month
- Two firms: SingTel and StarHub
- Each firm’s costs: $MC = \$10$

EXAMPLE: Cellphone Duopoly in Lion City

P	Q	Revenue	Cost	Profit
\$0	140	\$0	\$1,400	-1,400
5	130	650	1,300	-650
10	120	1,200	1,200	0
15	110	1,650	1,100	550
20	100	2,000	1,000	1,000
25	90	2,250	900	1,350
30	80	2,400	800	1,600
35	70	2,450	700	1,750
40	60	2,400	600	1,800
45	50	2,250	500	1,750

Competitive
outcome:

$P =$

$Q =$

Profit =

Monopoly
outcome:

$P =$

$Q =$

Profit =

EXAMPLE: Cellphone Duopoly in Lion City

P	Q	Revenue	Cost	Profit
\$0	140	\$0	\$1,400	-1,400
5	130	650	1,300	-650
10	120	1,200	1,200	0
15	110	1,650	1,100	550
20	100	2,000	1,000	1,000
25	90	2,250	900	1,350
30	80	2,400	800	1,600
35	70	2,450	700	1,750
40	60	2,400	600	1,800
45	50	2,250	500	1,750

Competitive
outcome:

$$P = MC = \$10$$

$$Q = 120$$

$$\text{Profit} = \$0$$

Monopoly
outcome:

$$P = \$40$$

$$Q = 60$$

$$\text{Profit} = \$1,800$$

EXAMPLE: Cellphone Duopoly in Lion City

- One possible duopoly outcome: *collusion*.
- **Collusion:** an agreement among firms in a market about quantities to produce or prices to charge.
- SingTel and StarHub could agree to each produce half of the monopoly output:
 - For each firm: $Q_i = 30$, $P = \$40$, profit = \$900
- **Cartel:** a group of firms acting in unison.

ACTIVE LEARNING 6.5

Collusion vs. Self-Interest

P	Q
\$0	140
5	130
10	120
15	110
20	100
25	90
30	80
35	70
40	60
45	50

Each firm's cost: \$10 per unit.

Duopoly outcome with collusion:

Each firm agrees to produce $Q_i = 30$,
earns profit = \$900.

- A.** If SingTel cheats and produces $Q_i = 40$, what happens to the market price? SingTel's profits? Is it in SingTel's interest to cheat? (*Assume StarHub does not cheat.*)
- B.** If both firms cheat and each produces $Q_i = 40$, determine each firm's profits.

ACTIVE LEARNING *6.5*

Collusion vs. Self-Interest

Collusion vs. Self-Interest

- Both firms would be better off if they both *stick to the cartel agreement*.
- But each firm has an incentive to *cheat*.
- It is difficult for oligopoly firms to form cartels and honor their agreements.

Nash Equilibrium

- **Nash equilibrium:** a situation in which players interacting with one another each chooses his *best* strategy given the strategies that all the others have chosen.
- Our duopoly example has a Nash equilibrium in which each firm produces $Q_i = 40$.
 - Given that SingTel produces $Q_i = 40$,
StarHub's best move is to produce $Q_i = 40$.
 - Given that StarHub produces $Q_i = 40$,
SingTel's best move is to produce $Q_i = 40$.

A Comparison of Market Outcomes

	Perfect Competition	Oligopoly	Cartel	Monopoly
<i>Price</i>				
<i>Total Q</i>				
<i>Total Profit</i>				

Oligopoly: Game Theory

Game Theory

- Game theory helps us understand oligopoly and other situations where players interact and behave strategically.
- **Dominant strategy:** a strategy that is *best* for a player in a game regardless of the strategies chosen by the other players.
- **Prisoners' dilemma:** a game between two captured criminals that illustrates why cooperation is *difficult* even when it is mutually beneficial.

