16 Oligopoly

PRINCIPLES OF

ECONOMICS

FOURTH EDITION

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by Ron Cronovich**
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In this chapter, look for the answers to these questions:

- What market structures lie between perfect competition and monopoly, and what are their characteristics?
- What outcomes are possible under oligopoly?
- Why is it difficult for oligopoly firms to cooperate?
- How are antitrust laws used to foster competition?

Introduction:
Between Monopoly and Competition

Two extremes

- Competitive markets: many firms, identical products
- Monopoly: one firm

In between these extremes

- **Oligopoly**: only a few sellers offer similar or identical products.
- **Monopolistic competition**: many firms sell similar but not identical products.

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.

Concentration Ratios in Selected U.S. Industries

Industry	Concentration ratio
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%

EXAMPLE: Gasoline Duopoly in Daiwan

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

- Daiwan, not to be confused with Taiwan, has 23 million residents
- The "good":
  Gasoline, fuel to power vehicles for personal transportation
- Daiwan's demand schedule
- Two firms: T-CPC and FPC
  (**duopoly**: an oligopoly with two firms)
- Each firm's costs: $FC = \$0$, $MC = \$10$

EXAMPLE: Gasoline Duopoly in Daiwan

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:
$P = MC = \$10$
$Q = 120$
Profit = $0

Monopoly outcome:
$P = \$40$
$Q = 60$
Profit = $1,800

EXAMPLE: Cell Phone Duopoly in Smalltown

- 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 1:
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

Duopoly outcome with collusion:
Each firm agrees to produce $Q = 30$, earns profit = $900.

If T-CPC reneges on the agreement and produces $Q = 40$, what happens to the market price? T-CPC's profits?

Is it in T-CPC's interest to renege on the agreement?

If both firms renege and produce $Q = 40$, determine each firm's profits.

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ACTIVE LEARNING 1:
Answers

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

If both firms stick to agreement, each firm's profit = $900

If T-CPC reneges on agreement and produces $Q = 40$:
Market quantity = 70, $P = \$35$
T-CPC's profit = 40 x ($35 − 10) = $1000
T-CPC's profits are higher if it reneges.

FPC will conclude the same, so both firms renege, each produces $Q = 40$:
Market quantity = 80, $P = \$30$
Each firm's profit = 40 x ($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 2:
The oligopoly equilibrium

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

If each firm produces $Q = 40$, market quantity = 80
$P = \$30$
each firm's profit = $800

Is it in T-CPC's interest to increase its output further, to $Q = 50$?

Is it in FPC's interest to increase its output to $Q = 50$?

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Answers

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

If each firm produces $Q = 40$, then each firm's profit = $800.

If T-CPC increases output to $Q = 50$:
   Market quantity = 90, P = $25
   T-CPC's profit = 50 x ($25 – 10) = $750

T-CPC's profits are higher at $Q = 40$ than at $Q = 50$.

The same is true for FPC.

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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 $Q = 40$.

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.

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

> *Another benefit of international trade:*
> Trade increases the number of firms competing, increases Q, keeps P closer to marginal cost

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Game Theory

- **Game theory**: the study of how people behave in strategic situations

- **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 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.

Prisoners' Dilemma Example

Confessing is the dominant strategy for both players.

Nash equilibrium: both confess

Bonnie's decision

	Confess →	Remain silent →
Confess →	Bonnie gets 8 years / Clyde gets 8 years	Bonnie gets 20 years / Clyde goes free
Remain silent →	Bonnie goes free / Clyde gets 20 years	Bonnie gets 1 year / Clyde gets 1 year

Clyde's decision

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 self-interest takes over and leads them to confess.

Oligopolies as a Prisoners' Dilemma

- When oligopolies form a cartel in hopes of reaching the monopoly outcome, they become players in a prisoners' dilemma.
- Our earlier example:
  - T-CPC and FPC are duopolists in Daiwan.
  - The cartel outcome maximizes profits: Each firm agrees to serve Q = 30 customers.
- Here is the "payoff matrix" for this example…

T-CPC & FPC in the Prisoners' Dilemma

Each firm's dominant strategy: renege on agreement, produce Q = 40.

T-CPC

	Q = 30	Q = 40
Q = 30	T-CPC's profit = $900 / FPC's profit = $900	T-CPC's profit = $1000 / FPC's profit = $750
Q = 40	T-CPC's profit = $750 / FPC's profit = $1000	T-CPC's profit = $800 / FPC's profit = $800

FPC

ACTIVE LEARNING 3:
The "fare wars" game

The players: China Airlines and EVA Air

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, find the Nash equilibrium.

Answers

Nash equilibrium:
both firms cut fares

		China Airlines	
		Cut fares	*Don't cut fares*
Cut fares **EVA Air**		$400 million / $400 million	$200 million / $800 million
Don't cut fares		$800 million / $200 million	$600 million / $600 million

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Other 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, agree to limit oil production to boost prices & profits. But agreements sometimes break down when individual countries renege.

Other 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 Society's Welfare

- The noncooperative oligopoly equilibrium
  - bad for oligopoly firms:
    prevents them 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

Another Example: Negative Campaign Ads

- Election with two candidates, "H" and "M."
- If H runs a negative ad attacking M, 1,000,000 fewer people will vote for M: 300,000 of these people vote for H, the rest abstain.
- If M runs a negative ad attacking H, H loses 1,000,000 votes, M gains 300,000, 700,000 abstain.
- H and M agree to refrain from running attack ads. Will each one stick to the agreement?

Another Example: Negative Campaign Ads

Each candidate's dominant strategy: *run attack ads.*

		H's decision	
		Do not run attack ads (cooperate)	Run attack ads (defect)
M's decision Do not run attack ads (cooperate)		no votes lost or gained / no votes lost or gained	H gains 300,000 votes / M loses 1,000,000 votes
Run attack ads (defect)		H loses 1,000,000 votes / M gains 300,000 votes	H loses 700,000 votes / M loses 700,000 votes

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.

Why People Sometimes Cooperate

- When the game is repeated many times, cooperation may be possible.

- Strategies which 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.

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.

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

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…

1. Resale Price Maintenance ("Fair Trade")

- 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.

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.

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.

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.

CHAPTER SUMMARY

- Oligopolists can maximize profits if they form a cartel and act like a monopolist.

- Yet, self-interest leads each oligopolist to a higher quantity and lower price than under the monopoly outcome.

- The larger the number of firms, the closer will be the quantity and price to the levels that would prevail under competition.

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. 16, pp.368-371 Problem 3, 4, 6, 9, 10, 11