Chapter 18
Horizontal, Vertical, and Conglomerate Mergers

The immediate and most dramatic way for a company to expand its size and influence market structure is to purchase another company. Historical examples abound. In the late 1800s, Standard Oil Company gained a 90% share of the petroleum market by purchasing more than 120 competitors. In the 1960s, ITT (International Telephone and Telegraph) became a diversified corporation by acquiring 52 domestic and 55 foreign companies, including such well-known businesses as Avis Rent-a-Car, Continental Baking (Wonder Bread), Hartford Insurance, and Sheraton Hotels. By 1968, ITT had become the 11th largest corporation in the USA. The recent financial crisis has forced a number of very large acquisitions. The largest of these occurred in 2008, with Bank of America purchasing Merrill Lynch, a provider of insurance and financial services, for $50 billion and Wells Fargo Bank purchasing Wachovia Bank for $15.1 billion.

In the business and economics literature, these examples are called mergers and acquisitions, which we will typically call mergers.[1] They are said to occur when two or more independent firms come under the control of a single firm. As we discussed in Chap. 2, there are three types of mergers. The first is a horizontal merger, which involves the combination of firms that compete in the same market. Standard Oil's acquisition of a competing oil company constitutes a horizontal merger.

The second type is a vertical merger. This involves the combination of firms that have a buyer–seller relationship. For example, a manufacturer of hardwood desks may purchase one of its input suppliers, such as a hardwood supplier, or one of its distributors. You can think of this as a process where output from various stages of production travel down a stream, with raw input suppliers located furthest upstream and retail distributors located furthest downstream. Thus, when a manufacturer buys

[1] Technically, an acquisition happens when one company buys another. Acquisitions are sometimes hostile (i.e., hostile takeovers). This occurs when management of the targeted firm resists being purchased by the acquiring firm. A merger occurs when companies become a single new company. These are sometimes called "mergers of equals," because typically the companies involved are of similar size.

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one of its input suppliers, this is called an **upstream (backward) vertical acquisition**. When a firm buys another firm that purchases its product, this is called a **downstream (forward) vertical acquisition**. Another way of looking at such mergers is that they involve a merger between firms that produce complementary goods.

The third type, a conglomerate merger, captures all mergers that are neither horizontal nor vertical. That is, a conglomerate merger involves firms that produce unrelated products that are neither substitutes nor complements. One example is when ITT, a telephone and telegraph company, purchased Sheraton Hotels. Conglomerate mergers cover a lot of ground and can be divided into two types: pure and impure conglomerate mergers. A **pure conglomerate merger** involves two firms that produce completely unrelated products that compete in separate markets, such as an ice cream parlor that purchases a bicycle shop.

An **impure conglomerate merger** involves firms that compete in markets that are not entirely separate. This can occur when the merging firms produce the same product but in different geographic locations, which is called a **market extension merger**. Another type is a merger between firms that sell "somewhat" related products. This is called a **product extension merger**.[2] For example, a merger between an ice cream parlor and a donut shop could be considered a product extension merger, because ice cream and donuts are imperfect substitutes.[3]

In this chapter, our goal is to provide a brief history of mergers in the USA and discuss why mergers take place.[4] We begin with a general discussion of the main motives for merger. Because the causes and consequences can be quite different for each type, we also discuss the unique motives and empirical evidence for horizontal, vertical, and conglomerate mergers separately.

18.1 A Brief History of US Mergers

Fig. 18.1 plots data from several studies regarding the number of mergers and acquisitions in the USA from 1895 to 2005. It shows that mergers came in waves and that there were four periods of relatively high merger activity.[5] The first wave

[2] Notice that product and market extension mergers are related to horizontal mergers, because the firms involved are imperfect competitors in the product extension case and potential competitors in the market extension case. Thus, they can have greater antitrust consequences, as we will see in Chap. 20.

[3] This begs the question of how close is close, a question that is difficult to answer in practice. Certainly, vanilla ice cream and strawberry ice cream are close enough substitutes such that a merger between a supplier of vanilla and a supplier of strawberry ice cream would be considered a horizontal merger. But what about a merger between an ice cream parlor and a bakery? Clearly, judgment calls must be made.

[4] Antitrust implications are discussed in the next chapter.

[5] For a more complete discussion of US merger waves, see Scherer and Ross (1990) and Martin (2007a, b).

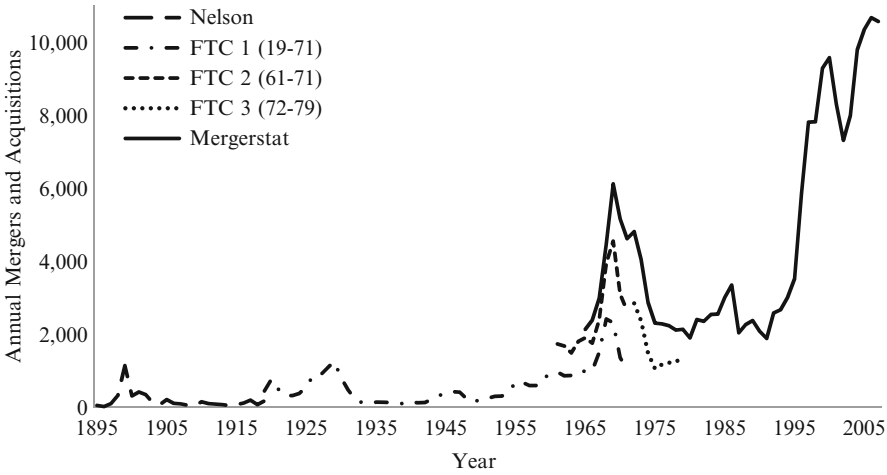

Fig. 18.1 Total number of mergers and acquisitions, 1895–2005

occurred at the end of the nineteenth century. Stigler (1950) called this a period of "merger for monopoly," because these mergers typically involved several firms within the same industry and produced a dominant firm. Of the mergers in this period, Nelson (1959) found that 75% involved at least five firms and 26% involved at least ten firms within the same industry. Many of today's dominant firms gained their positions during this period, including General Electric, Goodyear, Standard Oil (Exxon Mobil today), and US Steel.

The second wave occurred in the 1920s. By the beginning of the twentieth century, strict enforcement of the antitrust laws made it impossible to create a dominant firm by merger. Thus, although most mergers during this period were horizontal, they typically involved small firms. As a result, Stigler (1950) calls this a period of "merger for oligopoly." Besides horizontal mergers, Eis (1969) found that vertical and product-extension mergers also became more common during this wave.

The third wave occurred in the 1960s and marked an era of conglomerate mergers. Passage of the Celler-Kefauver Act of 1950 closed a loophole in the Clayton Act, making it much more difficult for firms to engage in horizontal mergers. This channeled mergers in the conglomerate direction. As a result, approximately 80% of mergers between 1963 and 1972 were conglomerate in nature (Ravenscraft and Scherer 1987).

The fourth wave began in the 1990s and continues to this day. Government policy appears to play a role at the beginning of the wave. In fact, Andrade et al. (2001) call the 1990s the "decade of deregulation," as previously regulated industries accounted for nearly half of the merger activity from 1989 to 1997. Industries and the year of deregulation include: airlines (1978), broadcasting (1984 and 1996), utilities (1992), banking (1994), and telecommunications (1996), and each experienced considerable activity. Although merger activity waned after the terrorist attacks of September 11, 2001, it subsequently picked back up.

Before discussing potential motives for horizontal, vertical, and conglomerate mergers, it is important to put in perspective the merger numbers in Fig. 18.1. They indicate that there has been unparalleled merger activity in the most recent wave. However, the size of the economy is substantially larger today than ever before. If we normalize the number of mergers by real gross national product, the merger wave at the end of the nineteenth century dominates all others (Carlton and Perloff 2005).

18.2 Main Motives for Merger

Mergers occur for a variety of reasons. If firms are profit maximizers, mergers are motivated by purely financial considerations. At any given time, a firm has a number of investment opportunities, one of which is to expand the size of the company. This can be done internally, by building new plant and equipment, or externally, by acquiring another company. Managers who are motivated by profit alone will choose the investment that produces the highest expected profit. A merger will be profitable when it is expected to create some type of synergy, an outcome where the whole exceeds the sum of its parts. This can take the form of a cost synergy, which leads to lower costs, or revenue synergy, which gives the combined company greater market power, for example.

Other factors can influence merger activity. For instance, risk averse managers will pursue safer investments. In addition, research in behavioral economics suggests that managers may have their own psychological motives for mergers. Finally, government policy can influence a firm's merger decision.

In this section, we provide a brief description of the main motives for merger activity. A more detailed discussion will be provided in subsequent sections when a motivation is particularly relevant to horizontal, vertical, or conglomerate mergers. It is important to note that although some motives are more applicable than others, there are typically multiple causes for any given merger. For the most part, we will postpone discussion of antitrust issues until Chap. 20.

18.2.1 Market Power

Perhaps the most obvious potential reason for mergers is to increase market power. After all, if a merger enables the combined firm to raise prices, *ceteris paribus*, it will raise the profit and market value of the firm. This is most natural for horizontal mergers, because they reduce the number of competitors. If firms compete in a Cournot-type game, for example, average firm profit increases with a decrease in the number of competitors. Nevertheless, a vertical merger may also increase market power if it increases entry barriers. Conglomerate mergers are least likely to raise market power, but we will see that under certain circumstances multimarket contact can increase the likelihood of cooperation among firms. Mergers that raise market power are socially undesirable because they increase allocative inefficiency.

18.2.2 Efficiency

Mergers that increase efficiency are socially desirable. There are many ways in which a merger can raise productivity, depending on the type of merger. One example is an industry that has substantial economies of scale, where a horizontal merger between two small firms leads to lower unit costs.

A merger to exploit scale economies represents a static efficiency motive, but dynamic considerations can be just as significant. At any point in time, the relative performance of firms in an industry can vary widely, as superior firms may employ a more effective management team or have access to higher quality raw materials. Over time, firms that fall below an acceptable performance threshold exit the market. Dewey (1961) points out that this can occur through merger as well as bankruptcy. As Dewey (1961, 257) puts it, most mergers "are merely a civilized alternative to bankruptcy or the voluntary liquidation that transfers assets from failing to rising firms."

According to Manne (1965), this line of reasoning motivates the market's way of disciplining inefficient firms through what is called the **market for corporate control**. Ownership shares of public corporations are traded on the stock market. Firms with ineffective managers will experience declining profits, which will cause an observable decline in the market (stock) value of the firm. At some point, the firm will go bankrupt and exit the market. Before this happens, however, a firm with a successful management team may purchase the failing firm and replace its inefficient managers with more efficient ones. According to the market for corporate control hypothesis, this threat of takeover, which can be hostile in nature, will provide sufficient pressure on managers of all corporations to behave efficiently and in the interest of its owners. In Manne's (1965, 113) words:

> The lower the stock price, relative to what it could be with more efficient management, the more attractive the take-over becomes to those who believe they can manage the company more efficiently. And the potential return from the successful take-over and revitalization of a poorly run company can be enormous.

