



Chapter 17

Oligopoly

Another Case of Imperfect Competition: Oligopoly

An **oligopoly**: has the following characteristics:

- Few sellers, usually big firms.
- Homogeneous or nearly identical products.
- Interdependent firms: one firm's decisions affects another firm's profits.
- Examples: big oil companies, soft drink market

- A duopoly is an oligopoly with only two members. It is the simplest type of oligopoly.
- Let's do a numerical example:
- Robin and Wills are the only two producers of clean drinking water in Thorold. Every Saturday they pump water at no cost to them and sell it to meet the following demand schedule:

The Demand Schedule for Water

Quantity (in barrels)	Price	Total Revenue (and total profit since costs = 0)
0	\$120	\$ 0
10	110	1,100
20	100	2,000
30	90	2,700
40	80	3,200
50	70	3,500
60	60	3,600
70	50	3,500
80	40	3,200
90	30	2,700
100	20	2,000
110	10	1,100
120	0	0

- The price and quantity in a monopoly market would be where total profit is maximized:
- $P = \$60$
- $Q = 60$ barrels
- $\Pi = \$3600$

Profit Maximizing Q and P

Quantity (in barrels)	Price	Total Revenue (and total profit since costs = 0)
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30	90	2,700
40	80	3,200
50	70	3,500
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70	50	3,500
80	40	3,200
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100	20	2,000
110	10	1,100
120	0	0

- If Robin and Wills were cooperative, they would agree on a monopoly outcome, split the production at 30 barrels each and each make a maximum profit of \$1800. This would be:

Collusion

An agreement among firms in a market about quantities to produce or prices to charge. They would form a:

Cartel

A group of firms acting in unison.

- However, if they did agree to split the monopoly outcome, a problem would arise.
- There would be temptation for both Robin and Wills to cheat:
 - By breaking the agreement, each would see the potential to increase their profits.

- Robin knows that Wills will produce 30 barrels.
- If Robin cheats and produces 40 barrels, there will be his 40 + Wills' 30 = 70 barrels for sale at a market price of \$50.
- Robin would make $40 \times \$50 = \2000 profit, \$200 more than if he sticks to the agreement.

- However, Wills now sees his profit dropping to $30 \times \$50 = \1500 .
- He figures that Robin has cheated and decides to cheat, too.
- Wills increases his output to 40 barrels.
- There are now 80 barrels in total for sale at a market price of \$40 per barrel.

- Now, Robin and Wills are both selling 40 barrels at \$40 each.
- Each makes a profit of \$1600.
- If Robin decided to cheat again and produce 10 more barrels, there'd be 90 barrels for sale at a market price of \$30 each.
- His profit would be $50 \times \$30 = \1500 , less than before.

- The same thing would happen to Wills if he decided to cheat.
- The end result: they decide to stop the game at producing 40 barrels each.
- Each makes a profit of \$1600.
- There is no further temptation to cheat.

- Had they been able to stick to the monopoly agreement, they would have maximized their profits at \$1800 each.
- Because there is temptation to cheat, each acts in his own best interest and ends up with \$1600 profit, a **suboptimal** outcome.
- They settle in at a sort of equilibrium.

We define:

Nash Equilibrium

Nash equilibrium:

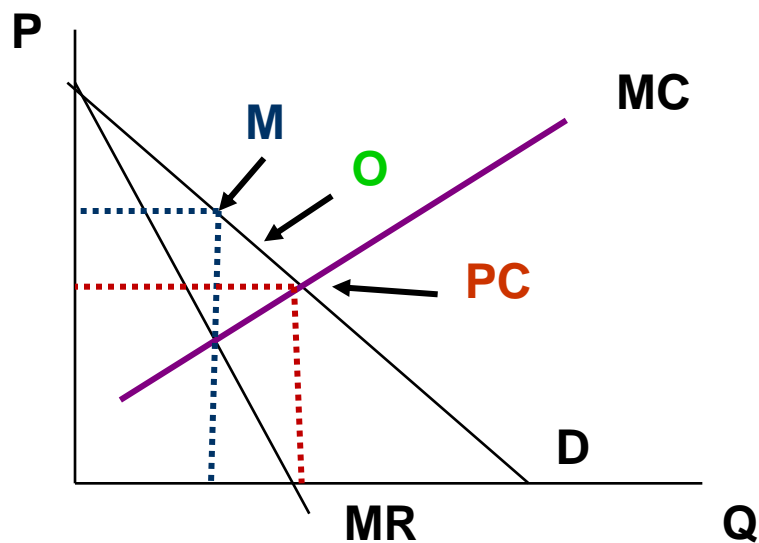
a situation in which economic actors interacting with one another each choose their best strategy given the strategies that all the others have chosen.

