Introduction

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ECON 2216: Industrial Organization

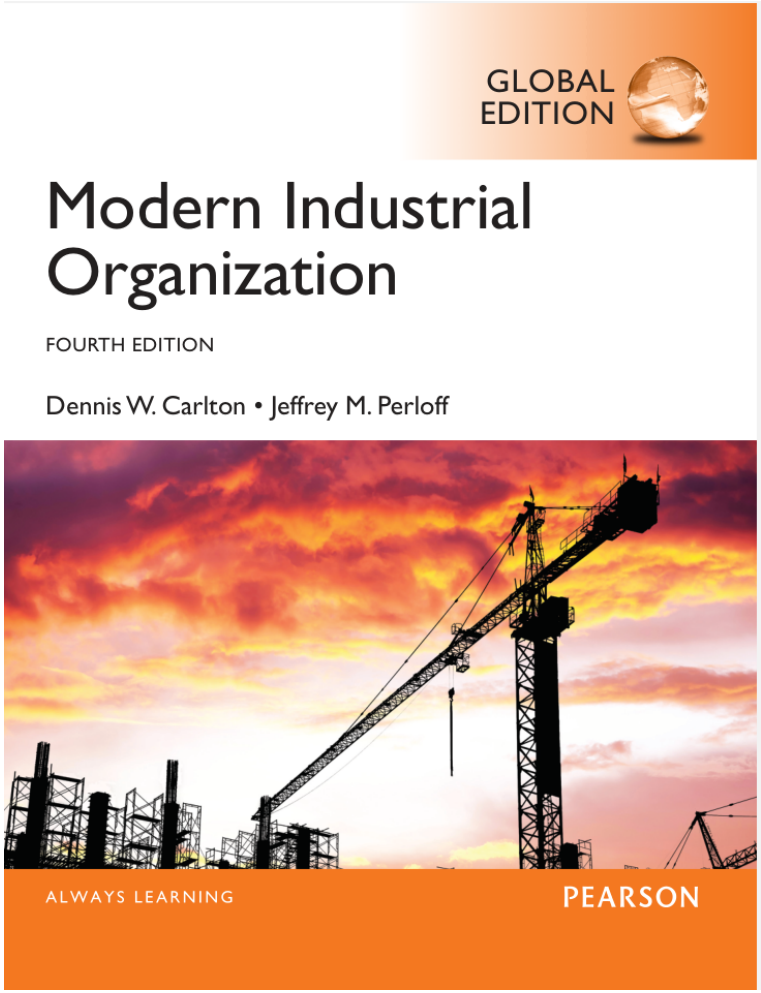
Outline

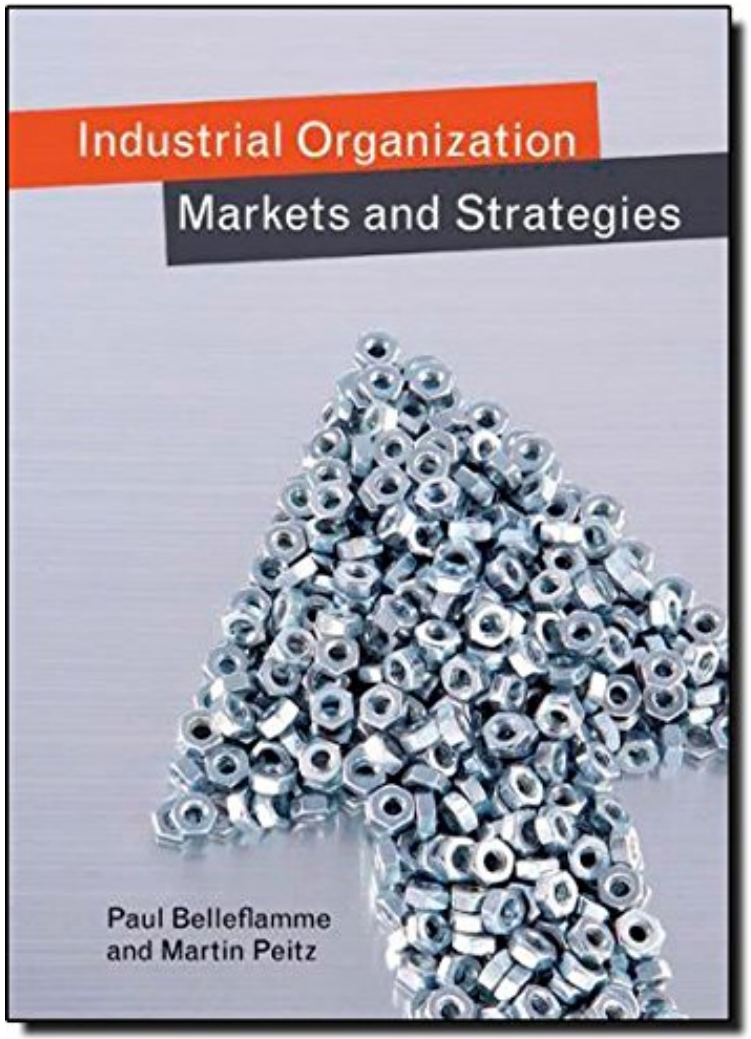
Information

- Instructor: Yu(Jasmine) Hao
- Email: haoyu@hku.hk
- Teaching Time: 12:30 PM 02:20 PM, Monday, 12:30 PM 01:20 PM Thursday
- Classroom: KKLG103
- Office Hour: 10:00 AM 11:00 AM Thursday, KKL 927
- Tutor: Kwong Yuk Hang (Email: harryhk@connect.hku.hk)

Textbook

- I will follow closely the textbook.
  - Carlton, Dennis W., and Jeffrey M. Perloff. *Modern Industrial Organization.* Fourth edition. CP henceforth)
- For more advanced IO theory
  - Belleflamme, Paul., and Martin. Peitz. *Industrial Organization : Markets and Strategies.* BP henceforth)
  - Serves as good supplementary material, contain many interesting examples.


GLOBAL
EDITION
Modern Industrial
Organization
FOURTH EDITION
Dennis W. Carlton • Jeffrey M. Perloff
ALWAYS LEARNING
PEARSON


Industrial Organization
Markets and Strategies
Paul Belleflamme
and Martin Peitz

Evaluation

- Assignment(30 % int total) : There will be 6 assignments in total.
  - You are encouraged to discuss with your classmate, however, every student should submit individually.
  - Each assignment contains 4 to 6 questions, mainly for review purpose.
- Midterm Exam(30 %) : A 2-hour midterm will be scheduled on March 13th, Monday, 2023
  - Coverage of the midterm will be based on the first half of the class(up to week 6 of the course.)
- Final Exam (40 %) : A final exam date pending(May 8 to May 23).
  - Coverage of the final exam is cumulative, including everything before the midterm, but emphasize on material after the midterm.