Mergers such as these will be socially efficient, because they eliminate managerial inefficiency.

18.2.3 Other

There are at least three other motives for mergers. First, firms may pursue a merger to reduce risk (i.e., the variance in profits). We will see that this motive can be especially applicable to conglomerate mergers, because a conglomerate merger increases the extent to which a firm is diversified into different markets.

Second, government policy can influence merger activity. We have already seen that many of the mergers in 1990s were motivated by deregulation. Current tax policies can also cause certain types of mergers to be profitable. For example, a vertical merger between a manufacturer and input supplier may allow the firm to charge itself a high-accounting cost or transfer price for internally supplied inputs.

This will reduce the firm's accounting profit and reduce its corporate income (i.e., profit) tax payment. For example, a merger between a firm that earns $100 million with a firm that loses $100 million will eliminate the joint company's profit, enabling it to pay 0 corporate income tax. Moreover, an international merger may allow the joint company to shift profits to subsidiaries in countries with low corporate income tax rates. As an example of divergent tax rates, the average (federal and state) corporate rate is 39.1% in the USA and is 28% in the UK.[6]

The third set of factors that may influence merger activity derive from non-profit-maximizing behavior found in the managerial and behavioral economics literature. As noted in Chap. 2, in very large corporations stockholder ownership is separate from managerial control. From agency theory we know that this creates a *principle–agent problem*, which arises when the principle (owner of a company) and the agent (manager) are separate and have different goals.[7] In other words, agents have a conflict of interest, as it is not in the agent's interest to maximize the welfare of the principle. For large corporations, owners want to maximize profits (or the present value of the stream of present and future profits), while managers are more interested in maximizing their own income. The principle–agent problem can lead to excessive merger activity from the point of view of owners unless manager income is closely tied to corporate profits and the value of the firm.

Furthermore, evidence from behavioral economics shows that some managers are overly optimistic or excessively driven to build corporate empires, which can also lead to excessive merger activity. Because antitrust law effectively constrains large horizontal and vertical mergers, these motives are more common with conglomerate mergers.

With these basic ideas in place, we now discuss how they apply to horizontal, vertical, and conglomerate mergers.

18.3 Horizontal Mergers

Motives for horizontal mergers are the most straightforward, so we discuss them first. In theory, horizontal mergers can reduce both competition and production costs. Because less rigorous competition is socially undesirable and lower costs are socially desirable, the welfare effect of a particular horizontal merger depends on the relative importance of these two effects. In this section, our goal is to unearth these benefits and costs and evaluate the social consequences of horizontal mergers. We begin with a theoretical discussion of the motive for horizontal mergers and conclude by summarizing the empirical evidence.

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[6] National and state corporate income tax rates are available from the Tax Foundation, http://www.taxfoundation.org/taxdata/show/23034.html.

[7] For early discussions of this problem, see Berle et al. (1932) and Marris (1964). For more recent surveys of the principle–agent problem, see Rees (1985a, b), Eisenhardt (1989), and Shleifer and Vishny (1997).

18.3.1 The Market Power Motive for Mergers

Because a horizontal merger reduces the number of competitors, firms in the same industry may merge to increase market power. Early mergers in our history best reflect this motive. One example is the 1892 merger between Thomson-Houston and Edison General Electric to form the General Electric Company. Regarding the merger, Thomas Edison is quoted as saying, "The consolidation... will do away with a competition that has become so sharp that the product of the factories has been worth little more than ordinary hardware."

In another example, US Steel Corporation became a dominant firm by merging 785 plants in 1901. This gave the company control of about 65% of the steel capacity in the USA. As we discussed in Chap. 9, this merger greatly benefited US Steel by reducing price competition. Before the merger, the combined value of the individual companies was approximately $700 million, and after the merger US Steel was worth approximately $1.4 billion.[8]

The simplest way to illustrate that a horizontal merger can increase market power is to consider a Cournot model with n firms. From the Cournot Limit Theorem, discussed in Sect. 10.1.3, we know that Cournot equilibrium prices and profits increase as the number of competitors decreases. Thus, any horizontal merger will increase the profits of the average firm.[9] Nevertheless, even though the average firm benefits from a horizontal merger, Salant et al. (1983) showed that firms participating in the merger do not necessarily earn greater profit. This is called the **merger paradox**.

To illustrate this idea, consider a Cournot model with n original firms that produce homogeneous goods. Inverse demand is $p = a - bQ$, where p is price, Q is industry output, and firm i's total cost is $\text{TC}_i = cq_i$, where q_i is firm i's output, $b > 0$, and $a > c > 0$. From Chap. 10 we saw that firm i's Cournot equilibrium profit (π_i^*) is

$$\pi_i^* = \frac{(a-c)^2}{b(n+1)^2}. \tag{18.1}$$

If m firms engage in a horizontal merger where $2 \leq m \leq n$, this leaves $n - m + 1$ firms in the industry. For example, if three firms merge in a market that originally has six firms, four firms remain ($6 - 3 + 1 = 4$). Thus, if m firms merge, firm i's profits become

$$\pi_{i,m}^* = \frac{(a-c)^2}{b(n-m+2)^2}. \tag{18.2}$$

[8] Part of this gain could have been caused by cost efficiencies. For further discussion of this merger, see Scherer and Ross (1990) and Greer (1992).

[9] Of course, not all models give the same prediction. In the homogeneous Bertrand model with symmetric firms, a merger short of monopoly will have no effect on prices and profits.

Because a merger reduces the number of firms, firm i's profits increase as a result of the merger. This is because overall industry output falls with fewer firms in the Cournot model.

For a merger of m firms to be profitable for the combined firm, however, its postmerger profits must be greater than its premerger profits of all m firms. For firms involved in the merger, postmerger profits are $\pi_{i,m}{}^{*}$ and premerger profits are m times π_i^*. From (18.1) and (18.2), this means that the following inequality must hold for the merger to be profitable:

$$\frac{(a-c)^2}{b(n-m+2)^2} > \frac{m(a-c)^2}{b(n+1)^2}. \tag{18.3}$$

This condition is met when $(n + 1)^2 > m(n - m + 2)^2$. For this condition to hold, m must be greater than 80% of n.[10] Thus, a horizontal merger generally benefits outside firms more than the merged firm. Notice that this condition does not depend on demand or cost parameters and is, therefore, true for any linear demand and cost equations. The Salant et al. (1983) model suggests that firms are unlikely to pursue horizontal mergers for market power reasons because today's antitrust enforcement would forbid a merger that involved more than 80% of the firms in an industry.[11]

Nonetheless, you would be correct to question this conclusion. A key reason for the merger paradox associated with the Cournot model is symmetry. Firms remain symmetric after the merger, with the merged firm adjusting its equilibrium output level to equal that of its remaining competitors.

The paradox can be overturned if we introduce sufficient asymmetry. For example, if a horizontal merger leaves the merged firm with considerable productive capacity, firms would be asymmetric and the merged firm may behave like a dominant firm or Stackelberg leader, as discussed in Chap. 11. Because the leader earns greater profit than the follower in a Stackelberg (i.e., dynamic Cournot) model, a horizontal merger would be more likely in this case (Daughety 1990). In addition, Creane and Davidson (2004) showed that a horizontal merger can be profitable for the merged firm if it treats its original m firms as independent entities. Finally, Deneckere and Davidson (1985) showed that the merger paradox is overturned in a Bertrand game when there is sufficient product differentiation. In conclusion, the theoretical literature demonstrates that there can be a market power motive for horizontal merger.

[10] More precisely, the following condition must hold for a merger to be profitable, $m > n + 1.5\sqrt{5+4n}/2$. For example, m must be greater than 80% of n when $n = 5$ firms, 81.5% when $n = 10$, and 91.4% when $n = 100$.

[11] This conclusion would also hold in a Bertrand model where firms compete in price instead of output. In the Bertrand case, as long as $m < n$, the Bertrand price remains at marginal cost. In this model, market power is nonexistent, and a horizontal merger cannot increase market power as long as more than one firm remains.

18.3.2 *Efficiency Motive for Horizontal Mergers*

Firms may also engage in a horizontal merger if it lowers costs. There are two principle ways that this can happen. First, the market for corporate control applies when an efficiently run firm buys a poorly managed one. As inefficient managers are replaced by a more efficient management team, this can reduce overhead (fixed) costs. It can also cause inputs to be used more efficiently, thus, lowering variable costs. Synergies such as these may be easier to accomplish with a horizontal merger than a vertical or conglomerate merger, because managers in the acquiring firm will have a better understanding of the production and marketing technologies of firms in the same industry.

Second, firms may merge in order to increase their size and take advantage of economies of scale. That is, a single larger firm will have lower unit costs than two smaller firms. There are two types of scale economies, technical and pecuniary economies. **Technical economies** occur when a larger firm can use fewer inputs to produce a unit of output. This produces genuine cost savings to society. **Pecuniary economies** result from a larger firm's ability to bargain for lower input prices, which are normally associated with quantity discounts for raw materials or lower interest rates for financial capital.[12] These savings benefit the larger buyer (firm) at the expense of the seller (input supplier), and, therefore, do not constitute a social gain. Because pecuniary economies involve issues of equity, we focus on technical economies in this chapter.[13]

A horizontal merger that lowers costs can also increase market power, and it is important to compare their relative effects. Williamson (1968) developed a model to address this issue. To illustrate, consider a market with firms that produce homogeneous goods. Demand and cost conditions are described in Fig. 18.2, where D is market demand, MR is marginal revenue, and MC is long-run marginal cost. Before the merger marginal cost equals MC_1 and the market is perfectly competitive. This produces the equilibrium price and market output pair, p_1^* and Q_1^*. Profit or producer surplus is 0 in perfect competition, and total surplus equals consumer surplus, area Ap_1^*B.

Now, consider the effect of a merger on total surplus. After the merger, assume marginal cost falls to MC_2 in Fig. 18.2 and produces a monopoly outcome at Q_2^* and $p_2^* > MC_2$. Notice that two things happen. First, consumer surplus falls to area Ap_2^*H. Second, producer surplus increases from 0 to area p_2^*EFH. Area $p_2^*p_1^*$GH is transferred from consumers to producers. Total surplus becomes area AEFH. The change in total surplus is AEFH $- Ap_1^*B = p_1$EFG $-$ HGB, which is positive (negative) when the merger is efficient (inefficient). Even though the merger raises price and creates market power, you can see that in this example, it is efficient because it leads to a sufficient reduction in costs (i.e., $MC_1 - MC_2$ or $p_1^* - E$ is sufficiently large).

