

### Measuring Market Concentration

- Concentration ratio: the percentage of the market's total output supplied by its four largest firms.
- The higher the concentration ratio, the less competition.
- This chapter focuses on oligopoly, a market structure with high concentration ratios.

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Conce	entration Ratios in	Selected U.S. Indu	stri
	Industry	<b>Concentration ratio</b>	
	Video game consoles	100%	
	Tennis balls	100%	
	Credit cards	99%	
	Batteries	94%	
	Soft drinks	93%	
	Web search engines	92%	
	Breakfast cereal	92%	
	Cigarettes	89%	
	Greeting cards	88%	
	Beer	85%	
	Cell phone service	82%	
	Autos	79%	

### Oligopoly

- Oligopoly: a market structure in which only a few sellers offer similar or identical products.
- Strategic behavior in oligopoly: 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.

E	XAM	IPLE: Gasoline Duopoly in Daiwan	
Ρ	Q	Daiwan, not to be confused with Taiwan,	
\$0	140	has 23 million residents	
5	130	The "good":	
10	120	Gasoline, fuel to power vehicles for	
15	110	personal transportation	
20	100	Daiwan's demand schedule	
25	90		
30	80	Two firms: T-CPC and FPC	
35	70	(duopoly: an oligopoly with two firms)	
40	60	Each firm's costs: FC = \$0, MC = \$10	
45	50		
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EXAMPLE: Gasoline Duopoly in Daiwan								
Р	Q	Revenue	Cost	Profit		Competitive		
\$0	140	\$0	\$1,400	-1,400		outcome:		
5	130	650	1,300	-650		P = MC = \$10		
10	120	1,200	1,200	0		<b>Q</b> = 120		
15	110	1,650	1,100	550		Profit = \$0		
20	100	2,000	1,000	1,000				
25	90	2,250	900	1,350		Monopoly		
30	80	2,400	800	1,600		outcome:		
35	70	2,450	700	1,750		<b>P</b> = \$40		
40	60	2,400	600	1,800		<b>Q</b> = 60		
45	50	2,250	500	1,750		Profit = \$1,800		
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### **EXAMPLE:** Gasoline Duopoly in Daiwan

- One possible duopoly outcome: collusion
- Collusion: an agreement among firms in a market about quantities to produce or prices to charge
- T-CPC and FPC could agree to each produce half of the monopoly output:
  - For each firm: **Q** = 30, **P** = \$40, profits = \$900
- **Cartel**: a group of firms acting in unison, *e.g.*, T-CPC and FPC in the outcome with collusion

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ACTIVE LEARNING <b>1</b> Collusion vs. self-interest						
Р	Q	Duopoly outcome with collusion:				
\$0	140	Each firm agrees to produce $Q = 30$ ,				
5	130	earns profit = \$900.				
10	120	If T-CPC reneges on the agreement and				
15	110	produces $Q = 40$ , what happens to the				
20	100	market price? T-CPC's profits?				
25	90	Is it in T-CPC's interest to renege on the				
30	80	agreement?				
35	70	If both firms renege and produce $Q = 40$ ,				
40	60	determine each firm's profits.				
45	50		8			
	Col \$0 5 10 15 20 25 30 35 40	P         Q           \$0         140           \$5         130           10         120           15         110           20         100           25         90           30         80           35         70           40         60	PQDuopoly outcome with collusion: $\$0$ 140Each firm agrees to produce $Q = 30$ , earns profit = \$900. $$0$ 120If T-CPC reneges on the agreement and produces $Q = 40$ , what happens to the market price? T-CPC's profits? $$25$ 90Is it in T-CPC's interest to renege on the agreement? $$35$ 70If both firms renege and produce $Q = 40$ , determine each firm's profits.			

	ACTIVE LEARNING <b>1</b> Answers					
0	Р	Q	If both firms stick to agreement,			
2	\$0	140	each firm's profit = \$900			
	5	130	If T-CPC reneges on agreement and			
2	10	120	produces $\mathbf{Q} = 40$ :			
	15	110	Market quantity = 70, $P = $35$			
	20	100	T-CPC's profit = $40 \times (\$35 - 10) = \$1000$			
	25	90	T-CPC's profits are higher if it reneges.			
2	30	80	FPC will conclude the same, so			
2	35	70	both firms renege, each produces $\mathbf{Q} = 40$ :			
	40	60	Market quantity = $80$ , $P = $30$			
	45	50	Each firm's profit = $40 \times ($30 - 10) = $800$			

### **Collusion vs. Self-Interest**

- Both firms would be better off if both stick to the cartel agreement.
- But each firm has incentive to renege on the agreement.
- Lesson: It is difficult for oligopoly firms to form cartels and honor their agreements.