Philosophy of this course

- This course discusses firms' behavoiurs, and how they deviate from perfect competition.
- We emphasize on the intuition, concept, ideas of business conduct. The purpose of this course is to provide an introduction to various of topics. Students are encouraged to explore further materials if finding particular topic interesting.
- The content of this course will be largely qualitative, but we will conduct some mathematical analysis, tools used includes:
  - basic operations, division, multiplication
  - taking derivatives of multivariable functions
  - optimization, constrained optimization of multivariable functions
  - (we will cover) basic game theory

Content[1]

- The first half for this course is as follow
  - **Topic 1: Introduction and Firm's costs***(CP Chapter 1 2)*. (Jan 16th, Jan 19th).
  - **Topic 2: Competition theory, varoius forms of market competition***(CP Chapter 3 -4)*. (Jan 30th, Feb 2nd)
  - **Topic 3: Monopoly-like act, cartels.** *(CP Chapter 5)* (Feb 6th, Feb 9th)
  - **Topic 4: Oligopolies, Strategic interactions, game theory**. *(CP Chapter 6-7)*. (Feb 13th, Feb 16th)
  - **Topic 5: Evidence on Performance and Market Structure.** (CP Chapter 8) (Feb 20th, Feb 23th)
  - **Topic 6: Price discrimination***(CP Chapter 9 10)*. (Feb 27th, Mar 2th)
  - Midterm (Mar 13th)

Content[2]

- The second half for this course is as follow
  - **Topic 7: Dynamic game theory, strategic behaviour, predatory pricing, limit pricing.***(CP Chapter 11).* (Mar 20th, Mar 23th)
  - **Topic 8: Vertical integration, foreclosure.***(CP Chapter 12).* (Mar 27th, Mar 30th)
  - **Topic 9: Limited information on market, Advertising.** *(CP Chapter 13 14).* (Apri 3rd, Apr 6th)
  - **Topic 10: Durable Good.** *(CP Chapter 15)* (Apri 10rd, Apr 13th)
  - **Topic 11: Government behaviour and technological change.** *(CP Chapter 16)* (Apri 17rd, Apr 20th)
  - **Topic 12: International Trade, Government Regulation.** *(CP Chapter 18 20).*(Apri 24rd, Apr 27th)

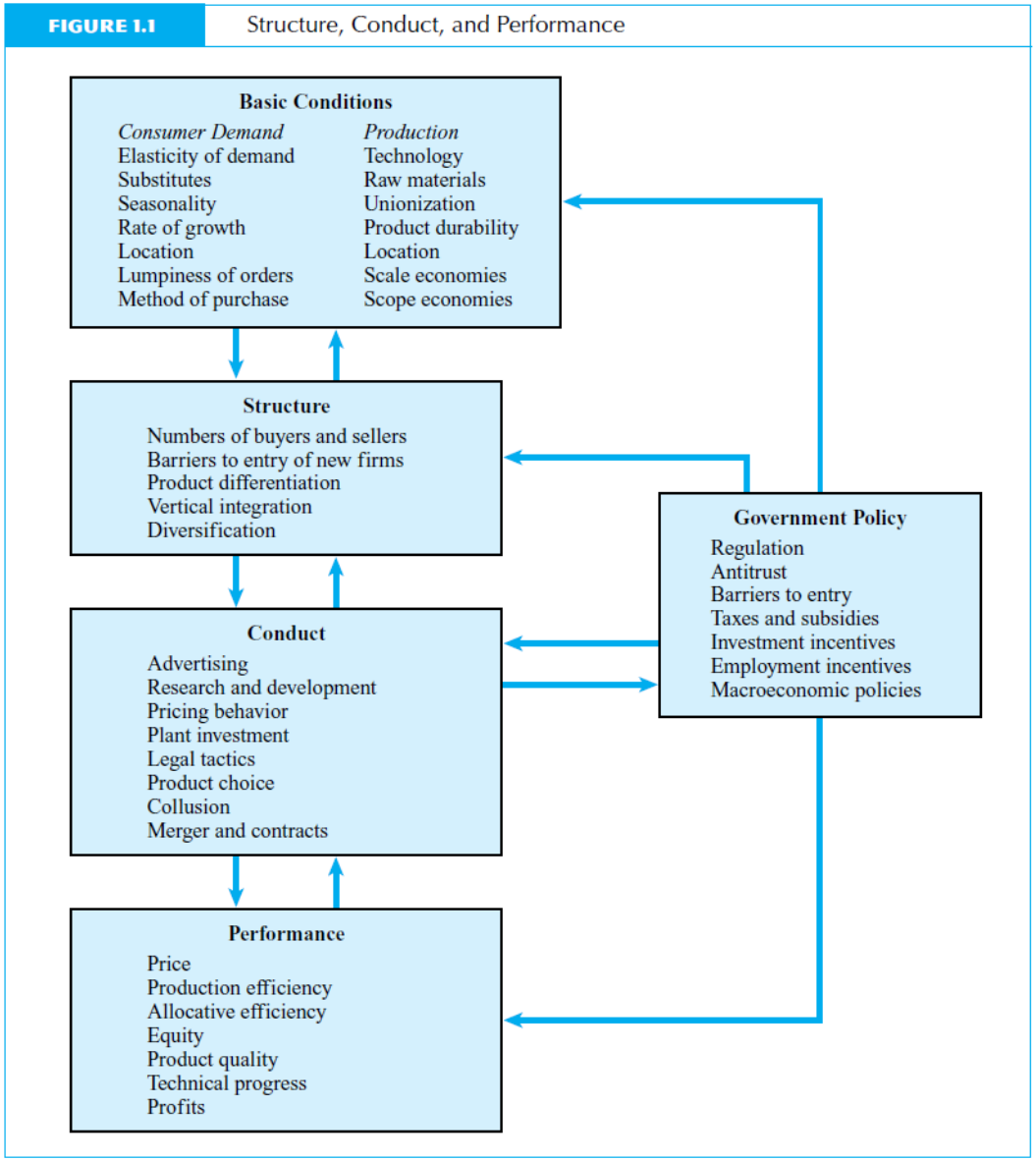
Outline

Outline

Structure, Conduct, and Performance[1]

- Two major approaches to the study of industrial organization
  - **Structure-conduct-performance**: descriptive, provide overview of industrial organization
  - According to the structure-conduct-performance approach, an industry's performance (the success of an industry in producing benefits for consumers) depends on the conduct (behavior) of its firms, which, in turn, depends on the structure (factors that determine the competitiveness of the market).
  - *The structure of an industry depends on basic conditions, such as technology and demand for a product.*
    - ⋆ In an industry with a technology such that the average cost of production falls as output increases, the industry tends to have only one firm, or possibly a small number of firms.
    - ⋆ If only one firm (a monopoly) sells output in an industry, it may be able to set a price that is well above its marginal costs of production.
    - ⋆ If the basic conditions make the demand for the monopoly's product relatively inelastic (people are relatively insensitive to price), then the price in that market is higher than if the demand is relatively elastic (people are price sensitive).