[12] Alternatively, this may occur because the larger firm is more patient in bargaining than the smaller firm, as we discussed in Chap. 3.

[13] We postpone our discussion of equity issues until Chap. 19.

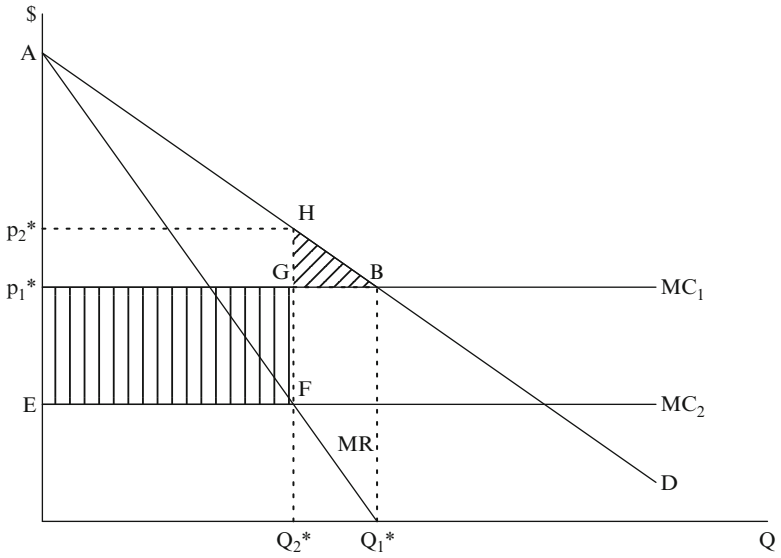

Fig. 18.2 Efficiency and a horizontal merger

To further illustrate this idea, we consider specific functional forms. The inverse market demand is linear, $p = 12 - Q$. Firms face identical costs in each period. Period 1 is pre-merger, and period 2 is post-merger. The total cost equation for each firm in period t is linear, $\mathrm{TC}_t = s{\cdot}c{\cdot}q_t$, where q_t is firm output in period t and $0 < c < 12$. Parameter $s > 0$ captures the cost savings due to a merger, equaling 1 before the merger and less than 1 after the merger. That is, $\mathrm{MC}_1 = c$ and $\mathrm{MC}_2 = s{\cdot}c$. For example, if the merger reduces cost by 10%, s equals 0.9. To provide a concrete answer, let $c = 6$. Before the merger, the market is perfectly competitive, with ${p_1}^* = {Q_1}^* = c = 6$. Because long-run profit is 0 in perfect competition, consumer surplus equals total surplus, which is 18.

The post-merger outcome depends upon the number of firms remaining after the merger. Consider the case where a merger involves all firms in the industry, transforming it from perfectly competitive to monopoly. The monopolist's profit equation is total revenue, $\mathrm{TR}_2 = (12 - q_2)q_2 = 12q_2 - {q_2}^2$, minus total cost, $\mathrm{TC}_2 = s6q_2$. The equilibrium price is ${p_2}^* = 3(2 + s)$, and equilibrium market output is ${q_2}^* = {Q_2}^* = 3(2 - s)$. Consumer surplus ($\mathrm{CS}_2$), profits or producer surplus (PS_2), and total surplus (TS_2) after the merger are:

$$\mathrm{CS}_2 = \frac{(12 - p_2^*)Q_2^*}{2} = \frac{9(2-s)^2}{2}, \tag{18.4}$$

$$\begin{aligned}\mathrm{PS}_2 &= \mathrm{TR}_2 - \mathrm{TC}_2 \\ &= \left(12q_2^* - q_2^{*2}\right) - \left(6sq_2^*\right) = 9(2-s)^2,\end{aligned} \tag{18.5}$$

$$\mathrm{TS}_2 = \mathrm{CS}_2 + \mathrm{PS}_2 = \frac{27(2-s)^2}{2}, \tag{18.6}$$

Notice that consumer, producer, and total surplus increase with greater cost saving (i.e., as s falls). If a merger does not generate cost savings (i.e., $s = 1$), then $\mathrm{TS}_2 = 13.5$, and society is clearly worse off as a result of the merger. If the merger reduces costs by over 15.5% ($s < 0.845$), it will increase total surplus and be socially efficient. Equity may also be a concern, however, as consumers are worse off as a result of a merger that produces a monopoly. The only way in which consumers can be unharmed by the merger is if costs fall by 100% ($s = 0$).

Today, it is illegal for firms to merge and form a monopoly. So, we are more interested in analyzing what happens if the merger creates an oligopoly. The answer to this question depends on the structure of the game that firms play. Consider the case where firms compete in a static pricing game, as described in the Bertrand model of Chap. 10. The total cost function for firms that did not merge would remain the same, $\mathrm{TC}_1 = cq_1$, while firms that did merge would see a cost reduction, $\mathrm{TC}_2 = s{\cdot}cq_2$ and $s < 1$. Firms that did not merge would have higher costs, $\mathrm{TC}_1 = cq_1$. In the Bertrand equilibrium, the merged firm will set its price just below its rivals' marginal cost of c. This will put rivals out of business but benefit consumers, producers, and society. Of course, rivals might respond with mergers of their own, which would put the Nash price at $s{\cdot}c$. In this case, all of the gain from lower costs would go to consumers. Producers would earn 0 profits before and after the merger, so all mergers that lower costs in a Bertrand game with homogeneous goods increase consumer and total surplus.

The answer is quite different when firms compete in a Cournot game. We assume that a wave of mergers creates a cost saving but also changes the number of firms from many (competitive) to just a few competitors. Demand and cost functions are the same as in the above example. The Cournot equilibrium was derived in Sect. 10.1.3, except that here marginal cost equals $s{\cdot}c$.

$$p^* = \frac{12 + scn}{n+1}, \tag{18.7}$$

$$Q^* = nq_i^* = \frac{n(12-sc)}{n+1}, \tag{18.8}$$

$$\mathrm{PS} = n\pi_i^* = \frac{n(12-sc)^2}{(n+1)^2}, \tag{18.9}$$

$$\mathrm{CS} = \frac{(12-p^*)Q^*}{2} = \frac{n^2(12-sc)^2}{2(n+1)^2}, \tag{18.10}$$

$$\mathrm{TS} = \mathrm{CS} + \mathrm{PS} = \frac{n^2(12-sc)^2}{2(n+1)^2}. \tag{18.11}$$

Table 18.1 Cost savings (in percent) needed for a horizontal merger to improve total surplus and consumer surplus

	Costs must fall by more than the following to increase:	
n^*	Total surplus	Consumer surplus
100	0.005%	1.0%
10	0.42%	10.0%
9	0.50%	11.1%
8	0.62%	12.5%
7	0.79%	14.2%
6	1.04%	16.7%
5	1.42%	20.0%
4	2.06%	25.0%
3	3.28%	33.3%
2	6.01%	50.0%
1	15.5%	100.0%

n^* is the number of firms that remain after a merger. Column 2 identifies the minimum cost decrease that is needed for total surplus to increase or remain the same as the result of a merger. Column 3 identifies the minimum cost decrease needed for consumer surplus to increase or remain the same as the result of a merger

In this case, it is unclear whether a wave of mergers benefits society. A merger will lower s, which will put downward pressure on price, but it will also lower n, which puts upward pressure on price.

We use Table 18.1 to explain how s and n affect consumer and total surplus when a cost saving merger changes market structure from perfect competition to Cournot oligopoly. Column 1 lists the equilibrium number of firms that remain after the merger wave, n^*. Column 2 identifies the minimum cost decrease needed for total surplus to increase or remain the same. Column 3 identifies the minimum cost decrease needed for consumer surplus to increase or remain the same. For example, if 100 firms remain after a merger wave, costs must decrease by more than 0.005% for total surplus to increase and by more than 1% for consumer surplus to increase. In this Cournot model, three substantive implications emerge.

1. For a merger wave to be socially efficient, a relatively small cost decrease is required. For example, a merger wave that transforms an industry from perfectly competitive to Cournot with five firms will increase total surplus if costs fall by at least 1.42% (i.e., $s < 0.9858$).
2. For a merger wave to improve consumer surplus, a relatively large cost decrease is required. A merger wave that transforms an industry from perfectly competitive to Cournot with five firms will increase consumer surplus if costs fall by at least 20%.
3. A merger wave increases producer surplus, even if there is no cost saving (i.e., $s = 1$).

The main contribution of Williamson's (1968) work is the so called **Williamson trade-off**: in evaluating the effect of a horizontal merger on economic efficiency, one must compare the loss due to a reduction in competition with the gain due to

lower costs. If a merger results in a sufficient reduction in costs relative to the increase in market power, then consumers as well as society can be better off. Society is worse off, however, if horizontal mergers increase market power and have little or no effect on costs.

18.3.3 The Empirical Evidence

Economists have used three methods to analyze the economic effect of horizontal mergers. The first is the event study approach, which was developed by Eckbo (1983), Stillman (1983), and Eckbo and Weir (1985). It is based on the efficient-market hypothesis, which states that markets such as the stock market are informationally efficient (Fama 1965). This means that the price of a company's stock at a point in time reflects all publically available information and, therefore, accurately reflects the true or fundamental value of the firm.

If markets are efficient, one can use stock market data to test the hypothesis that an event like a horizontal merger is motivated by market power or efficiency. Mergers that increase market power will produce higher prices, *ceteris paribus*, which benefits all firms in the industry. This will cause the stock values of all firms to rise, both merging and rival firms alike. Mergers motivated by efficiency alone, however, will make the merging firm a tougher competitor and harm rivals. Thus, the stock value of rival firms will fall. The event study approach implies the following test: a horizontal merger that increases the market value of rival firms implies that the market power effect is dominant; and a horizontal merger that lowers the value of rival firms implies that the efficiency effect is dominant. To use the test, all one needs to do is analyze stock-price reactions of rival firms to a horizontal merger announcement.

Early studies by Eckbo (1983), Stillman (1983), and Eckbo and Wier (1985) rejected the market power motive for merger. That is, horizontal merger announcements did not increase the value of rival firms. More recently, Mullin et al. (1995) and Fee and Thomas (2004) used the event study approach to investigate the effect of horizontal mergers on upstream and downstream markets. These results are mixed: the Mullin et al. evidence suggests that horizontal mergers were anticompetitive; Fee and Thomas found support for the efficiency motive and rejected the market power motive for merger. In most cases, the event study evidence suggests that horizontal mergers are not anticompetitive. If true, this implies that antitrust enforcement has effectively eliminated horizontal mergers that increase market power.