- always results in a suboptimal outcome

- Comparing monopoly (m), oligopoly (o) and perfect competition (c):

$$P_m > P_o > P_c$$

$$Q_c > Q_o > Q_m$$



- As the number of sellers in an oligopoly grows larger, an oligopolistic market looks more and more like a competitive market.
- The price approaches marginal cost, and the quantity produced approaches the socially efficient level.

Price and Output Effects

- Increasing output has two effects on a firm's profits:
- **output effect:**
If $P > MC$, selling more output raises profits.
- **price effect:**
Raising production increases market quantity, which reduces market price and reduces profit on all units sold.

- If output effect $>$ price effect,
the firm increases production.
- If price effect $>$ output effect,
the firm reduces production.

Game Theory

- **Game theory** is the study of how people behave in strategic situations.
- Strategic decisions are those in which each person, in deciding what actions to take, must consider how others might respond to that action.

Prisoner's Dilemma

- The **prisoners' dilemma** provides insight into the difficulty in maintaining cooperation.
- Often people (or firms) fail to cooperate with one another even when cooperation would make them better off.

- The prisoners' dilemma is a particular “game” between two captured prisoners that illustrates why cooperation is difficult to maintain even when it is mutually beneficial.

- Suppose there are 2 criminals – Brad and Angelina.
- The police have caught them on a weapons' charge - the sentence is 1 year.
- The police suspect they robbed a bank, but lack evidence – they need one or both of the criminals to confess.
- They separate the criminals and offer each of them the same deal:

“If you confess to the bank robbery and your partner says nothing, I’ll let you go free and your partner will get 20 years.

If you both confess, we won’t have to go to trial so you’ll each get 8 years in jail.

If neither of you says anything, we’ve got you on the weapons’ charge so you’ll each get 1 year in jail.”

- Brad & Angelina's choices can be illustrated in a **pay-off matrix**.
- Their pay-offs from each decision, given what the other decides to do, are the jail terms.
- In this case, the pay-offs are negatives (jail time is not good), so they will rationally want to minimize the jail term they serve.
 - If the pay-offs were positive, they'd want to maximize their pay-offs, like a firm maximizing its profit.

The Prisoner's Dilemma

		Angelina's Decision	
		Confess	Remain Silent
Brad's Decision	Confess	(8, 8)	(0, 20)
	Remain Silent	(20, 0)	(1, 1)

- Consider Brad:
- If Angelina confesses, he should confess (8 years versus 20).
- If Angelina stays silent, he should confess (0 years versus 1).
- No matter what Angelina does, Brad should confess.
- Angelina's choices are the same: she should confess no matter what Brad does.

- A **dominant strategy** is the best strategy for a player to follow regardless of the strategies chosen by the other players.
- For both criminals, their dominant strategy is the same:
They should both confess, rather than risk that the other will confess if they stay silent.

The result is a suboptimal Nash equilibrium.

- Of course, it would have been better if both kept silent and only served 1 year each in jail, but they would have had to be able to collude to do so and stick to the agreement.
- But cooperation is difficult to maintain, because cooperation is not in the best interest of the *individual* player – cheating is (not sticking to the agreement and acting in one's own best interest).

Self-interest makes it difficult for an oligopoly to maintain a cooperative outcome with low production, high prices, and monopoly profits.