Structure, Conduct, and Performance[2]



Structure, Conduct, and Performance[2]

- Figure 1.1 illustrates the relationships among structure, conduct, and performance and shows how basic conditions and government policy interact. The relationships among the five boxes are complex.
  - For example, government regulations affect the number of sellers in an industry, and firms may influence government policy to achieve higher profits.
  - Similarly, if entry barriers lead to monopoly and monopoly profits, new industries may develop new, substitute products that affect the demand for the original product.
- Empirical researchers who rely on this paradigm typically use data at the industry level.
  - For example, if industries with certain structural features (for example, few firms) have high prices.
- The structure-conduct-performance approach is a very general way to organize the study of industrial organization, and can be used to organize the material in the rest of this book.

Price Theory

- George J. Stigler (1968), an early proponent of this analytical approach, believed that industrial organization researchers should use microeconomic theory to design empirical studies of markets and of the effects of public policy.
- Today, most industrial organization research and courses are well grounded in microeconomic theory.
- Two reasons for the shift to this approach
  - the recent availability of data at a more micro level and
  - advances in price theory.
- In recent years, three specific theoretical applications of price theory have won substantial support:transaction cost analysis, game theory, and contestable market analysis—and help to explain structure, conduct, and performance.

Outline

Transation Costs[1]

- Transaction costs are the expenses of trading with others about and beyond the price, such as the cost of writing and enforcing contracts.
- A firm and a market are alternative means of organizing economic activity. (Coase, 1937).
  - The use of market place involves costs
  - The costs help determine market structure
  - If the cost of buying from other firms is relatively low, a firm is more likely to buy supplies from others than to produce itself.

Transaction Costs[2]

- Four basic concepts underlie the transaction cost approach
  - Markets and firms are alternative means for completing related set of transactions.
  - The **relative cost** of using markets or a firm's own resources should determine the choice.
  - The **transaction costs of writing and executing complex contracts**across a market "vary with the characteristics of human decisiosn"
  - These human and environmental factors affect the transaction costs across markets and within firms.

Transaction Costs[3]

- **Bounded rationality:** limited human capacity to anticipate or solve complex problems.
- **Environmental uncertainty:** cost, consumers' preference.
- Reliance on markets is more likely when
  1. little uncertainty.
  2. many firms and limited opportunities for opportunistic behaviours.

Outline

Game Theory

- Use formal models to analyze conflict and coopration between firms and individuals. (Neumann and Morgenstern, 1944)
- Competing among firms are viewed as a game of strategies.
- Prisoner's Dilemma

Outline

Contestable Market

- The importance of entry to the competitive process has been recognized for a long time. (Demsetz, 1968; Baumol, Panzar, and Willig, 1982).
  - In contrast to perfect competition, a contestable market may have any number of firms (including only one or a few) and these firms need not be price-takers.
  - Industry with only a few firms can be very competitive if there is a threat of entry by the other firms.
- Contestable markets: Markets in which many firms can enter rapidly if prices exceed costs and can exit rapidly if prices drop below costs.
  - Firms are reluctant to enter an industry if costly to exit.
  - With few firms but easy entry and exit, a contestable firm can have the properties of a competitive market.

Organization of the Content

- Market structures: how many potential buyers and sellers? Does it have entry or exit barriers? (week 1 5)
  - perfect competition
  - monopoly
  - monopsony
  - oligopoly
- Strategies and Conduct: with game theory (week 6 9)
  - price discriminations
  - predatory pricing
  - verticle integration
- Other related topics(week 10 12)
  - Information, advertising and disclose
  - Durable goods
  - Government policies and their effect

Outline

The Objective of a firm

- A firm is an organization that transforms inputs into outputs.
- It earns the difference between what it receives as revenues and what it spends on inputs.
- We discuss the **objective**, **organization**, and **ownership** of firms.

Key issues

1. Most firms maximize profits.
2. Acquisitions and other mergers may (but do not always) force firms to operate efficiently and profitably.
3. Economists use the concept of an opportunity cost that includes a normal profit.
4. The costs of a single-product firm depend on the prices of factors of production and the output level.
5. A multiproduct firm's cost of producing a single product depends on factor prices, the output level of that product, and the output level of its other products.
6. Production processes may have various properties such as economies of scale and economies of scope.

Ownership

- Forms of ownership: (in the United States)
  - sole-propretorships(single owner)
  - partnership(multiple owners)
  - corporations. (Now 87 % of business sales are made by corporations.)
- Size of firms
  - A firm may expand because it wants to produce more of its basic output
  - or because it chooses to produce inputs as well or distribute its output.
  - The market and the firm are alternative means of providing goods and services.
  - The higher the costs of doing business with other firms, the more tasks a firm performs itself.
    - ⋆ For example, as the relative costs of dealing with others changed, General Motors went from purchasing car bodies from others, as it did before 1926, to producing the car bodies itself.

Outline

Importance of Coporations

- Today, most sales in the United States are made by corporations. Large corporations whose stock is publicly traded account for the bulk of economic activity and own a large percentage of all assets.
  - According to the 1997 Census of Manufactures (2001), out of 316,952 manufacturing firms, 246,189 (78 percent) are corporations.
  - In manufacturing,
    - ⋆ corporations produce 95 percent of all the value added,
    - ⋆ account for 94 percent of all new capital expenditures,
    - ⋆ and hire 94 percent of all workers and 93 percent of all production workers.
  - Individual proprietorships are 16 percent of all manufacturing firms but produce only 0.7 percent of the value added.
  - Partnerships are about 4 percent of all manufacturing firms and produce 1.6 percent of the value added.
  - **The importance of corporations has risen over time**.
    - ⋆ In 1947, they comprised only 49 percent of all manufacturing firms (compared to 78 percent in 1997) and produced 92 percent of the value added (compared to 95 percent in 1997)

The Rise of Coporations

- The rise of the corporation coincided with the need to increase the size of firms.
  - The money needed to finance large enterprises could be efficiently raised only through the corporate form of organization.
  - Otherwise, investors were not willing to accept the potential liabilities arising from the actions of managers whom they neither knew nor had the ability to monitor.
  - The increase in the importance of the corporation and the coincident rise in stock trading is a relatively recent phenomenon of the last 100 years.
    - ★ In 1900, only 113 companies were listed on the New York Stock Exchange; in 1920, there were 391; today, over 1900 companies are listed.

[Example]Value of Limited Liability

- The rise of limited liability coincided with an increase in the size of firms.
- In Scotland until 1879, limited liability was granted to only three Edinburgh banks;
  - all other competing banks had to accept unlimited liability.
  - We would expect that the limited-liability banks were larger and more successful than the others.
  - In fact, even though over 50 banks with unlimited liability failed between 1845 and 1879, none of the three limited-liability banks failed.
  - Furthermore, data from 1825 indicate that the three limited-liability banks averaged about 10 times the assets of the average bank with unlimited liability.
- After 1879, laws were changed, and all banks effectively became protected by limited liability.