Nevertheless, the event study approach has been criticized for a number of reasons. First, McAfee and Williams (1988) used the event study approach to examine a single horizontal merger, one that was specifically chosen because it was motivated by market power.[14] Yet, their event study results rejected the market

[14] It involved the 1979 merger between the Xidex and Kalvar corporations, producers of microfilm. This merger was successfully challenged by the Federal Trade Commission. Barton and Sherman (1984) demonstrated that it led to higher output prices and greater market power.

power hypothesis. McAfee and Williams argued that the main problem with the event study approach is that most acquiring and rival companies are conglomerates that derive only a small percent of their profits from the market affected by the merger. Thus, even if a merger raises market power, it is unlikely to be detected by the event study approach.

Second, Whinston (2007) pointed out that so called "precedent effects" can also be a problem with event studies. That is, a merger may convey other market information that raises the value of rival firms. For example, a merger that improves efficiency may inform the market of the productivity gains associated with mergers in this industry. This would raise the value of all firms in the industry that are likely to engage in similar mergers. In this case, event study results that suggest the presence of market power may be invalid.

The third criticism of the event study approach derives from behavioral economics.[15] Research in behavioral economics shows that some market participants may make systematic errors, which can cause markets to behave inefficiently and refute the efficient-market hypothesis (De Long et al. 1990, 1991). To see how this can invalidate the event study approach, consider the stock value of a hypothetical software company, Macrosoft. The fundamental value of a share of Macrosoft stock is $25 per share. Now imagine that a group of irrational investors become overly pessimistic about Macrosoft's future, which lowers its value to $20. De Long et al. (1990) called these "noise traders". If all investors were rational, they would bid up the price of Macrosoft stock back to $25. With some irrational noise traders, however, the rational investor may avoid Macrosoft stock or sell Macrosoft stock early because they fear that overly pessimistic investors may become even more pessimistic. Thus, the presence of noise traders can keep the price below its true value. Of course, the reverse can happen with overly optimistic investors.

Behavioral criticisms have important implications regarding the effect of a horizontal merger on the stock price of rival firms. There is always some uncertainty regarding the motive of a horizontal merger. Thus, even if a horizontal merger increases market power, the increased uncertainty associated with a merger announcement may cause pessimistic investors to sell. Rational investors correctly anticipate the behavior of pessimistic investors, and this keeps the stock price of rival firms from rising.[16] The point is that market power may exist even though it is undetected by event study evidence.

Given the methodological problems with event studies, economists began to pursue a more direct approach to determine the economic effects of horizontal mergers. Some studies have analyzed the effect that a merger has on output prices. Because of data availability and a proliferation of horizontal mergers, many have focused on the airline and banking industries. Kim and Singal (1993) examined a

[15] For a more complete review of behavioral issues as they apply to finance, see Barberis and Thaler (2003, Farmer and Lo (1999), Lo (2004), and Malkiel (2011)).

[16] Dafny (2009) also criticizes the event study approach for failing to correct for endogeneity. With such a correction, he finds that hospital mergers between local competitors lead to higher prices.

large sample involving 14 airline mergers that affected 11,629 routes.[17] They found that horizontal mergers were motivated by both market power and efficiency. Merging firms raised fares an average of 9.4% relative to comparable routes. In mergers involving airlines that use the same airport hub, however, fares declined. This suggests that such mergers were motivated by efficiency considerations (e.g., the merger led to reduced overhead of maintaining the hub).

In US banking, Prager and Hannan (1998) examined the effect on interest rates of horizontal mergers. They separated their sample into substantial mergers and less substantial mergers.[18] They found evidence that both market power and efficiency gains motivated mergers in banking. As you might expect, depositors received lower interest rates after substantial mergers, suggesting that the market power dominated the efficiency effect. For less substantial mergers, efficiency dominated the market power effect. This is consistent with Egger and Hahn's (2010) study of banking mergers in Australia, which found that mergers among smaller banks were more likely to generate cost savings. In Italian banking, Focarelli and Panetta (2003) found that horizontal mergers lowered interest rates received by depositors in the short term but raised them in the long term. This suggests that it takes time to implement changes that improve efficiency.

Ashenfelter and Hosken (2008) examined the price effect of five horizontal mergers that were investigated by the Federal Trade Commission from 1996 to 2003.[19] The authors note that these mergers were not representative but were chosen because they were expected to produce anticompetitive effects and provide an upper bound on the price increase from a horizontal merger. In four of the five mergers, there was a significant but small increase in price, suggesting that efficiency gains were also present. However, cost savings were insufficient to keep prices from rising.

An alternative way of estimating the effect of horizontal mergers is to see how a merger affects the market share of the combined firms. If firms merge to increase market power, we saw in the theoretical section above that this will tend to cause their combined market share to fall. If it increases efficiency, this will cause their combined market share to rise. Gugler and Siebert (2007) used this test to investigate the effect of horizontal mergers in the international semiconductor industry. Their results suggest that mergers generated substantial efficiency gains.

[17] Other studies include Borenstein (1990) and Singal (1996).

[18] A substantial merger was defined as one that increases the Herfindahl–Hirschman index (HHI) by at least 200 points. For example, if a market consists of ten equal size firms, they each have a market share of 10%. If two firms merge, this increases HHI by 200 points ($2 \cdot 10 \cdot 10$). That is, before the merger HHI = 1,000 ($10 \cdot 10^2$), and after the merger HHI = 1,200 ($20^2 + 8 \cdot 10^2$). See Chap. 8 for further discussion of HHI.

[19] These were near median size for mergers of the period. Many involved conglomerate firms that also competed in a horizontal market. They include Proctor & Gamble and Tambrands (in 1997, producers of sanitary products), Guinness and Grand Metropolitan (1997, alcoholic beverages), Pennzoil and Quaker State (1998, motor oil), General Mills and Ralcorp (1997, breakfast cereal), and Aurora Foods and Craft's Breakfast Syrup Business (1997, pancake syrup).

When the appropriate data are available, the most effective way to analyze the efficiency effect of horizontal mergers is to estimate a frontier production or cost function before and after the merger. If the merger allows the firm to produce more output with the same inputs or produce the same output at lower cost, the merger is efficient. Using this approach in their study of the US electric power industry, Kwoka and Pollitt (2010) found that horizontal mergers did not improve efficiency.[20]

In summary, there is evidence that horizontal mergers can increase market power and improve efficiency. In some industries, horizontal mergers have reduced output prices, but mergers involving larger firms appear to raise prices. A useful direction for future research would be to conduct additional work on the effect of horizontal mergers on technology, as in Kwoka and Pollitt (2010).

18.4 Vertical Integration, Contracts, and Restrictions

To produce a consumer good and bring it to market involves a number of manufacturing and distribution channels. Raw materials must be harvested and processed. To manufacture steel, ore must be extracted and converted into a useable form, such as sheet metal. At the next stage, sheet metal and other inputs are used to manufacture intermediate goods or physical capital such as heavy machinery and factories. Then, raw materials, physical capital, and labor are brought together to produce a finished product. Finally, a distribution system ships these goods to retail outlets where they are purchased by consumers.[21]

As Coase (1937) pointed out, the vertical relationship between production units can range from complete to separate. When a manufacturer owns all of its distribution outlets and input suppliers (except labor), vertical integration is said to be complete. When each stage of production and distribution is done by separate companies, vertical integration is nonexistent. In some cases, vertical integration is partial. For example, a manufacturer may have a contract with its independent distributors to set a minimum or maximum retail price. It may also restrict its independent distributors by imposing exclusive territories, requiring an exclusive dealing contract, and setting inventory requirements. These are called **vertical restrictions**.

Firms may increase vertical control via internal growth, merger, or vertical restriction. In some cases, a vertically integrated firm may dis-integrate, with a firm selling off one or more input suppliers or distributorships. A vertical merger (or restriction) is costly in terms of negotiating the deal and integrating two corporate cultures into one. Yet, there must be some added benefits for such

[20] They used a linear programming technique, called data envelopment analysis. This technique of estimating frontier production and cost functions is discussed in Färe et al. (1985, 2008).

[21] Complementary goods must also be available to consumers. For example, cameras need batteries, and automobiles need gas and oil.

mergers to take place. Our goal is to uncover the motives for vertical relationships and evaluate their social consequences.[22]

Public policy analysis of vertical integration is complex because so many outcomes are possible. In some cases theory predicts that vertical integration improves efficiency, while in others it increases market power. Thus, the welfare implication of a vertical arrangement is an empirical question. Prominent empirical results are discussed within each section below. An overall assessment of the empirical evidence is provided at the end of our discussion of vertical integration. Unfortunately, the available evidence is industry specific, making it difficult to provide a universal policy assessment.

18.4.1 Efficiency Motive for Vertical Mergers and Restrictions

In this section, we discuss socially beneficial reasons for vertical relationships. We will see that these involve reducing costs or eliminating free rider problems.

18.4.1.1 Technological Economies

In some cases, vertical integration is more efficient for purely technical reasons. The classic example is the energy savings of integrating molten steel production with sheet metal production. When separate, the steel producer must mold iron into ingots, let them cool, and ship them to a sheet metal manufacturer. The sheet metal producer must then reheat the iron before converting it to sheet metal. Merging these two operations within one plant eliminates reheating and shipping costs.

According to Stigler (1951), the degree of vertical integration depends on the size of the market and the extent of scale economies at each stage of production and distribution.[23] That is, even though minimum efficient scale in the production of a key input is large, the industry will be vertically integrated if the size of the market is too small to support a specialized input supplier. With sufficient industry growth, however, vertical "disintegration" or separation will take place as the industry becomes large enough to support a specialized firm.

[22] Given that the literature is so extensive, we focus on the main benefits and costs. Other possible reasons for vertical integration include a desire to avoid taxes and regulations. For a more complete description, see Waldman and Jensen (2006, Chap. 16), Rey and Tirole (2007), and Pepall (2008, Chaps. 17–19).

[23] This derives from Smith's (1776) insight that the division of labor is limited by the size of the market.