Example: oil profits

Petro-Canada and Esso are deciding how many new oil wells to drill: 1 or 2.

Their pay-off matrix for their profits (in millions of dollars) is:

Oligopoly Game

		Petro-Canada's Decision	
		Drill Two Wells	Drill One Well
Esso's Decision	Drill Two Wells	(4, 4)	(6, 3)
	Drill One Well	(3, 6)	(5, 5)

Here, each firm will produce the Nash equilibrium outcome of 2 wells each for profit of \$4-million each. Their dominant strategies are the same – drill 2 wells no matter what the other firm does.

- Note that this game is a one-time only game.
- Most games are repeated games, played over time with the same competitors.
- Firms that care about future profits will cooperate in repeated games rather than cheating in a single game to achieve a one-time gain.

Public Policy Toward Oligopolies

- Cooperation among oligopolists is undesirable from the standpoint of society as a whole because it leads to production that is too low and prices that are too high.

- Canada's Competition Act makes it **illegal to collude**.
- Most collusion is **tacit collusion**.
 - No formal agreements (paper trails).
 - Just an “understanding” among firms.

- Even tacit collusion is hard in practice.
- Complex pricing schemes & products make it hard to keep track of firms.
- Firms disagree over what's a fair share of output for each firm.
- Buyers have bargaining power who'll demand a good deal or threaten to go elsewhere, so firms may break the collusive deal.

Competition Policy - Some Controversies

Resale Price Maintenance

- requiring a retailer to sell a good at a certain price determined by the wholesaler.
- prevents retailers from competing in price, thus drive down profits.
- manufacturer may do this because it wishes to keep resellers profitable, and thus keep the manufacturer profitable.

- Others contend that minimum resale price maintenance overcomes a failure in the market for distributional services by ensuring that distributors who invest in promoting the manufacturer's product are able to recoup the additional costs of such promotion in the price they charge consumers.
- A consistent higher price may signal high quality, brand name products.

Predatory Pricing

- charging too low prices, hoping to drive out competitors.
- can lead to price wars which benefit consumers.
- if competitors or potential competitors cannot sustain equal or lower prices without losing money, they go out of business or choose not to enter the industry.
- Many economists doubt that predatory pricing is a rational strategy:
 - It involves selling at a loss, which is extremely costly for the firm.
 - It can backfire.

Tying

- in order to purchase a good, you must purchase another good at the same time.
- Example: you want to buy a printer, but to get the deal on the printer, you have to buy your copy paper from the same dealer even though you can buy it cheaper somewhere else.
 - They'd likely make you pay some amount up front to "cover" the paper you'd buy, knowing that you'd buy the cheaper paper elsewhere.

The Kinked Demand Curve Model

- This theory tries to explain why price and output are slow to change. It assumes:
- There exists a tacit collusion outcome of Q^* and P^* in the market.
- A firm believes that if it $\uparrow Q$ and $\downarrow P$, rival firms will copy it and it will only gain a small number of sales.
- The firm's D curve is inelastic (steep) for any $P < P^*$