Shareholders and Board of Directors

- A corporation may raise money by selling shares of stock.
  - Its shareholders elect a board of directors to run the corporation.
  - In practice, the board of directors of a large corporation rarely becomes involved in day-to-day affairs; it delegates that responsibility to officers of the company.
- Shareholders (also called equity owners because they own rights to the capital or equity of the firm) are entitled to receive dividend payments, which come out of the corporation's profits.
  - Dividends are one way stockholders earn returns on their investments.
  - If the price of the stock rises above what the shareholder paid, the shareholder can sell it for a profit

Debt holders

- Corporations also raise money by issuing debt.
  - They promise to pay those who lend them money (debt holders) a stipulated amount of interest plus repayment of the loan.
  - For example,
    - General Electric might sell a note for $1 million in
    - it promises to pay 10 percent, or $100,000, per year for three years and repay the $1 million at the end of three years.
- Debt holders are paid first; stockholders are paid from what remains.

Equity Holders v.s. Debt Holders

TABLE 2.1 Returns to Debt Holders and Equity Owners

Project 1

Outcome of Project	Probability	Payoff Received by Debt Holders	Payoff Received by Equity Owners
Success	.5	$600,000	$1,400,000
Failure	.5	500,000	0
Expected payoff		$550,000	$700,000
Initial investment		500,000	500,000
Expected payoff minus initial investment		50,000	200,000
Expected return		10%	40%

Project 2

Outcome of Project	Probability	Payoff Received by Debt Holders	Payoff Received by Equity Owners
Success	.5	$600,000	$1,300,000
Failure	.5	600,000	0
Expected payoff		$600,000	$650,000
Initial investment		500,000	500,000
Expected payoff minus initial investment		100,000	150,000
Expected return		20%	30%

Separation of Ownership and Control[1]

- The dramatic rise in the importance of the corporation caused a clamor in the 1930s about whether this organizational form was efficient.
  - The *Modern Corporation and Private Property,* by Berle and Means (1932), argued that the corporate form separates ownership from control.
  - **Managers may not attempt to maximize profits and may pursue other objectives, like maximizing their own incomes, not working hard, and having plush offices**
- In many corporations, often sharehold have incentive to monitor managers' actions. Shareholders elect a board of directors to minimize the conflicts.
  - The board's primary function is to act as an agent for the shareholders and oversee the efficient management of the company.
  - But who monitors the board of directors? If they do a bad job, how will they be punished? One potential punishment is that they may not be reelected and may acquire bad reputations that make it difficult for them to get other good jobs.
    - ★ For example, in 1992, when facing massive debts, the large retailer R. H. Macy & Co. brought in outside directors to take control and to ensure that, in the event of a filing for bankruptcy, a majority of the board members would not be company employees.

Separation of Ownership and Control[2]

- This control over the board of directors and over the managers may be inadequate to ensure profit-maximizing behavior.
- Therefore, according to Berle and Means, the actions of corporations cannot be predicted by a traditional economic analysis based on profit maximization.
- Berle and Means (1932) implied that the severity of the Great Depression was at least in part attributable to the rise of this new and inefficient form of business.

Outline

Mergers and Acquisitions

- Vertical Merger: a firm combines with its supplier
- **Horizontal Merger**: firms that compete within the same markets combine.
- Conglomerate merger: Firms in unrelated lines of business combine.

Reasons for Mergers and Acquisitions: Increase Efficiency

Mergers that increase efficiency are desirable for society. Reasons of efficiency increasing could be:

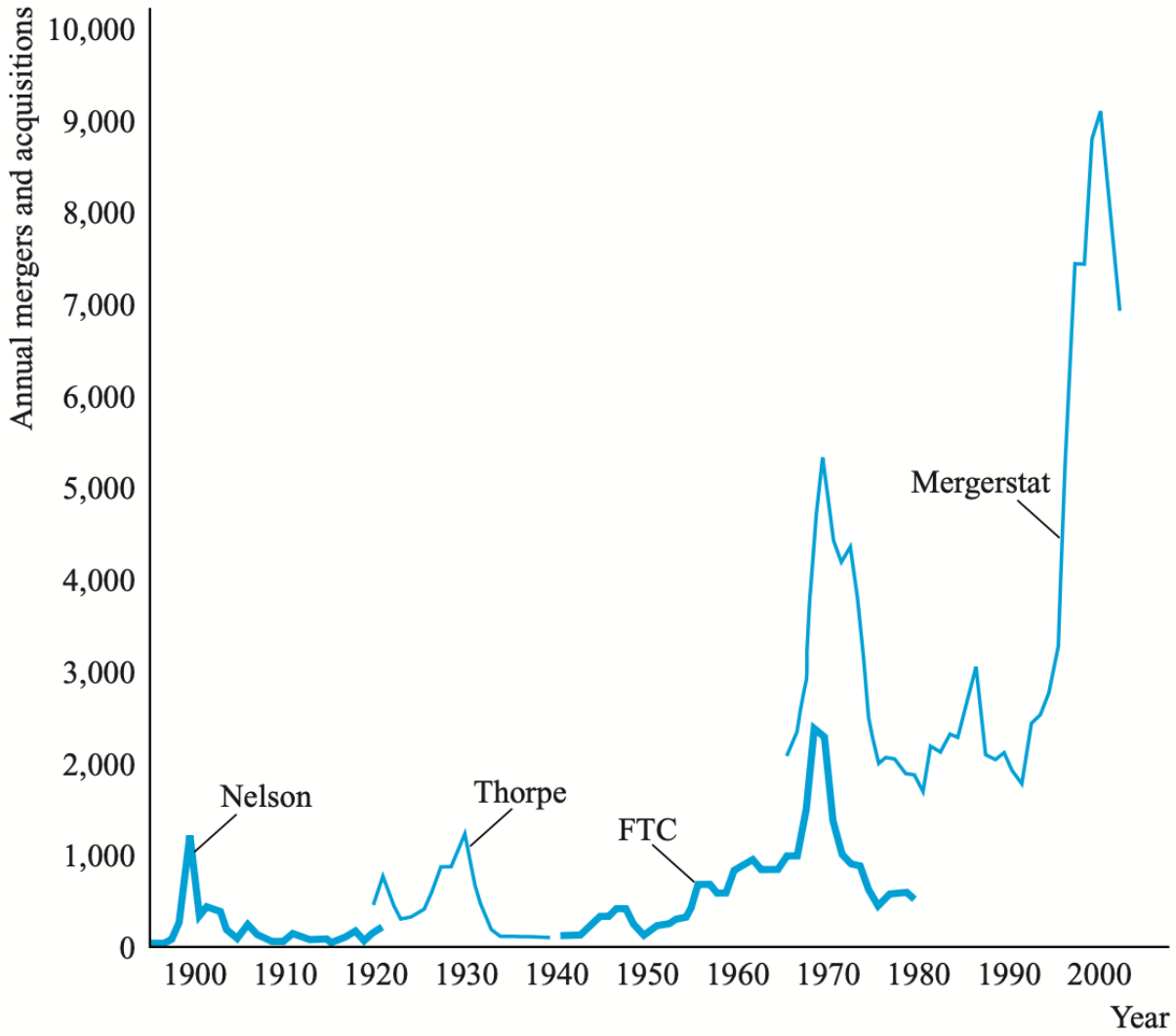
- Increasing scale to an optimal level. As cost factors of production change, the optimal size of a firm may increase.
- Reduced transaction costs. Bittlingmayer(1985) contends that the Sherman Act of 1890 created uncertainty about the legality of contracts between direct competitors and thereby create an incentive for firms that had been cooperating with each other through contracts to merge.
- Economies of scope: firms that engage in different but complementary activities may benefit from merger.
- Acquiring a badly run firm and installing better management produces gain.
- Hostile takeover. If the managers are unsuccessful in preventing the firm from changing hands, a hostile takeover occurs