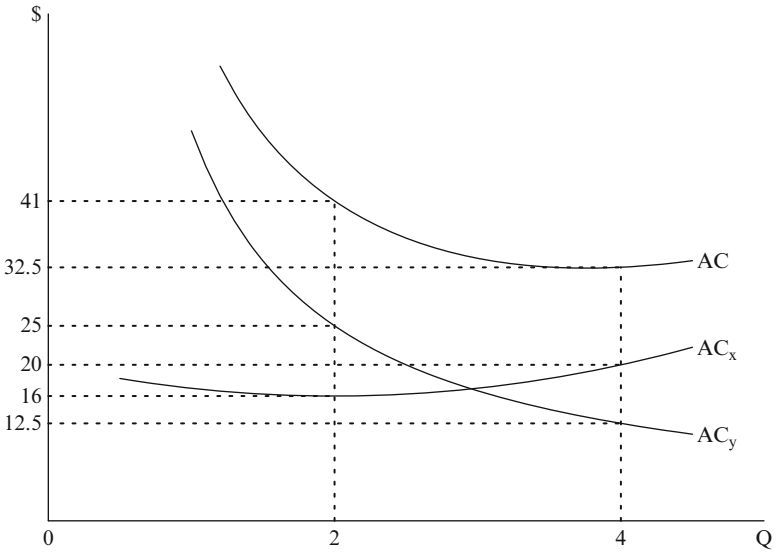

Fig. 18.3 Vertical integration, vertical separation, and efficiency

We illustrate Stigler's idea in Fig. 18.3, which identifies the average cost of production for a monopoly firm (firm 1) in which there are two stages of production (x and y). The average cost at stage x is identified by AC_x, and the average cost of stage y is identified by AC_y. The firm is vertically integrated, and its overall average cost (AC) is the (vertical) sum of AC_x and AC_y. To demonstrate, if the firm's profit maximizing output level is 2 (million units), its average cost is \$41 ($AC_x = 16$ and $AC_y = 25$). Notice that even though there are substantial scale economies associated with production at stage y, there is insufficient demand to profitably support a separate y producer at output level 2.

Now assume that the size of the market doubles, enabling the market to support two producers that each produce an output level of 2. In this case, if each firm is vertically integrated, each firm's $AC = 41$ ($AC_x = 16$ and $AC_y = 25$). If each firm discontinues their y operation, which is now conducted by a single and separate enterprise, firm y, AC_y falls to 12½. Thus, the average cost of the two x producers falls to 28½ ($AC_x = 16$ and $AC_y = 12½$). Vertical disintegration creates a unit cost saving of 12½. Of course, the y producer may charge a price above average cost, which has output cost implications, an issue we take up subsequently. In any case, even if y splits the cost saving and sets the price of y equal to 18.75, firm y and both x producers are better off from this vertical separation.

This theory of vertical integration in an expanding market is consistent with the early development of the automobile industry. At the end of the nineteenth century, car makers such as Ford and Oldsmobile were highly vertically integrated. For example,

Ford was known for fabricating engine pistons from steel pipe. Once demand for automobiles took off in the early twentieth century, however, the presence of input scale economies discouraged vertical integration. In almost every case, car companies were transformed from vertically integrated manufacturers to designers and assemblers of automobiles from parts supplied by other firms.[24]

18.4.1.2 Transaction Costs

Even without scale economies in production, we saw in Chap. 2 that vertical integration can lower transaction costs, the cost of conducting business in the market place. As a firm undertakes more and more of its stages of production and distribution, transaction costs fall. Unfortunately, a growth in firm size generally leads to higher monitoring costs. Thus, a vertical merger can be profitable if it sufficiently lowers transaction costs without substantially raising monitoring costs.

The transaction costs of using a market tend to be high in high-risk markets because this makes it difficult if not impossible to negotiate a contract that addresses every possible contingency. For instance, when there is considerable input supply variability, it will be costly to negotiate all price–quantity possibilities and include them in a contract between a buyer and a supplier. This is especially problematic for a credence good such as a completely assembled automobile engine where it is very difficult for a car manufacturer to determine the long-run durability and quality of an engine that is built by an independent supplier. Consequently, automobile companies assemble their own engines from parts supplied by separate companies that are built to meet certain specifications.

The cost of writing a complete contract is also high when dealing with products that are custom made. Consider an example where firm 1 orders a custom machine from firm 2 at price p', which is paid upon delivery. If firm 1 were to pull out of the contract once the machine is built, the next best alternative is for firm 2 to sell the machine at price p''. With few alternative uses for a custom machine, p'' will be considerably lower than p′. In this situation, firm 1 has an economic incentive to refuse payment when the machine is delivered to renegotiate a price that is closer to p''. If the cost of enforcing the contract is sufficiently high, the best firm 2 can do is renegotiate a price between p' and p''. This is called a **hold-up problem**, which is associated with opportunistic behavior on the part of one of the parties involved with the contract (firm 1 in this case).

A merger provides one solution to the hold-up problem (Alchian and Demsetz 1972; Williamson 1975, 1985; Klein et al. 1978). It internalizes the problem because it gives management the power to keep one division from exploiting

[24] For further discussion, see Thomas (1977) and Langlois and Robertson (1989). Langlois and Robertson argue that Ford was later forced to vertically integrate once again due to the rapid success of its Model T and delays in delivery of key inputs.

another. Such a merger would be efficient because it would lower the transaction costs of writing a complete contract and of using the court system, *ceteris paribus*.[25]

According to Klein (1988), hold-up problems motivated General Motors (GM) to buy Fisher Body in 1926. Before that time, Fisher Body manufactured all of the external body parts for GM cars. To stay competitive, GM focused on up-to-date styling that required relatively rapid changes in sheet metal body panels. Because delays in delivery were extremely costly to the success of this strategy, GM was vulnerable to a holdup. In addition, Monteverde and Teece (1982) found that the probability of a vertical relationship increases as the traded product becomes more specialized. In particular, they found an example of quasi-vertical integration in the automobile industry in the 1970s. The supplier retains ownership of the specialized asset, its die casting machine, and rents it out to the automobile manufacturer at an hourly rate.

18.4.1.3 Property Rights

Like transaction cost theory of vertical integration, property right theory emphasizes the importance of incomplete contracts and opportunistic behavior. According to Grossman and Hart (1986) and Hart and Moore (1990), property rights are crucial because ownership bestows power. A merger in which an input supplier buys a manufacturer may result in greater investment in the input division relative to the manufacturing division of the firm. Just the opposite may happen when the manufacturer buys the input supplier. This theory implies that the input supplier will buy the manufacturer when investments of the input supplier are more important than investments of the retailer to the success of the joint venture.

There has been little research on this issue, because the property rights theory is difficult to test. The one exception is Acemoglu et al. (2010), who studied the causes of vertical mergers in the manufacturing sector in the UK. One of their findings was that backward vertical integration is more likely when a manufacturer is more technologically intensive than the input supplier. Although there may be alternative motives for vertical mergers, this result is consistent with the property rights theory.

18.4.1.4 Quality of Service

In many cases, a manufacturer benefits from retailers that provide consumers with presale service. For example, a home theater manufacturer may prefer that its retailers have a knowledgeable sales staff, have a viewing/listening area, and provide free delivery and setup. If the retail sector is competitive, however, price

[25] Another solution would be to have the buyer pay in full before production is begun on a custom good. When it is costly to specify all product characteristics, this creates another problem. The seller has an incentive to cut costs by lowering quality.

may be driven so low that an insufficient margin remains to support a knowledgeable sales staff. If a retailer tries to charge a higher price to cover the cost of such a staff, consumers can obtain information from this retailer but buy from the low-priced store that provides little or no service. In this case, the low-priced retailer is free riding off of the information provided by the high-priced retailer. With sufficient price competition, the high-priced retailer would be forced out of business. A free rider problem such as this explains the success of electronics warehouse stores that offer low prices and little or no sales help. Such a situation may produce an outcome that has too little retail service from the point of view of some manufacturers and consumers.

The manufacturer could improve service quality by merging with all of its distributors. This would eliminate free riding, and the firm could set the optimal level of sales effort at each retail outlet. The problem can also be eliminated with vertical restrictions. For example, where such activities are legal the manufacturer could contract for a **resale-price maintenance program** (RPM) with its retailers. This establishes a minimum retail price that sufficiently exceeds marginal cost, eliminating price undercutting and forcing retailers to compete in service quality, thus raising the quality of service. Alternatively, when there are competing manufacturers, one manufacturer may require an **exclusive dealing contract** with its retailers. When such a contract is struck, the retailer cannot distribute brands of competing manufacturers. This assures that a retailer gives sufficient service support to the manufacturer's own product.

Even though these policies provide benefits, there is no guarantee that they are socially beneficial. In a free market, a higher level of service is offered only at a higher price. A profit-maximizing firm will increase the level of service until a marginal increase in quality no longer raises profit. An increase in service quality cannot lower producer surplus. From the consumer's perspective, the higher level of service raises consumer surplus, but the higher price lowers consumer surplus. The net effect on total (consumer plus producer) surplus is ambiguous.[26]

In the market for gasoline in Southern California, for example, Hastings (2004) examined the effect of vertical integration on retail prices. She found that vertical integration led to higher gas prices when branded stations replaced independent gas stations. However, branded stations typically offer a higher level of service than independent stations, making it impossible to tell if the typical consumer benefited or was harmed by vertical integration.

Sass (2005) examined this question for the US beer industry by comparing prices and output levels in states that allow exclusive dealing contracts with states where exclusive dealing contracts are illegal. His regression work shows that exclusive dealing contracts produce three results. First, an exclusive dealing contract by

[26] Much like the welfare analysis of advertising that we discussed in Chap. 15, an increase in service quality is more likely to be welfare improving when it leads to a parallel shift in demand and is more likely to lower welfare when it rotates demand clockwise (Scherer 1983; Comanor 1985). For an excellent survey of this literature, see Waldman and Jensen (2006, Chap. 16).

one brewer enabled it to increase sales and charge a higher consumer price. This suggests that distributors provided added services that consumers valued. Second, an exclusive dealing contract by one firm had no effect on the prices of rival brewers. Third, exclusive dealing contracts led to an increase in total beer sales. Taken together and ignoring possible externalities associated with alcohol consumption, these results imply that exclusive dealing contracts in brewing reduced incentive conflicts and increased the welfare of consumers and producers.

18.4.1.5 Double Marginalism

Spengler (1950) developed a model that produced a surprising result regarding the relationship between vertical mergers and market power. He showed that a vertical chain of suppliers (e.g., an input supplier, a manufacturer, and a retailer) where each is a monopolist will be more inefficient than if there were a single monopolist that is completely vertically integrated.[27] This is because at each vertical stage of production, firms charge a price above marginal cost. These margins or markups lead to successively higher marginal costs for downstream producers. In the case of two separate stages of production, this is referred to as the problem of **double marginalism**.[28] We will see that this leads to a higher price and a lower level of output than would occur if all firms merged into a single monopolist that was completely integrated.