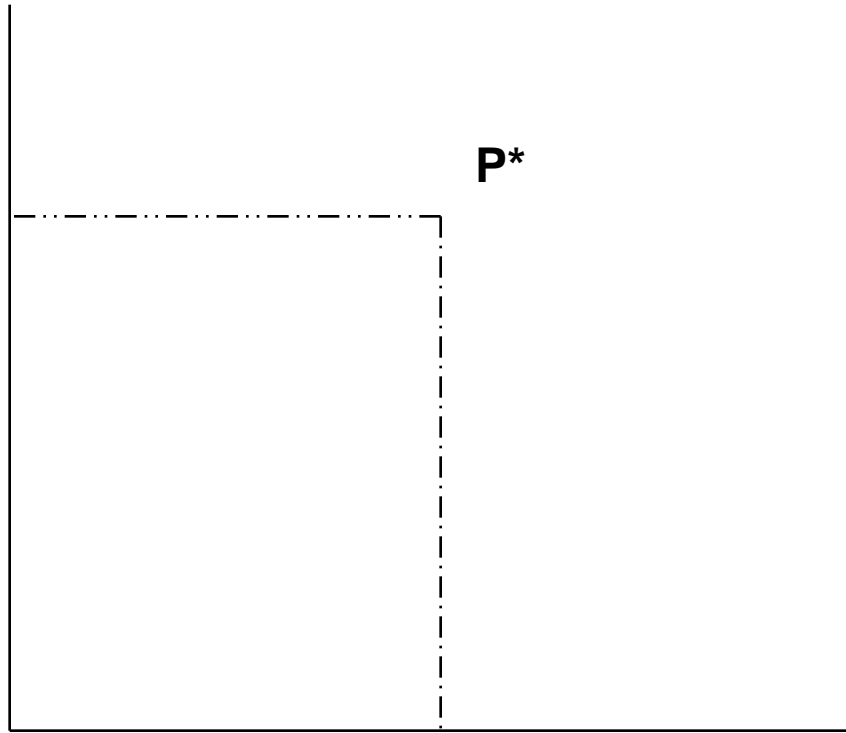
- The firm believes that if it $\downarrow Q$ and $\uparrow P$, rival firms won't copy it and it will lose a substantial number of sales.
- The firm's D curve is elastic (flatter) for any $P > P^*$