Leveraged Buyout LBO

- It is also possible that the firm's managers believe that they could significantly improve profits if only the board of directors would allow them to fire employees, sell off parts of the business, and embark on new projects. Such radical changes in operation might not appeal to either shareholders or the board, so the managers themselves might decide to buy out the firm.
  - A firm that is being taken over by its managers is said to be **going private**, because there are no longer any outside stockholders to whom management must answer. But how could a group of managers afford to buy out a corporation?
  - One way is to use a leveraged buyout (LBO), in which bonds based on the corporation's assets are sold in order to raise a tremendous amount of money.
  - These bonds are sometimes called junk bonds, which are high-yield bonds backed by a corporation's assets and are considered riskier than typical corporate bonds. Junk bonds became popular in the 1980s as a way for investors to raise money to acquire control of a firm. It is safer to own a junk bond than a share of stock in the same firm because bondholders are paid before stockholders.

[Illustration] U.S. Mergers

FIGURE 2.1 Annual Number of Mergers and Acquisitions



Notes: Nelson: Data derived by Nelson (1959) for manufacturing and mining. Thorpe: Data de-

U.S. Mergers[1]

- George Stigler (1950) called the first wave near the turn of the century the merger to monopoly movement.
  - During this period, the U.S. economy was undergoing widespread changes in response to the development of railroads and communications.
  - The stock market became a more important source of capital, and this period witnessed the creation of firms that, to this day, remain large and successful—among them, General Electric and U.S. Steel.
  - The end of the first merger wave in the early 1900s coincided with a downturn in economic activity and with the Supreme Court's 1904 decision in the Northern Securities case, in which the Court found that certain (horizontal) mergers violated the antitrust law of the Sherman Act, which was passed in 1890.

U.S. Mergers[2]

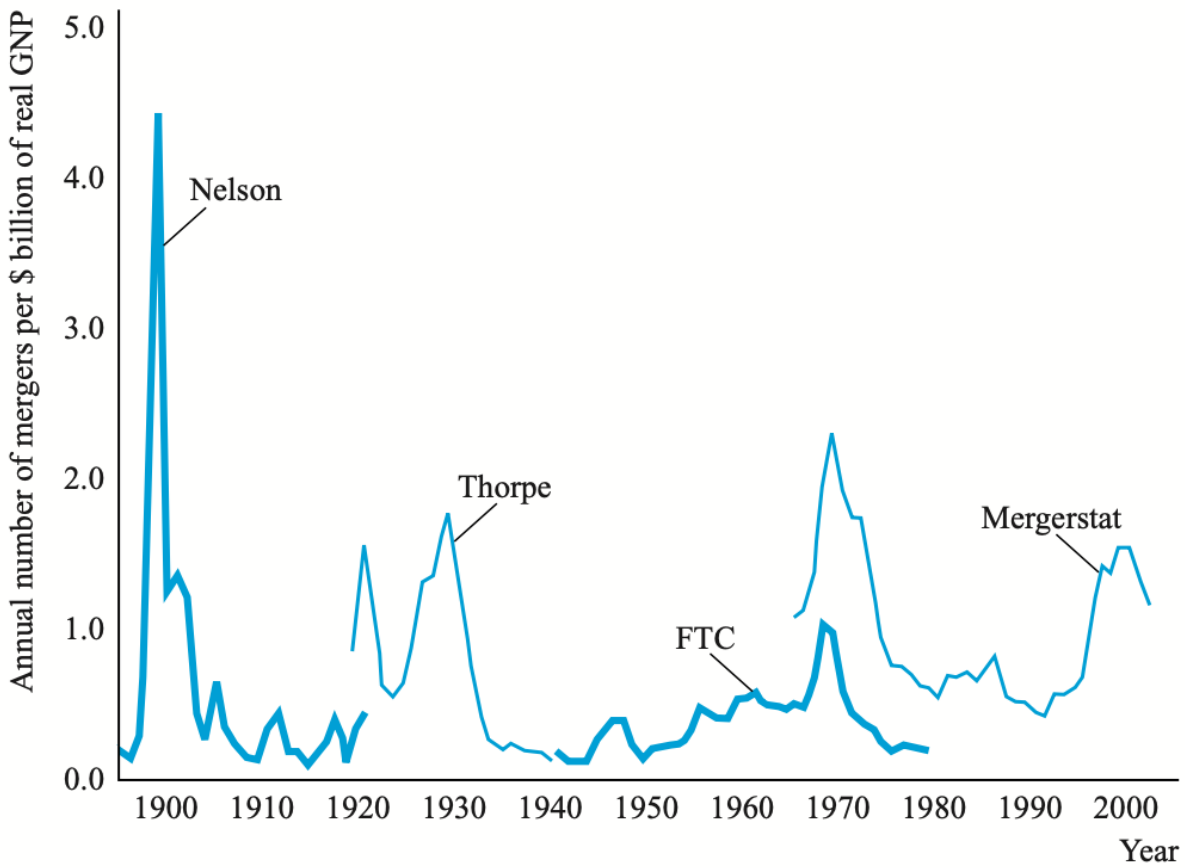
- Stigler (1950) called the second wave in the 1920s the merger to oligopoly movement. The third wave in the 1960s is called the conglomerate merger movement
  - many of these mergers produced conglomerate firms or holding companies that own many firms that produce in different markets.
- There is no common name for the fourth wave. It was in this merger wave that hostile takeovers became more common, although they still remained a small share (less than 25 percent) of overall merger activity.

U.S. Mergers[3]

- The fifth wave could be labeled the deregulation merger wave because nearly half of the mergers took place in industries that had recently been deregulated, such as airlines, telecommunications, media, and banking.
  - News reports often proclaim that the 1980s and 1990s had *unparalleled merger activity*. Based on the pure number of mergers (Figure 2.1) or the nominal (not adjusted for inflation) value of the mergers, these statements are true.
  - However, the *economy is much larger today than near the turn of the century*.
  - If we compare mergers to the size of the economy, there was greater activity near the turn of the century.
  - Figure 2.2 shows the ratio of the number of transactions per billion dollars of inflation-adjusted or "real" gross national product (GNP). Thus, the merger activity since the 1980s, though substantial, is not unprecedented.

[Illustration]Normalized Merger Value

FIGURE 2.2 Annual Number of Mergers and Acquisitions per Billion Dollars of Real GNP



Note: Annual number of mergers and acquisitions per billion dollars of real GNP (in 1982 dollars); Nelson Series, FTC "Broad" series and Mergerstat.

Source: Adapted from Golbe and White (1988). Figure 9.7, in Alan J. Auerbach, ed., *Corporate Takeovers.* Copyright 1988 by the National Bureau of Economic Research. All rights reserved.