To illustrate, we compare outcomes when the input and output markets vary by their degree of competitiveness, which is either perfectly competitive or monopolized by a single firm. To simplify things, consider the wholesale (upstream) market and retail (downstream) market for gasoline, where producers or wholesalers (W) supply gas to service stations or retailers (R). Notice that the wholesaler and the retailer sell the same product, so that there is a one-to-one relationship between the quantity sold by the wholesaler and the quantity sold by the retailer. This is called a fixed-proportions technology. The wholesaler's marginal cost is constant and equal to MC_W. To simplify things, consumer demand is linear and the retailer is assumed to have no additional cost other than the cost of purchasing gas from the wholesaler. The situation is dynamic, with wholesalers making their decisions in the first period and retailers making their decision in the second period.

We begin with the simple case where both the wholesale and retail markets are perfectly competitive, which we call the *competitive–competitive case*. This is illustrated in Fig. 18.4, where the horizontal axis measures the quantity of gasoline supplied by the wholesaler and sold by the retailer. Dynamic effects are unimportant in this case, because price equals marginal cost in competition, leaving no room

[27] We will see that the most efficient outcome is when all input and output markets are competitive.

[28] With three stages and a monopolist at each stage, there is triple marginalism.

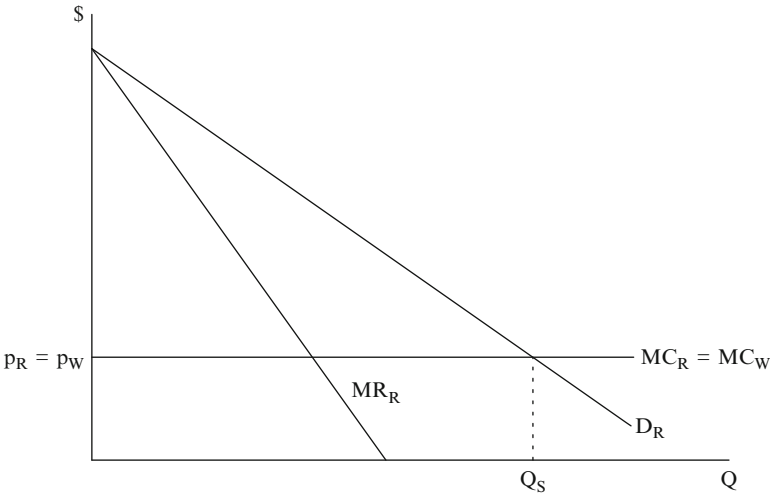

Fig. 18.4 Wholesale and retail equilibrium when both markets are perfectly competitive

for strategic interaction. Nevertheless, we still use backwards induction to illustrate the process of determining the subgame-perfect Nash equilibrium (SPNE).[29] Solving the second stage problem first, the price (p_R) will equal marginal cost (MC_R) in the retail market. Given our assumption that there are no added costs to the retailer, MC_R will be identical to the wholesale price (p_W). Although wholesalers can look forward and reason back in the first stage of the game, this knowledge is inconsequential because the wholesale market is also competitive, p_W equals the marginal cost of the wholesaler (MC_W). In this setting, the equilibrium set of prices is $p_R = MC_R \equiv p_W = MC_W$. This produces the socially efficient level of output, Q_S.

Second, consider the case where the wholesale market is competitive and there is a monopoly retailer, the *competitive–monopoly case*. This is illustrated in Fig. 18.5. Using backwards induction, we solve the second stage problem first. Again, dynamics are unimportant because there is no possibility for strategic interaction between the retailer and wholesalers. Regardless of the expected behavior of the retailer, price will equal marginal cost in the wholesale market, $p_W = MC_W$. The retailer's marginal cost is the wholesale price ($MC_R \equiv p_W$). To maximize profit, the retailer equates its marginal revenue with its marginal cost, which produces the optimum at Q_1 and p_R, where $p_R > p_W = MC_W$. This is the standard monopoly result, which is socially inefficient (i.e., $Q_1 < Q_S$). A vertical merger between all wholesalers and the retailer will have no effect on the market outcome. For the merged firm, the monopoly outcome prevails, with $Q = Q_1$. We call this price–output pair the "simple monopoly" outcome.

[29] See Chaps. 3 and 11 for a review of the use of backwards induction to identify the SPNE.

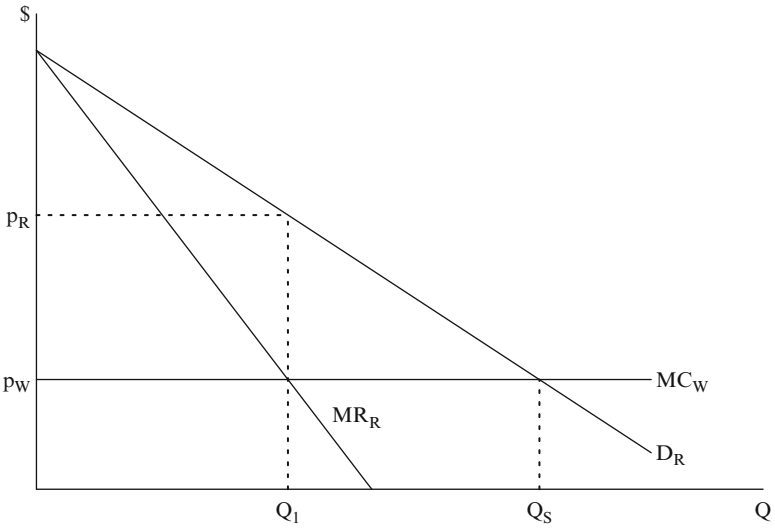

Fig. 18.5 Equilibrium when wholesale market is competitive and there is a monopoly retailer

In the third example, there is a monopoly wholesaler and a competitive retail market, the *monopoly–competitive case*. From the consumer's perspective, the equilibrium output and price levels are the same as in the competitive–monopoly case (p_R and Q_1 in Fig. 18.5). In a review question at the end of the chapter, you are asked to identify the equilibrium wholesale price, retail marginal cost, retail price, and market output level for this case.

The problem of double marginalism occurs when market power exists at both the wholesale and retail levels. To illustrate, we let both the wholesaler and retailer be monopolies, the *monopoly–monopoly case*. Demand and cost conditions are described in Fig. 18.6. To identify the SPNE, we solve the second stage problem first. The retailer is a monopolist and will equate its marginal cost with its marginal revenue (MR_R). At the second stage, the wholesaler correctly anticipates this, knowing that the retailer will choose output where its marginal cost (MC_R), which is the wholesale price (p_w), equals MR_R.

In other words, MR_R is the retailer's best-reply function because for any given p_W, MR_R identifies the retailer's optimal quantity. This means that MR_R is the wholesaler's demand function (D_W). Given that D_W is linear, the wholesaler's marginal revenue function (MR_W) has the same intercept as D_W but is twice as steep (as depicted in Fig. 18.6). Thus, the wholesaler's optimum occurs where $MR_W = MC_W$. This occurs at Q_2, p_R, and p_W, where $p_R > p_W \equiv MC_R > MC_W$. We derive this result more formally in Appendix 18.A.

Notice that the monopoly–monopoly case leads to even greater inefficiency than the simple monopoly case, where the firms are vertically integrated into one firm. The reason for this is that monopoly power at the wholesale level raises the wholesale price, and therefore the marginal cost at the retail level, which in

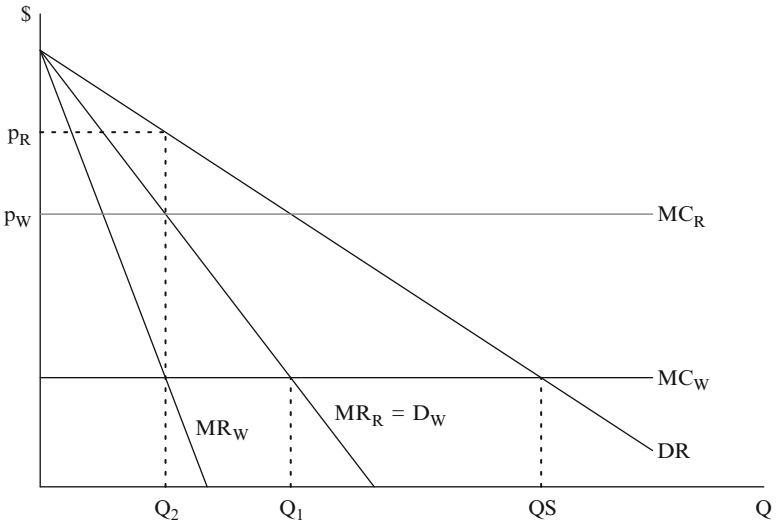

Fig. 18.6 Equilibrium when there is a monopoly wholesaler and a monopoly retailer

turn leads to an even higher price and a greater restriction in output at the retail level. That is, $Q_2 < Q_1 < Q_S$. Although the level of inefficiency will generally be less pronounced in an oligopoly setting, the same general outcome occurs as long as price exceeds marginal cost at each stage of production (i.e., competition is less severe than homogeneous Bertrand). This illustrates what is meant by double marginalism.

In order to gain better insight into this problem, we provide a specific example. Assume inverse demand is $p = 12 - Q$, and marginal cost at the wholesale level equals $MC_W = 2$. For each of the four cases described above, Table 18.2 identifies consumer surplus (CS), producer surplus (PS), total surplus (TS), and the equilibrium prices and output levels for this market. Three primary results emerge:

1. Competition at both stages produces the socially efficient outcome, with TS equaling 50. This is the best outcome for consumers (CS = 50) but the worst for producers (PS = 0).
2. Monopoly at either the wholesale or retail stage of production leads to the simple monopoly outcome (as if they were a single firm), where TS = 37½. This maximizes producer surplus (PS = 25). The wholesaler's profit (π_W) is highest when it is the monopolist, and the retailer's profit (π_R) is highest when it is the monopolist.
3. The least efficient outcome occurs when both the wholesale and retail markets are monopolized by separate firms, with TS equaling 21⅞. Both CS and PS are higher in the monopoly case when there is competition at either the wholesaler or the retailer level. In other words, a market with a monopoly wholesaler and a

Table 18.2 Monopoly power and market equilibria in wholesale (W) and retail (R) markets in competitive (C) versus monopoly (M) settings

Level of competition				
Wholesale market: Retail market:	Competitive Competitive	Competitive Monopoly	Monopoly Competitive	Monopoly Monopoly
p_W	2	2	7	7
p_R	2	7	7	9½
Q	10	5	5	2½
π_W	0	0	25	12½
π_R	0	25	0	6¼
PS	0	25	25	18
CS	50	12½	12½	3⅛
TS	50	37½	37½	21⅞

These four cases refer to competition in both the wholesale and retail markets (competitive–competitive); a competitive wholesaler and a monopoly retailer (competitive–monopoly); a monopoly wholesaler and competitive retailer (monopoly–competitive); monopoly at both the wholesale and retail levels (monopoly–monopoly)

Notationally, p_W is the equilibrium wholesale price; p_R is the equilibrium retail price; Q is equilibrium output; π_W is the wholesaler profit; π_R is the retailer profit; PS is producer surplus ($\pi_W + \pi_R$); CS is consumer surplus; TS is total surplus (PS + CS)

monopoly retailer produces less consumer surplus and less producer surplus than markets with more competition at either the wholesale or the retail (or both) stages of production.