Prisoners' Dilemma

Each player's dominant strategy: *confess*

Nash equilibrium: *both confess*

		Yoshi	
		→ Stay silent	→ Confess
Xavier	→ Stay silent	<div>Yoshi gets 1 month</div> <div>Xavier gets 1 month</div>	<div>Yoshi gets 0 years</div> <div>Xavier gets 10 years</div>
	→ Confess	<div>Yoshi gets 10 years</div> <div>Xavier gets 0 years</div>	<div>Yoshi gets 8 years</div> <div>Xavier gets 8 years</div>

Prisoners' Dilemma

- Economists use the phrase “prisoners’ dilemma” to refer to any situation with a similar incentive structure.

		Player 2	
		A	B
Player 1	A	Good, Good	Worst, Best
	B	Best, Worst	Bad, Bad

- In a prisoners’ dilemma, both players have *dominant* strategies that result in *inefficient* outcomes.

ACTIVE LEARNING 6.6

SingTel vs. StarHub

The players: SingTel and StarHub.

The choice: produce $Q = 30$ or $Q = 40$.

- If both firms produce $Q = 30 \Rightarrow$ each firm's profit = \$900.
- If both firms produce $Q = 40 \Rightarrow$ each firm's profit = \$800.
- If one firm produces $Q = 30 \Rightarrow$ its profit = \$750;
the other firm produces $Q = 40 \Rightarrow$ its profit = \$1,000.

Draw the payoff matrix, and find the Nash equilibrium.

ACTIVE LEARNING *6.6*

SingTel vs. StarHub

ACTIVE LEARNING 6.7

Fare Wars

The players: AirAsia and Scoot.

The choice: cut fares by 50% or leave fares alone.

- If both airlines cut fares,
each airline's profit = \$400 million
- If neither airline cuts fares,
each airline's profit = \$600 million
- If only one airline cuts its fares,
its profit = \$800 million,
the other airline's profits = \$200 million

Draw the payoff matrix, and find the Nash equilibrium.

ACTIVE LEARNING *6.7*

Fare Wars

Examples of the Prisoners' Dilemma

- Ad wars
 - Two firms spend millions on TV ads to steal business from each other.
Each firm's ad cancels out the effects of the other, and both firms' profits fall by the cost of the ads.
- Organization of Petroleum Exporting Countries
 - Member countries try to act like a cartel, and agree to limit oil production to boost prices and profits.
But agreements sometimes break down when individual countries renege.

Examples of the Prisoners' Dilemma

- Arms race between military superpowers
 - Each country would be better off if both disarm, but each has a dominant strategy of arming.
- Common resources
 - All would be better off if everyone conserved common resources, but each person's dominant strategy is overusing the resources.

Prisoners' Dilemma and Social Welfare

- The non-cooperative oligopoly equilibrium:
 - Bad for oligopoly firms:
They are prevented from achieving *monopoly* profits.
 - Good for society:
 Q is *closer to* the socially efficient output.
 P is *closer to* MC.
- In other prisoners' dilemmas, the inability to cooperate may *reduce* social welfare, e.g., arms race, overuse of common resources.

Why Players Sometimes Cooperate

- When the game is repeated many times, cooperation may be possible.
- These strategies may lead to cooperation:
 - **Grim:**
If your rival cheats in one round,
you *cheat* in all subsequent rounds.
 - **Tit-for-tat:**
Whatever your rival does in one round
(whether cheat or cooperate),
you do in the following round.

Test Yourself

- The group of oligopolists is best off forming a _____ and acting like a _____.
- When oligopolists individually choose production to maximize profits, the result is a _____ quantity and a _____ price than under the monopoly outcome.
- As the number of sellers in an oligopoly increases, an oligopoly looks more and more like a _____.

Test Yourself

- The _____ illustrates how self-interest can prevent people from maintaining cooperation, even when cooperation is mutually beneficial.
- A _____ strategy is the best strategy for a player regardless of the strategies pursued by other players.
- In a _____ equilibrium, each player has chosen a strategy, and no player can benefit by changing his strategy.