Mergers that reduce efficiency[1]

- Some mergers are disastrous: they reduce both efficiency and profitability.
- Although the owners of the new firm may benefit, society loses.
- Such mergers may occur to take advantage of tax codes, for reasons of short-run exploitation, or to extend market or political power.
  - Suppose Firm 1 has \$100 in profits and Firm 2 has \$100 in losses.
    - ★ If the corporate tax rate is 50 percent, Firm 1 must pay \$50 in taxes, and Firm 2 pays nothing.
  - If Firms 1 and 2 combine, their profit is zero.
    - ★ The profits of Firm 1 are offset by the losses of Firm 2, so the combined firm owes no taxes.
  - The government gets \$50 less, but the profit of the new firm is \$50 more than the combined profits of the two firms had they not merged

Mergers that reduce efficiency[2]

- People might acquire a firm to take advantage of short-run gains, even if there are long-run losses.
  - Suppose a firm has implicitly agreed to employ loyal workers even during slack times.
    - ⋆ As a result of this arrangement, workers receive lower wages in return for steadier employment.
    - ⋆ If management reneged on its arrangement and fired workers during slack times, workers would never again trust management.
  - If you buy an inefficient firm and get rid of surplus labor in slack times,
    - ⋆ you can make a short-run gain.
    - ⋆ Workers will soon demand higher wages to compensate them for less steady employment,
    - ⋆ you can run the firm more profitably than the previous management.
    - ⋆ Your action may harm the firm in the long run as the wage payments rise.
    - ⋆ Still, the short-run gain to the acquiring firm could offset the long-run loss (Shleifer and Summers 1988)

Mergers that reduce efficiency[3]

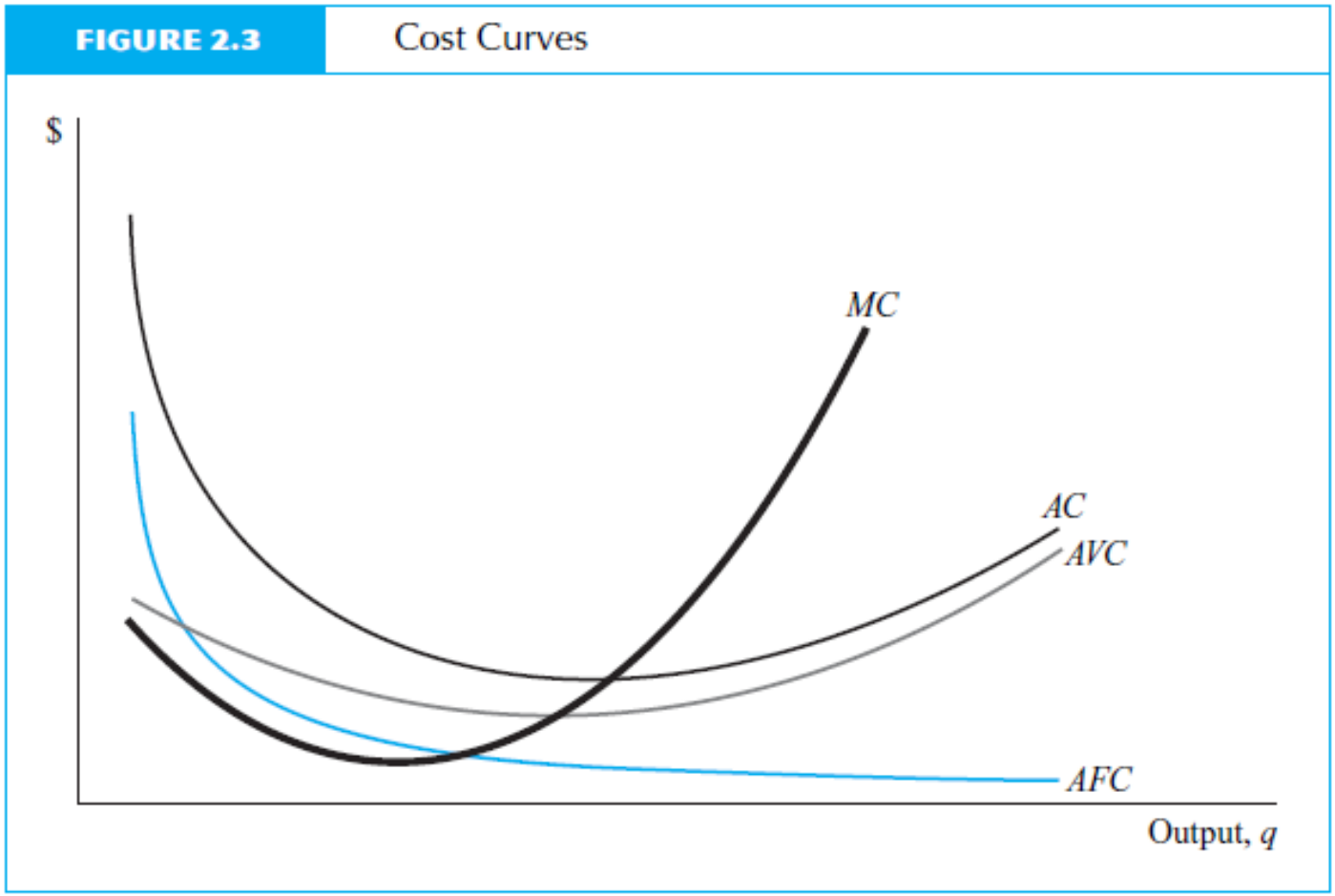
- If a sufficient number of firms in one industry merge, the resulting firm would face less competition and acquire additional market power:
  - the ability of a firm to set price profitably above competitive levels.
- Some observers point to the relaxation of antitrust scrutiny as one of the reasons for the U.S. merger wave of the 1980s and 1990s.
  - However, there is little evidence of significant increases in market power overall or in market concentration (Pautler 2001, White 2002).
- Even if firms are in different industries, so that there are no concerns about a reduction in competition, their amalgamation may create a potent political force that could influence legislation to their benefit at the expense of the rest of society.

Outline

Types of Costs

- A fixed cost (F) is an expense that does not vary with the level of output.
  - sunk cost: The portion of fixed costs that is not recoverable.
  - avoidable costs: Costs, including fixed costs, that are not incurred if operations cease.
- Variable costs (VC) are costs that change with the level of output, q. Because variable costs vary with output, we normally write them as a function of output: $VC(q)$.
- Total costs (C) are the sum of all fixed and variable costs: C= F + VC.
- Marginal cost (MC), the increment, or addition, to cost that results from producing one more unit of output.
- Average cost (AC) (sometimes called average total cost or ATC) is total cost divided by output: $AC = C(q)/q$.
- Average variable cost (AVC) is variable cost divided by output: $AVC = VC(q)/q$.
- Average fixed cost (AFC) is fixed cost divided by output: $AFC = F/q$.