This implies that a monopolist has no market power motive to vertically integrate into a competitive stage of production. A merger of this type has no effect on CS, PS, and TS. Nevertheless, a monopoly wholesaler does have an incentive to merge with a monopoly retailer, and vice versa. A merger of this type is socially efficient, because it increases CS, PS, and TS.

This example illustrates the **principle of double marginalism**: vertical integration either increases or has no effect on market efficiency.[30] That is, total surplus is unaffected by a merger between (1) a competitive wholesaler and a competitive retailer, (2) a competitive wholesaler and a monopoly retailer, and (3) a monopoly wholesaler and a competitive retailer. However, a merger between a monopoly wholesaler and a monopoly retailer produces the simple monopoly outcome. This causes output to increase from Q_2 to Q_1 in Fig. 18.6, which benefits both consumers and producers (increasing TS from 21⅞ to 37½ in Table 18.2). Because this theoretical analysis indicates that a vertical merger has either no effect or improves social efficiency, it implies that public policy should not discourage vertical mergers.

[30] This is sometimes called the Chicago School critique of early concerns that vertical mergers can enhance market power. As we discussed in Chap. 1, the Chicago School is skeptical that government policy can produce net social benefits. For further discussion, see Posner (1976), Bork (1978), and Riordan (1998).

Caution is warranted, however, as this discussion ignores other possible problems associated with vertical mergers, an issue we will take up in the next section. It is also based on a model that assumes that the retailer does not substitute away from the wholesaler's product when there is a price increase (i.e., there is a fixed-proportions technology). Although this may be true for gasoline, it need not be true for other production processes. For example, when a steel producer raises the price of steel, a producer of exotic motorcycles may substitute aluminum and carbon fiber for steel. Allowing for this substitution possibility, which will occur in a variable-proportions technology, reduces the monopoly power of the steel producer and complicates the analysis, as we will see subsequently.[31]

Vertical restrictions can also be used by the wholesaler to avoid the problem of double marginalism when both the wholesaler and retailer are independent monopolists. First, the wholesaler can impose a price ceiling on the retailer at the simple monopoly retail price. This vertical restriction will generate the monopoly solution and full monopoly profits for the wholesaler, although zero profits for the retailer. In addition, the wholesaler can use a two-part pricing policy, as discussed in Chap. 14.[32] Setting p_W equal to MC_W guarantees the simple monopoly outcome, and charging the retailer a fixed fee that just equals the retailers total profit transfers all monopoly profit to the wholesaler. Finally, the wholesaler could set a sales quota for the retailer, guaranteeing that the simple monopoly outcome is reached (Q_1 in Fig. 18.6).

Mortimer (2007) found that video distributors and video rental stores such as Blockbuster used a two-part pricing policy to solve the double marginalism problem. Market power existed at these stages, although they operated in oligopoly rather than monopoly markets. Prior to 1998, video distributors sold videos at a fixed price of $65–70 per tape to rental stores, creating a double marginalism problem. By 1998, a new contract was widely adopted: videos were sold for $3–8 per tape and rental revenues were shared, with 55% going to video distributors. As the theory predicts, Mortimer found that (1) consumers benefited and (2) upstream and downstream profits increased by about 10%.

[31] A variable proportions technology is characterized by a convex isoquant. This implies a certain amount of substitutability between inputs, as with steel and aluminum in automobile production. As the price of steel increases, cost-minimizing manufacturers will substitute aluminum for steel. A fixed-proportion technology implies that inputs are perfect complements and are characterized by right-angled isoquants. This characterizes tires and car chassis. Four tires are used with each chassis, regardless of the relative prices of tires and chassis. For further discussion, see Varian (2010, Chap. 10).

[32] This sometimes takes the form of a franchising fee (Caves and Murphy 1976; Rubin 1978). A franchise contract between a wholesaler and retailer frequently gives the retailer the legal right to sell the wholesaler's product, requires that the wholesaler provide sales training to the retailer, specifies the level of sales effort, and specifies a nonlinear payment contract. Typically, this will include a fixed franchise fee and a split of retail revenues. Contracts such as these are common practice in the fast-food industry, where companies like McDonald's have a franchise contract with retailers for the right to distribute McDonald's food.

18.4.1.6 The Market for Corporate Control

As discussed earlier in the chapter, the market for corporate control is one way of disciplining inefficient management teams and transferring assets from failing to successful firms. Given that our antitrust laws are more strictly enforced for horizontal mergers, vertical and conglomerate mergers would be a likely outlets for this motive for merger. Vertical mergers may be especially appealing to managers, as they may have a better understanding of markets that are vertically related than completely unrelated markets (i.e., conglomerate mergers).

Hortacsu and Syverson (2007) found support for the market for corporate control hypothesis for vertical mergers in the ready-mix concrete industry.[33] Their empirical results showed that large highly efficient producers were more likely to vertically integrate, a process that takes market share from higher-priced and less efficient producers. They also found that vertical integration lowers price, increases production, and has no effect on entry rates. Taken together, the results imply that vertical integration in cement and concrete has been welfare enhancing.

18.4.2 Vertical Relationships and Anticompetitive Effects

We have seen how vertical mergers and vertical restrictions can lower costs and promote economic efficiency. This is not the whole story, as there are situations where vertical mergers and restrictions can increase profit and lower efficiency. We consider these possibilities in this section.

18.4.2.1 Foreclosure

First is the foreclosure argument. Foreclosure occurs when a firm uses its market power in one market to restrict output in another market. With vertical foreclosure, an upstream firm restricts output to a downstream firm or a downstream firm restricts its demand for an upstream firm's product. Such foreclosure is common after a vertical merger, but does it enhance market power? The Supreme Court thought so, as indicated in its ruling in the first antitrust case involving anticompetitive concerns with vertical mergers (*Brown Shoe Co., Inc. v. U.S.,* 370 U.S. 294, 1962)[34]:

> The primary vice of a vertical merger or other arrangement tying a customer to a supplier is that, by foreclosing the competitors of either party from a segment of the market otherwise open to them, the arrangement may act as a "clog on competition,". . . which "deprive[s] . . . rivals of a fair opportunity to compete."

[33] Although often used interchangeably, cement is an input for concrete. Cement is a powered substance made from limestone and clay. Concrete is produced by mixing cement, sand, gravel, and water.

[34] This quote is taken from Stelzer (1976, 133). For further discussion of this case, see Waldman (1986).

Given the problem of double marginalism, which showed that vertical mergers cannot lower total surplus, you might wonder how this can be true.

One way is by increasing entry barriers.[35] To illustrate, consider a market with a monopoly wholesaler (M), two retailers (R_1 and R_2), and a potential entrant into the wholesale market (PE). For entry to be profitable, PE needs at least 2 retailers. Thus, without vertical integration or a vertical restriction, PE will enter. If, however, M buys R_1, then PE can enter at the manufacturing stage only if it adds one of its own retail outputs. This will block entry if it sufficiently raises the cost of entry. Thus, by foreclosing PE's access to R_1, entry is forestalled.

We have discussed strategic behavior like this in Chap. 8, where an incumbent monopolist commits to an investment in a strategic barrier to protect its market power. This problem is described in Fig. 8.7. In this case, however, σ_M is M's sunk cost associated with vertical integration, and σ_{PE} is PE's added sunk costs associated with opening up its own retail store. To simplify things, assume that $\sigma_M = \sigma_{PE} = \sigma$. If $30 < \sigma < 70$, the unique SPNE is for M to vertically integrate and for PE to stay out of the market.[36] As with all strategic barriers, social efficiency diminishes because such barriers are costly and reduce wholesale competition.

Although the evidence is limited, Comanor and Frech (1985) found that GE effectively used exclusive dealing arrangements to forestall entry of Rhodia's silicone sealant in the 1970s. When Rhodia entered the market with a product that sold at a discounted price, GE responded by stopping shipment of GE's sealant to major retailers that had agreed to market Rhodia's product. This discouraged retailers from marketing Rhodia's product and helped GE maintain its dominant market position.

When the wholesale market is oligopolistic, the use of vertical integration or vertical restrictions can raise entry barriers and increase concentration. This in turn can increase the probability of collusion, through the use of a trigger strategy as we discussed in Chaps. 9 and 11. There is also a concern that resale price maintenance agreements may facilitate collusive pricing at the retail level, but there is little evidence that collusion motivates such agreements (Overstreet and Price 1983).

18.4.2.2 Double Marginalism with Variable Proportions

In our discussion of double marginalism we saw that a vertical merger in a market with a monopoly wholesaler and a competitive retail market has no effect on consumer and producer surplus. It turns out that this is only true when retailers use inputs in fixed proportion. For a variable-proportions technology, a vertical merger can reduce total surplus by protecting and enhancing the wholesaler's market power.

[35] In addition, Ordover et al. (1990) show that vertical foreclosure can harm competition when products are differentiated.

[36] Given the benefits of learning, a merger is likely to be cheaper than opening up a brand new store, $\sigma_M \leq \sigma_{PE}$. If they are unequal, this will remain a unique SPNE as long as $\sigma_M < 70$ and $\sigma_{PE} > 30$.

With a variable-proportions technology, if a monopoly wholesaler raises its price above marginal cost, competitive retailers are able to mitigate the higher price by substituting away from the monopolist's product. This substitution ability reduces the wholesaler's market power and control over retailers. Moreover, charging a monopoly price still creates an input price distortion which raises retailer costs.

In this case, a vertical merger between the wholesaler and a retailer has two effects. First, by using the marginal cost of the wholesaler as the retailer's opportunity cost of that input, called its transfer price, the retailer can use the least cost combination of inputs. This efficiency effect will lower costs and push down the retail price. Second, it reestablishes the wholesaler's market power because the substitution effect due to charging the retailer a monopoly price is eliminated for the vertically integrated firm. This market power effect will push up the retail price. The net effect on the retail price and total surplus is now ambiguous and depends on demand, cost, and substitution possibilities.[37] Nevertheless, this is a situation where a vertical merger can increase market power.