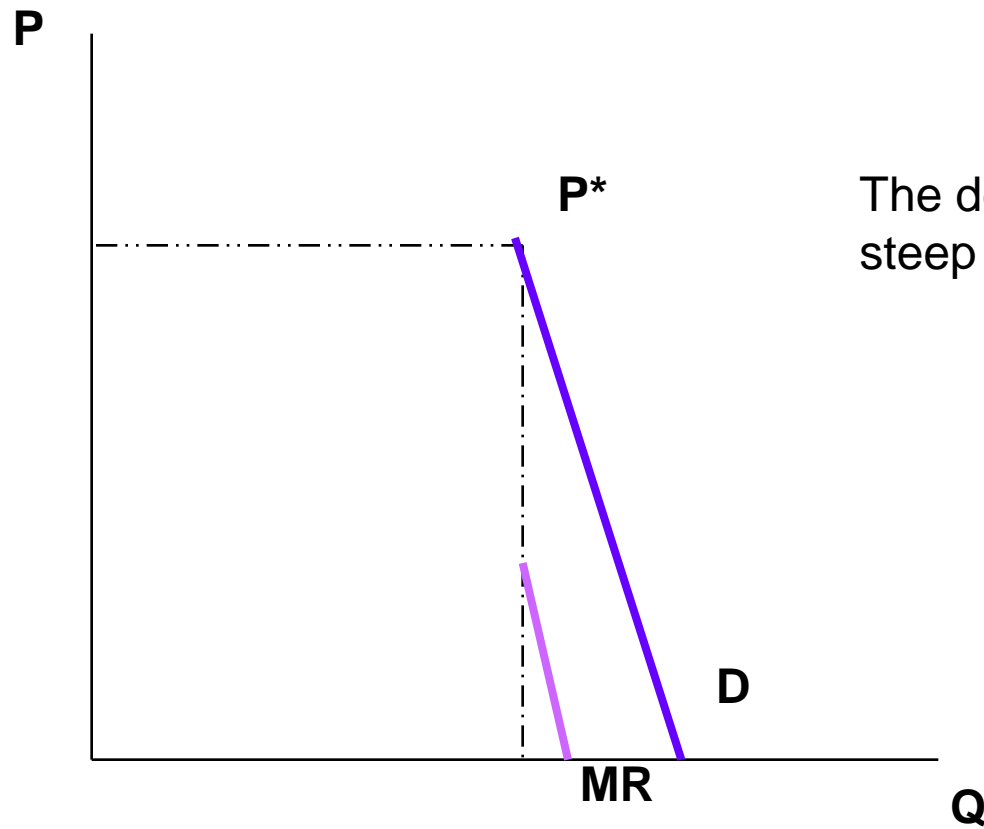
The demand curve is kinked at P^*

P

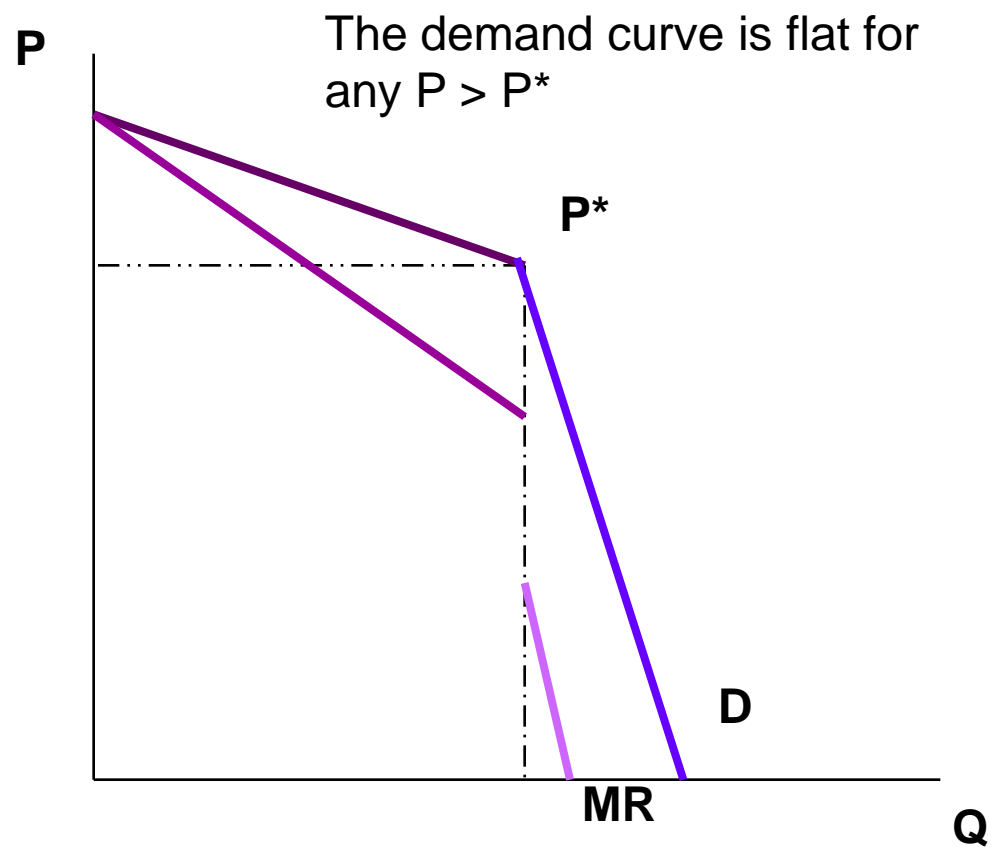
P*

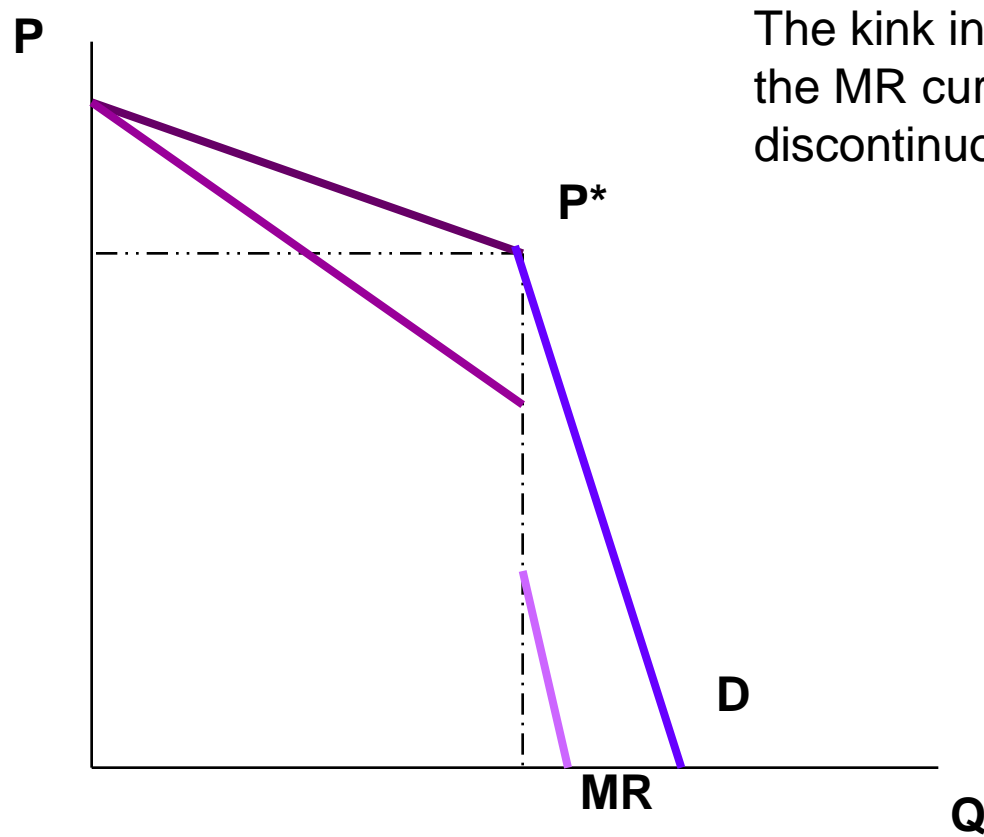
Q





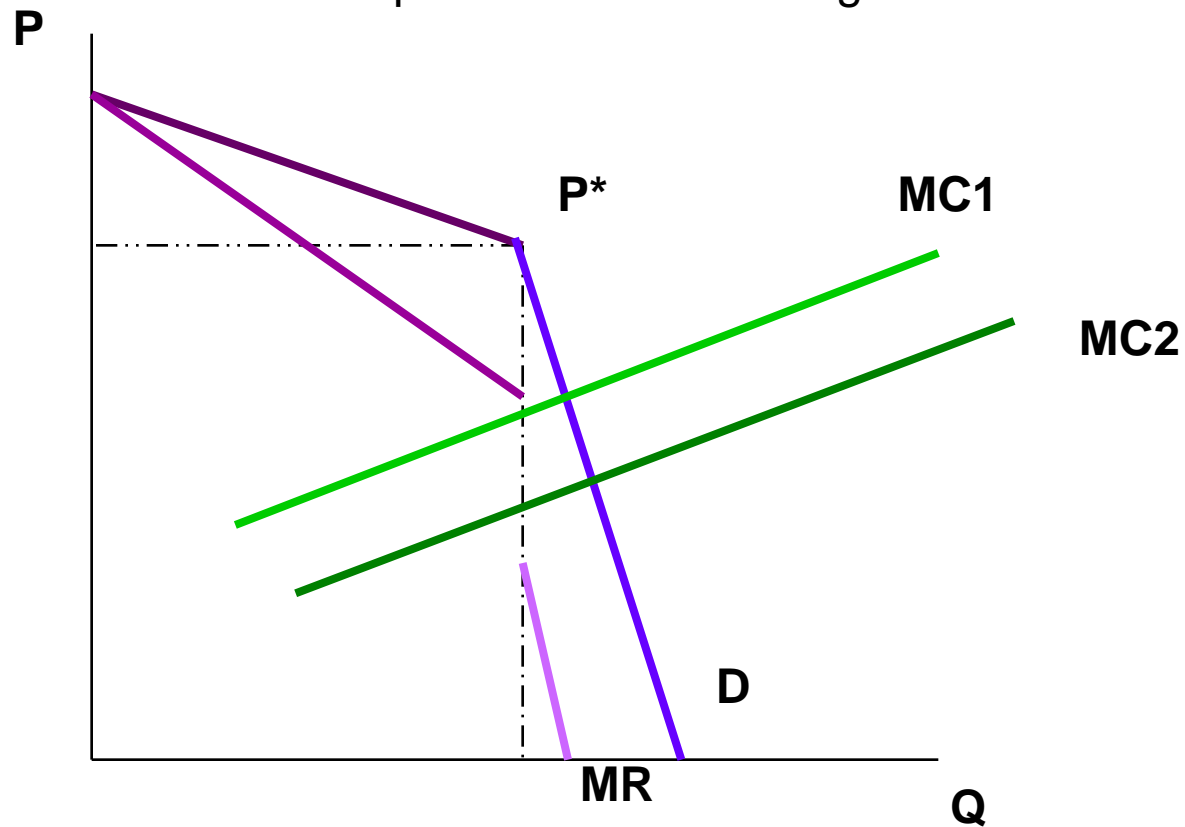
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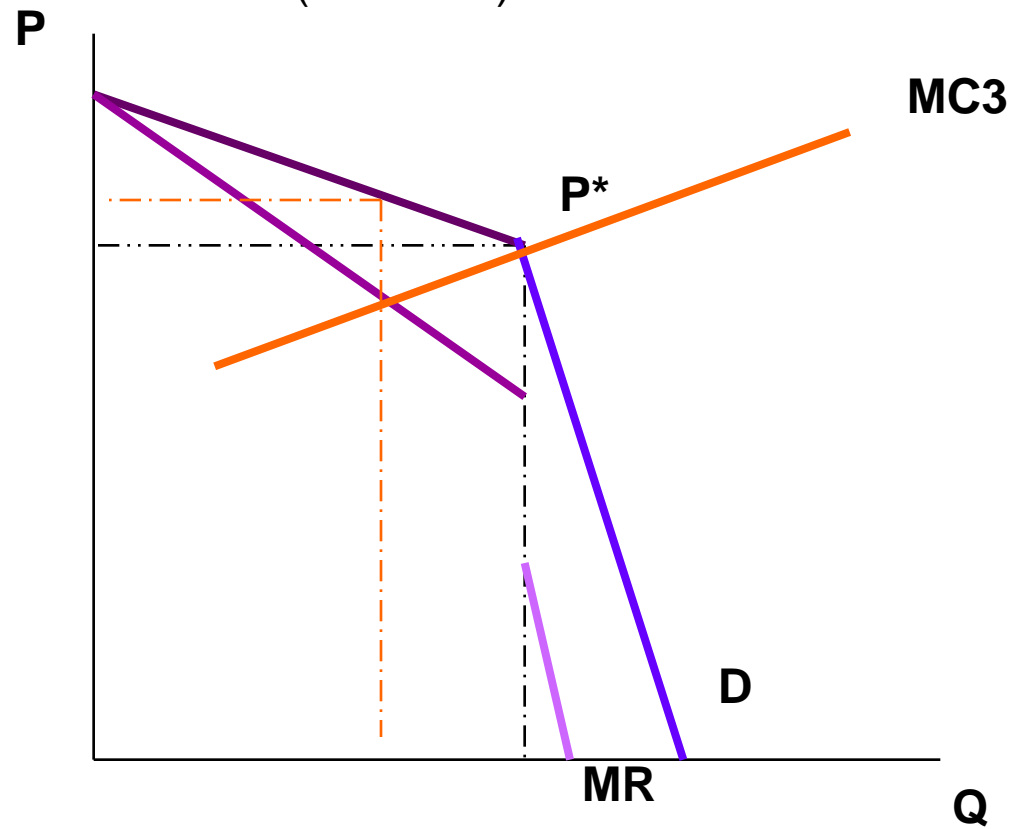


The kink in D means that
the MR curve is
discontinuous

Any MC curve that lies within the break leads the firm to produce Q^* and charge P^* .



It would take a large change in MC to change Q and P (like MC3).



- One big criticism of the kinked demand model is that it doesn't explain how P^* and Q^* are originally determined.
- It does help explain why prices don't change quickly in many markets.
- We use it in oligopoly because the firms are big and powerful and since there are only a few firms, they can keep an eye on each other.

Four Types of Market Structures: A Summary