[Illustration] Types of Costs



Cost Factors in Addition to Output

- A firm's costs depend on how much it produces for any given set of input prices .
- But factor prices are generally not the only influence on cost (Alchian 1959).
  - The costs of production depend not only on how much is produced but also on how fast. Producing something quickly is more costly than producing it slowly. Moreover, variation in the rate of production over time matters.
  - For example, steady production of 60 units/hour for 10 hours might involve lower costs than 100 units/hour for 2 hours plus 50 units/hour for 8 hours, even though total production is 600 units in either case.

The Short Run v.s. The Long Run

- The short run is a time period so brief that some factors of production cannot be costlessly varied.
- The long run is a period of time sufficiently long that all factors of production can be costlessly varied.
  - For example, at the end of the year, the lawyer who rented an office is free to renew the lease or lease a new space.
  - However, during the course of the year, the lease may not be broken without cost (there are sunk costs).
- In this example, the short run is less than one year, whereas the long run is one year or longer.

Opportunity Cost[1]

- As Adam Smith said,
  "The real price of everything is the toil and trouble of acquiring it."
  - That is, an action's opportunity cost is the value of the best forgone alternative use of the resources employed in that action.
- For example, if a firm hires three workers at the going wage of $10 per hour, then its labor cost is $30 per hour.
  - In this example, the opportunity cost and the actual out-of-pocket costs are the same.
- Suppose, instead, that one of the three workers is the firm's owner, who does not receive a wage.
- An economist still measures the opportunity cost of the three workers at $30 per hour: The labor used by the firm is worth $30 because another firm would value the labor at that amount.

Opportunity Cost[2]

- We use the opportunity cost to determine whether it is profitable to continue an activity:
  - suppose that each worker produces 1 unit of output per hour, which sells for $9.
  - The owner calculates the profits earned in one hour as the revenue of $27 minus the cost (using opportunity cost as the measure) of $30 for a net loss of $3.
  - The presence of a loss shows that the owner should cease production and work for someone else at $10 per hour.
  - Clearly, the owner is better off earning $10 per hour than earning $7 ($27 $20) in wages.

Opportunity Cost[3]

- Consider a firm that owns the building it occupies.
  - If the building could be rented to another tenant for $1,000 per month, then the firm should count that amount as its cost of occupying the building.
  - It is the forgone earnings of not renting out the building. If the firm cannot afford to pay itself rent (because doing so would result in a negative profit), then the firm should realize that its use of the building is not the most profitable—it would be better to go out of its current business and rent the building.

Opportunity Cost[4]

- Surprisingly, if all costs are valued at their opportunity cost, then profit need only be zero to make remaining in business worthwhile. Opportunity cost values all resources used at the highest value they could receive elsewhere.
- If revenues just cover costs, then all resources (for example, the owner's time, the firm's building) are being used in an efficient manner and would not be worth more if used elsewhere.
  - Because opportunity cost values each resource at its most profitable alternative use, economists sometimes say that opportunity cost attributes a normal profit (best possible profit from an alternative use of the resource) to all of the firm's resources.

Expensing v.s. Amortizing[1]

- Suppose that a firm rents a machine by the month for $100 and then decides to purchase the machine outright for its market price of $10,000.
  - Should it count all $10,000 as a fixed cost incurred in its month of purchase, or
  - spread the cost over the months the machine will be used?
  - When costs are counted as they are incurred, they are said to be expensed; when they are spread out over the useful life of the machine, they are said to be amortized. If the firm amortizes the cost of the machine, how much should it charge itself? The answer clearly affects how the firm judges its performance.
- The simple answer to any question about the appropriate cost to assign a durable asset is that the relevant cost is the rent that the owner could earn by renting the asset to someone else.

Expensing v.s. Amortizing[2]

- When a firm owns an office building and uses only some of the space for its own needs, it determines the appropriate market rent when it rents space.
- In other cases, the appropriate rent may not be available;
  - For example, there is no rental market for blast furnaces.
  - How should the cost of such assets be treated?
  - One answer is to calculate the cost of owning an asset as the lost interest on its value (if it were sold for \$100, that \$100 could be earning interest) plus the depreciation on the asset.
- Economic depreciation is the decline in the value of an asset during the year (for example, using a machine causes it to wear out and fall in value).
- Even when installed assets cannot be resold, one can still use this method to calculate a rent.
- The resulting profit calculation reveals whether the firm's decision to install the machine was a good one and whether further investment would be profitable.

Outline

Economies of Scale

- A firm's average costs may remain constant, rise, or fall as its output expands.
- If average cost falls as output increases, the firm is said to have economies of scale (or increasing returns to scale);
- if average costs do not vary with output, it has constant returns to scale;
- and if average cost rises with output, the firm is said to have diseconomies of scale (or decreasing returns to scale).

Reasons for Economies of Scale[1]

- There are many reasons to expect a firm's average costs to decline, at least initially, as its output expands.
- One reason is that fixed setup costs do not vary with the level of output.
  - For example, a publishing company typically incurs substantial costs to have a book written. Editors must be paid and the plates for printing made.
  - If 100 rather than 50 books are produced, the cost does not rise by a factor of 2 because the additional books require few additional costs.
  - Another example is an automobile stamping facility. Typically, special dies must be made to press the parts into their unique shapes.
  - The more parts produced with each die, the lower the average total cost of production.

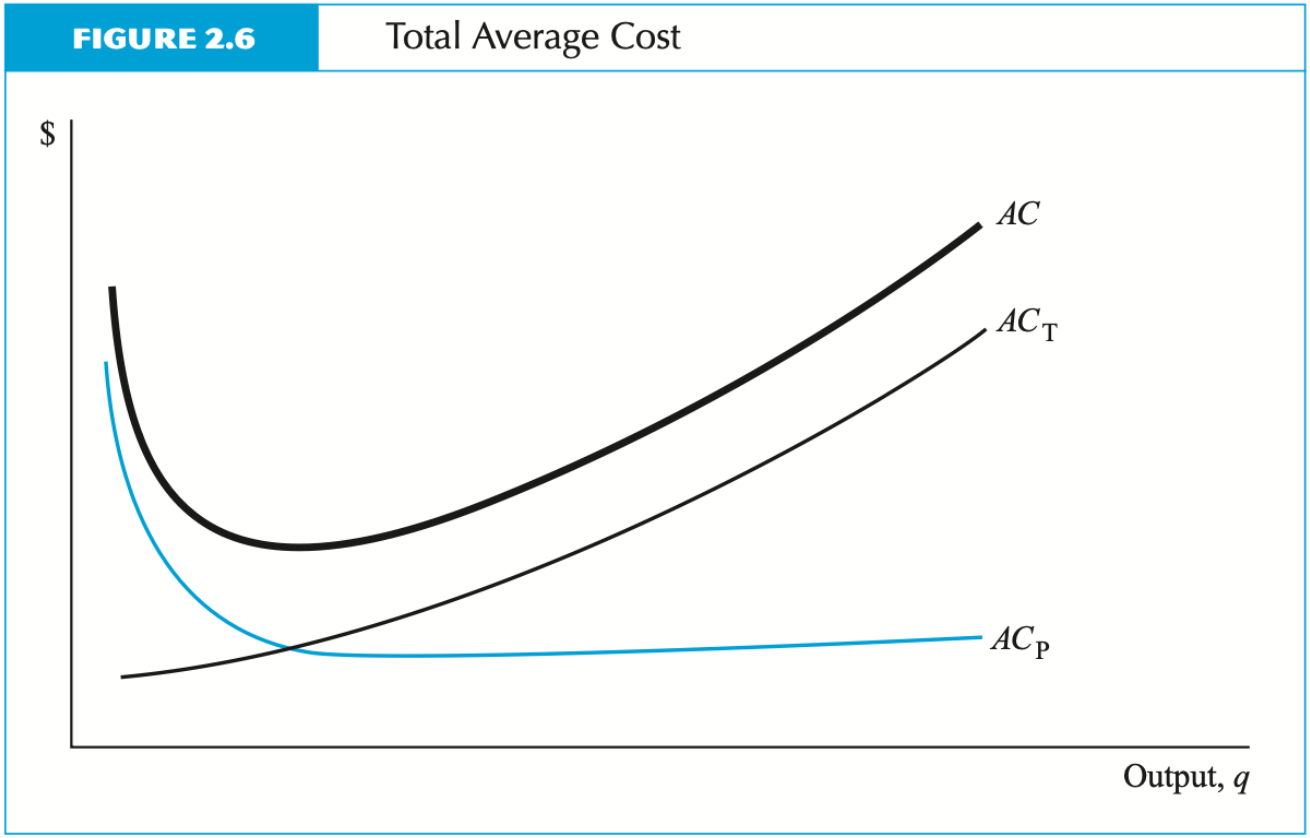
Reasons for Economies of Scale[2]