	ACTIVE LEARNING <b>2</b> The oligopoly equilibrium					
	Р	Q	If each firm produces $\mathbf{Q} = 40$ ,			
1	\$0	140	market quantity = 80			
	5	130	<b>P</b> = \$30			
	10	120	each firm's profit = \$800			
1	15	110	Is it in T-CPC's interest to increase its			
9	20	100	output further, to $Q = 50$ ?			
2	25	90	Is it in FPC's interest to increase its output			
	30	80	to <b>Q</b> = 50?			
	35	70				
1	40	60				
2	45	50	11			

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		IVE L	EARNING <b>2</b> S	
Ī	Р	Q	If each firm produces $\mathbf{Q} = 40$ ,	
1	\$0	140	then each firm's profit = \$800.	
	5	130	If T-CPC increases output to $Q = 50$ :	
	10	120	Market quantity = 90, $P = $25$	
	15	110	T-CPC's profit = 50 x (\$25 - 10) = \$750	
1	20	100	T-CPC's profits are higher at $\mathbf{Q} = 40$	
	25	90	than at $\mathbf{Q} = 50$ .	
	30	80	The same is true for FPC.	
2	35	70	The same is the form of the	
	40	60		
	45	50		

### The Equilibrium for an Oligopoly

- Nash equilibrium: a situation in which economic participants interacting with one another each choose their best strategy given the strategies that all the others have chosen
- Our duopoly example has a Nash equilibrium in which each firm produces *Q* = 40.
  - Given that FPC produces Q = 40,
     T-CPC's best move is to produce Q = 40.
  - Given that T-CPC produces Q = 40, FPC's best move is to produce Q = 40.

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### A Comparison of Market Outcomes

When firms in an oligopoly individually choose production to maximize profit,

- oligopoly Q is greater than monopoly Q but smaller than competitive Q.
- oligopoly *P* is greater than competitive *P* but less than monopoly *P*.

The Output & Price 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.

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# The Size of the Oligopoly As the number of firms in the market increases, the price effect becomes smaller the oligopoly looks more and more like a competitive market *P* approaches *MC*the market quantity approaches the socially efficient quantity

Trade increases the number of firms competing, increases *Q*, brings *P* closer to marginal cost

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### **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

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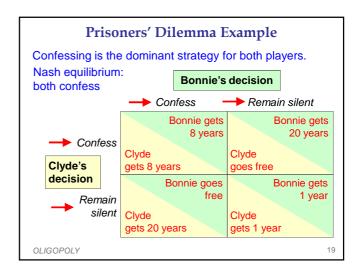
### Prisoners' Dilemma Example

- The police have caught Bonnie and Clyde, two suspected bank robbers, but only have enough evidence to imprison each for 1 year.
- The police question each in separate rooms, offer each the following deal:
  - If you confess and implicate your partner, you go free.
  - If you do not confess but your partner implicates you, you get 20 years in prison.
  - If you both confess, each gets 8 years in prison.

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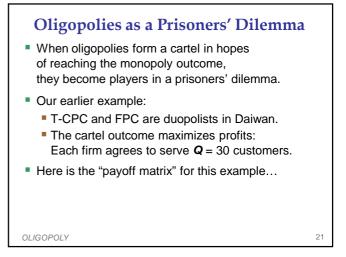
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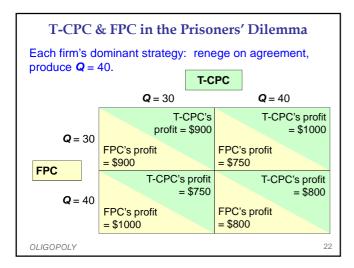


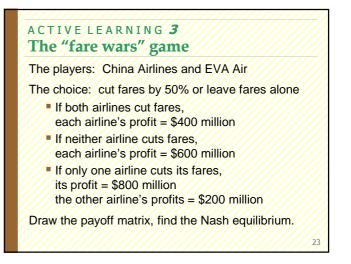
### Prisoners' Dilemma Example

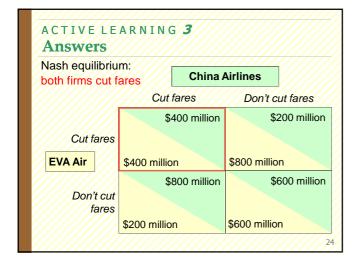
- Outcome: Bonnie and Clyde both confess, each gets 8 years in prison.
- Both would have been better off if both remained silent.
- But even if Bonnie and Clyde had agreed before being caught to remain silent, the logic of selfinterest takes over and leads them to confess.

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### Other Examples of the Prisoners' Dilemma <u>Ad Wars</u> 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. <u>Organization of Petroleum Exporting Countries</u> Member countries try to act like a cartel, agree to limit oil production to boost prices & profits. But agreements sometimes break down when individual countries renege.