- Average costs tend to fall with increased output for a second reason. As output expands, a firm can use its labor in more specialized tasks.
  - For example, at low levels of business, one lawyer may handle both divorce and bankruptcy cases. As the law firm expands, one lawyer may specialize in divorce, while another specializes in bankruptcy, and each one can develop expertise in one area.
  - If a training cost is associated with developing expertise in each task, only a firm that requires frequent repetition of each task finds it worthwhile to train separate workers for each task.
- If a firm manufactures several products in one plant, the length of the production run could increase as output expands.
- Certain physical laws generate scale economies;
  - the best known concerns the relationship between volume and surface area. Suppose a chemical firm plans to make a certain liquid in a spherical container.
- There is a natural economy of scale in the holding of inventories and replacement parts because of the law of large numbers.

Total Costs Determine Scale Economies

- Even if economies of scale characterize some functions of a firm, diseconomies of scale may characterize other functions.
- Whether the firm experiences economies of scale overall depends on the contribution of each function to overall cost.
  - For example, just because an individual plant has economies of scale in production, one should not conclude that it is most efficient to have only one plant producing. Such a false conclusion ignores other types of costs, such as monitoring costs and transportation costs.
  - Suppose that a firm produces pasteurized milk and delivers it to grocery stores.
    - The fewer the plants, the farther the milk has to be shipped, and the higher the transportation costs.
    - Even if there are substantial economies of scale in production, it is not efficient to have one plant if transportation costs are very high.
  - The relevant average cost curve is the sum of the cost of producing the milk and the cost of transporting it to customers.

[Illustration]Average Cost



Average Cost

- Figure 2.6 shows the AC curve of production, ACP. It slopes downward initially, indicating economies of scale in production.
- The average cost of transporting raw materials to the plant and transporting the milk to customers is ACT.
  - As more milk is produced in one location, it must be shipped farther, and so average transportation costs rise.
  - The sum of these two curves is the overall average cost, AC, which is the relevant curve for determining the cost of operation.
- The output at the minimum of the AC curve would be smaller if the transportation costs increase so that ACT becomes steeper.
  - That means, all else equal, that the optimal size of the plant becomes smaller as transportation costs become more important. Many small-scale plants are common in industries characterized by high transportation costs.

Multi-product Firm

- If a firm produces two or more products, one cannot measure the average cost or the marginal cost because there is no one measure of output. One can, however, define cost concepts that are analogous to those in a single-product environment.
- For example, if q_1 units of Product 1 and q_2 units of Product 2 are produced.
- In this definition, the marginal cost of Product 1 depends not only on the level of output for Product 1 but also on q2. Marginal cost for Product 2 is defined analogously.
- Unlike marginal cost, average costs are not as easy to define in a multiproduct context. The problem arises in trying to decide whether to divide total cost by the output of Product 1, q_1, or Product 2, q_2. Perhaps total cost should be divided by the sum, $q_1 + q_2$.

Economies of Scope

- When it is cheaper to produce two products together (joint production) rather than separately, there is an economy of scope (Baumol, Panzar, and Willig 1982; Panzar and Willig 1977a). [Exercise]
  - For example, a steer produces beef and hide. Although it is possible to use some steers just for hide and others just for beef, it would be inefficient with current technology.
- Economies of scope imply that it is efficient to produce two or more products together; they do not necessarily imply that these products should be produced by a single firm.
  - For example, consider how steel is made. First, iron ore is melted down into pig iron in a blast furnace; the molten pig iron is then run into a steel-making furnace.
  - It is possible to conceive of two separate firms, side by side, one of which makes pig iron and the other steel, with a pipe carrying the molten pig iron between the two firms.

Factors that contribute to economies of scope

- **The use of common inputs**.
- **Knowledge** is one of the most important common inputs for producing and selling related products: Information about one product is likely to be relevant for another closely related product.
  - Knowing how to manufacture steel bars efficiently (knowing where to obtain low-price iron ore) might contribute to the efficient manufacture of steel sheets. In such situations, it is efficient to produce and sell these products together.
  - because it is difficult to buy and sell information, a single firm often produces related products.
- **When a person's physical presence is required for certain services**.
  - A plumber who repairs only sinks could service them better than a more versatile plumber. For that matter, there might be gains from specializing further and having one plumber repair sink washers and another repair sink stoppers.
  - But a homeowner would have to call several plumbers to diagnose the problem before finding the right specialist. In other words, because of the indivisibility involved in diagnosing a problem (you need one person physically present to do it).

[Example] The Baking Industry

- The baking industry provides an excellent example of multiplant specialization.
  - Bakeries typically produced a wide range of products (breads, rolls, cakes) and served relatively small geographic areas.
  - Bakery products are perishable, shipping distances were limited in earlier times.
- The development of improved preservatives extended the shelf life of baked goods with the result that shipping distances could be increased.
- Bakeries began to acquire nearby bakeries and use reciprocal baking to produce their products.
  - Reciprocal baking means that plants become specialized in particular products and then ship their products to each other, so that each geographic area is served by a full line.
  - Reciprocal baking allows bakery firms to take advantage of scale economies and still preserve the economies of scope in marketing that come from having a full product line.

For Further Reading I

- Carlton, Dennis W., and Jeffrey M. Perloff. Modern Industrial Organization. Fourth edition. Harlow, Essex, England: Pearson, 2015. Print.
- Belleflamme, Paul., and Martin. Peitz. Industrial Organization : Markets and Strategies. Cambridge, UK ;: Cambridge University Press, 2010. Print.