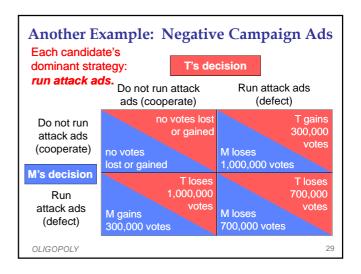
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Other Examples of the Prisoners' Dilemm	a	Prisoners' Dilemma and Society's Welfar	re
<ul> <li><u>Arms race between military superpowers</u></li> <li>Each country would be better off if both disarm, but each has a dominant strategy of arming.</li> <li><u>Common resources</u></li> <li>All would be better off if everyone conserved common resources, but each person's dominant strategy is overusing the resources.</li> <li><u>Public goods contribution</u></li> <li>Everyone would be better off if we all contributed to the pool, but it's a dominant strategy to free ride.</li> </ul>	,	<ul> <li>The noncooperative oligopoly equilibrium</li> <li>Bad for oligopoly firms: prevents them from achieving monopoly profits</li> <li>Good for society: <i>Q</i> is closer to the socially efficient output <i>P</i> is closer to <i>MC</i></li> <li>In other prisoners' dilemmas, the inability to cooperate may reduce social welfare.</li> <li><i>e.g.</i>, arms race, overuse of common resources, public goods contribution</li> </ul>	
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# Another Example: Negative Campaign Ads Election with two candidates, "T" and "M." If T runs a negative ad attacking M, 1,000,000 fewer people will vote for M: 300,000 of them vote for T, the rest abstain. If M runs a negative ad attacking T, T loses 1,000,000 votes, M gains 300,000, 700,000 abstain. T and M agree to refrain from running attack ads. Will each one stick to the agreement?

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### Another Example: Negative Campaign Ads

- Nash eq'm: both candidates run attack ads.
- Effects on election outcome: NONE.
   Each side's ads cancel out the effects of the other side's ads.
- Effects on society: NEGATIVE.
   Lower voter turnout, higher apathy about politics, less voter scrutiny of elected officials' actions.

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### Why People Sometimes Cooperate

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

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### **Public Policy Toward Oligopolies**

- Recall one of the Ten Principles from Chap.1: Governments can sometimes improve market outcomes.
- In oligopolies, production is too low and prices are too high, relative to the social optimum.
- Role for policymakers: Promote competition, prevent cooperation to move the oligopoly outcome closer to the efficient outcome.

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# Restraint of Trade and Antitrust Laws Sherman Antitrust Act (1890): Forbids collusion between competitors Clayton Antitrust Act (1914): Strengthened rights of individuals damaged by anticompetitive arrangements between firms

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### **Controversies Over Antitrust Policy**

- Most people agree that price-fixing agreements among competitors should be illegal.
- Some economists are concerned that policymakers go too far when using antitrust laws to stifle business practices that are not necessarily harmful, and may have legitimate objectives.
- We consider three such practices...

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1. Resale Price Maintenance ("Fair Trade")
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- Occurs when a manufacturer imposes lower limits on the prices retailers can charge.
- Is often opposed because it appears to reduce competition at the retail level.
- Yet, any market power the manufacturer has is at the wholesale level; manufacturers do not gain from restricting competition at the retail level.
- The practice has a legitimate objective: preventing discount retailers from free-riding on the services provided by full-service retailers.

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### 2. Predatory Pricing

- Occurs when a firm cuts prices to prevent entry or drive a competitor out of the market, so that it can charge monopoly prices later.
- Illegal under antitrust laws, but hard for the courts to determine when a price cut is predatory and when it is competitive & beneficial to consumers.
- 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.

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### 3. Tying

- Occurs when a manufacturer bundles two products together and sells them for one price (*e.g.*, Microsoft including a browser with its operating system)
- Critics argue that tying gives firms more market power by connecting weak products to strong ones.
- Others counter that tying cannot change market power: Buyers are not willing to pay more for two goods together than for the goods separately.
- Firms may use tying for price discrimination, which is not illegal, and which sometimes increases economic efficiency.

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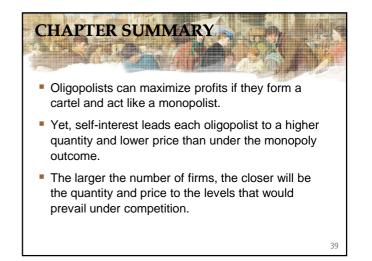
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### CONCLUSION

- Oligopolies can end up looking like monopolies or like competitive markets, depending on the number of firms and how cooperative they are.
- The prisoners' dilemma shows how difficult it is for firms to maintain cooperation, even when doing so is in their best interest.
- Policymakers use the antitrust laws to regulate oligopolists' behavior. The proper scope of these laws is the subject of ongoing controversy.

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# CHAPTER SUMMARY

- The prisoners' dilemma shows that self-interest can prevent people from cooperating, even when cooperation is in their mutual interest. The logic of the prisoners' dilemma applies in many situations.
- Policymakers use the antitrust laws to prevent oligopolies from engaging in anticompetitive behavior such as price-fixing. But the application of these laws is sometimes controversial.

### Oligopoly

- When there are only a few firms
- Firms care about each other's actions
  - Game Theory; Nash Equilibrium; P.D.
- Collusion (Monopoly) vs. Self-Interest
- Policy: Increase competition; antitrust
- Homework: Mankiw, Ch. 17, pp.386-388, Problem 3, 5, 7, 8, 9, 10

## Oligopoly

- True or False. The firms that sell personal computers have never banded together to form a cartel. We may infer from this that at least one firm would fail to benefit from a successful cartel.
- **True or False.** When all firms in an industry charge the same price, this is evidence of collusion.