18.4.2.3 Price Discrimination

Another reason why a firm may prefer to vertically integrate is that when coupled with market power, integration can facilitate third degree price discrimination. Assuming just two groups of consumers, recall from Chap. 14 that a firm will charge a higher price to the group that has a more inelastic demand function. A necessary condition for this to be effective is that the firm must be able to prevent arbitrage. That is, the firm must keep high-price consumers from bypassing the firm and buying directly from low-price consumers. Vertical integration can be an effective way to prevent this type of resale.

To illustrate how this works, assume that an aluminum firm (A) is a monopolist that sells aluminum ingot to groups of manufacturers in competitive markets, B and C. Demand from market B is inelastic relative to demand from market C. Thus, firm A would like to price discriminate by charging a high price in market B and a low price in market C. The problem is that firm A cannot stop arbitrage, where firms in market B buy ingot from firms in market C. The question is whether vertical integration into one of these markets will enable firm A to earn higher profits and avoid the problem with arbitrage.

It turns out that complete integration into either market eliminates arbitrage, but price discrimination becomes more effective when A buys C. The new A–C firm can now charge a higher price in market B because there are no longer any

[37] For a more complete discussion, see Vernon and Graham (1971), Schmalensee (1973), Blair and Kaserman (1983), and Salinger (1988).

companies in market C in which to make a purchase. Unfortunately, we are unable to determine the welfare effect of this type of behavior, because price discrimination can increase or decrease total surplus, as we saw in Chap. 14.

Perry (1980) makes an effective argument that this is exactly what Alcoa (Aluminum Company of America) did in the early twentieth century. At that time, Alcoa faced two types of buyers, those who used aluminum to make wire and those who used it to make parts for aircraft. With a greater elasticity of demand for wire, Alcoa integrated downstream into wire production. By eliminating all competing aluminum wire producers, arbitrage became impossible and Alcoa was able to raise the price of aluminum ingot to aircraft manufacturers who had a more inelastic demand for aluminum.

18.4.3 A Summary of the Empirical Evidence

As we have seen throughout the chapter, there is evidence to support some of the theories of vertical integration and vertical restrictions. First, evidence from the US automobile industry is consistent with the technological motivation for vertical integration and separation. That is, vertical integration was high at the industry's inception, but vertical separation became more common with growing market demand. Second, firms do engage in vertical integration to lower transaction costs, especially where there are hold-up problems and quality considerations. Third, evidence from the US brewing industry suggests that exclusive dealing contracts benefit both consumers and producers. Fourth, the evidence shows that the two-part pricing policy of the video rental industry benefits both consumers and producers. Fifth, the evidence regarding vertical mergers between cement and concrete producers is consistent with the market for corporate control hypothesis where successful firms purchase less successful ones. Finally, it does appear that Alcoa vertically integrated to avoid arbitrage and to charge a higher price to consumers with more inelastic demands.

Although there are exceptions, the empirical studies show that efficiency reasons trump anticompetitive motives of vertical integration. In their extensive review of the literature, Lafontaine and Slade (2007, 680) conclude: "...under most circumstances, profit-maximizing vertical-integration decisions are efficient, not just from the firms' but also from the consumers' point of view. Although there are isolated studies that contradict this claim, the vast majority support it." Given the evidence, their policy recommendation is that when "faced with a vertical arrangement, the burden of evidence should be placed on competition [i.e., antitrust] authorities to demonstrate that" a vertical "arrangement is harmful before the practice is attacked."

18.5 Diversification and Conglomerate Mergers

In many cases, firms produce a diversified set of unrelated products. These are conglomerate firms. One example is Procter & Gamble, which produces detergent (Tide), small appliances (Braun), toothpaste (Crest), and paper towels (Bounty). Another example is General Electric, which produces lighting equipment, aircraft engines, appliances, and television entertainment (NBC). General Electric's purchase of the NBC television network in 1986 is an example of a conglomerate merger.

Because conglomerate mergers involve firms that produce unrelated products, you might wonder what motivates them. Are they the result of underlying economic forces, business errors, or historical accident? In this section, we explore the main economic reasons for them. At the end of this section, we also discuss which explanations are best supported by the empirical evidence.

18.5.1 Efficiency Motives for Conglomerate Mergers

One possible motive for a conglomerate merger is efficiency, perhaps due to economies of scope. Recall that economies of scope exist when several products are more efficiently produced by a single firm than by separate firms. In general, this occurs when there are complements in production or marketing.

There are numerous cases where economies of scope play a role in production. Manufacturers of custom motorcycles and of iron fences may both use a water jet machine, which makes precision cuts in aluminum and steel. If each enterprise has sufficient demand to keep a water jet machine operating at half capacity, excess capacity can be eliminated by a merger. This suggests that a merger can be profitable when it involves companies that produce different products but use similar production techniques (Montgomery 1994).

Economies of scope in marketing can also be important. In some cases it may be more efficient to use a single marketing division to market otherwise unrelated products that appeal to the same target audience. This was one of the reasons why Philip Morris, a cigarette company, bought Miller, a beer company, in 1970 (V. Tremblay and C. Tremblay 2005). Even though cigarettes and beer markets are unrelated, the target audience of each is young adults, and executives at Philip Morris felt that their success in marketing cigarettes would spill over to marketing beer.[38] Although reliable profit data are unavailable, the merger did rejuvenate Miller, as its market share rose from 4.13% in 1970 to over 21% in 1980.

[38] In 1970, cigarette ads were as common as beer ads are today. Beginning in 1971, the federal government severely limit cigarette advertising, making it illegal to advertise outdoors and on television and radio (Chaloupka 2007; Iwasaki and V. Tremblay 2009).

A second possible efficiency motive for a conglomerate merger is that it may reduce transaction costs. The resulting cost savings is unlikely to be sufficient to motivate many conglomerate mergers, however. Conglomerate firms produce a diverse set of products and are likely to employ a relatively heterogeneous set of workers and managers. Thus, the cost of monitoring a larger and more diverse enterprise will be relatively high.

A final efficiency motive for conglomerate mergers is the market for corporate control hypothesis, where a merger serves as an effective way of transferring managerial control from inefficient to more efficient management teams. This may be more difficult with conglomerate mergers, however, because managerial success in one industry may not translate well to another industry. On the other hand, antimerger laws are more likely to be strictly enforced when firms are in related markets (i.e., in horizontal and vertical mergers). Thus, conglomerate mergers may be a main outlet for the market for corporate control, especially when large firms are involved.

18.5.2 Conglomerate Mergers and Risk Reduction

A potential advantage of a conglomerate merger is that it can reduce the risk of doing business. We borrow an example from Sherman (1974, 104–105) to illustrate the old piece of advice: "Don't put all of your eggs in one basket." Suppose you want to send one dozen eggs to your grandparents who live in the woods. The only means of transportation is via children in your neighborhood who are 5 years old. There is a 50–50 chance that a child making the delivery will break the eggs. What is the best method of delivery if you want to maximize the probability that the eggs will be delivered unbroken?

We can identify the answer by investigating how the probability of failure changes with the number of children used to deliver eggs. By using just one child to make the delivery, the probability that none will arrive safely is 0.5. With two children each carrying six eggs, the probability drops to 0.25 [i.e., $(½)^2$].[39] With 12 children each carrying one egg, the probability drops to below 0.00025 [i.e., $(½)^{12}$]. This demonstrates the **principle that diversification reduces risk**. For this principle to hold, the probability of failure must be independent among children (or individual investments). Independence would be violated, for example, if the children held hands and all fell if one fell. In business, independence would mean that the profits of one division would rise or fall independently with the profits of other divisions within the firm, a condition that is more likely to hold for a widely diversified conglomerate firm.

[39] That is, four outcomes are possible and each is equally likely to occur: (1) no eggs are broken; (2) all eggs are broken; (3) child 1 breaks the eggs but not child 2; (4) child 2 breaks the eggs but not child 1. Thus, there is a 1 in 4 chance that none of the eggs arrive safely.

18.5.3 Conglomerate Mergers and Anticompetitive Effects

Although conglomerate mergers involve firms in unrelated markets and would have no effect on the concentration level in any one industry, there are cases in which such mergers can increase market power. One way this can happen is if a conglomerate merger eliminates potential competition. We have seen in Chaps. 8 and 10 how the presence of a potential competitor can increase price competition. Thus, competition will diminish when conglomerate mergers eliminate potential competitors. The classic example was when Procter & Gamble (the nation's leading producer of soap and detergent) purchased Clorox (the nation's leading supplier of laundry bleach). The Federal Trade Commission successfully challenged the merger on the grounds that the merger eliminated Procter & Gamble as a potential competitor in the market for bleach.[40]

Second, because conglomerate mergers increase the firm's diversity and size, it may increase the possibility of something called **reciprocity**. For example, assume that firm A supplies inputs to firm B and firm B supplies inputs to firm C. Firm C is a monopsony buyer of firm B's inputs, and several firms besides A provide inputs to firm B. If firms A and C were to merge to form firm A–C, then it can inform firm B that "I will buy from you only if you buy from me." The point is that even though there is no direct link between firms A and C, their merger may increase its bargaining power over firm B.

A conglomerate merger can also increase market power by facilitating collusion. For instance, a firm may be more willing to engage in the punishment phase of a trigger strategy (e.g., a price cut) to discipline an aggressive competitor in one market if it is a conglomerate firm, because it can use profits earned in another market to **cross-subsidize** the cost of punishment. It may also use profits from one market to subsidize aggressive action designed to gain market share and power in another market. It has been argued that Philip Morris used its cigarette profits to cross-subsidize the expensive advertising campaigns of Miller Brewing in the 1970s, a tactic that did substantially increase Miller's market share.[41]

Similarly, Edwards (1955) argued that when conglomerate firms compete with one another in more than one market, they will take a "live and let live" policy. That is, they are more likely to behave cooperatively for fear that noncooperative behavior in one market will trigger punishment in more than just one market in which they compete.[42] This is called the **mutual forbearance hypothesis**.

The best example where the action of a conglomerate firm in one market led to retaliation in another market occurred between Clorox and Procter & Gamble.

[40] *Federal Trade Commission v. Procter & Gamble Co.*, (1967). For further discussion of this case, see Waldman (1986).

[41] For further discussion, see *Business Week* (November 8, 1976) and Elzinga (1990).

[42] When information is incomplete and monitoring costs are high, Thomas and Willig (2006) find that firms will be unwilling to link strategies across markets.

In 1988 Clorox entered the detergent market with its Clorox Super Detergent, a market that was the purview of Procter & Gamble. Within a few months, Procter & Gamble not only lowered the price of its detergent but introduced its own brand of bleach. In other words, Clorox's entry led Procter & Gamble to retaliate in both the detergent and bleach markets. This multimarket response caused Clorox to exit the detergent market in 1991.[43]

18.5.4 Managerial Motives for Conglomerate Mergers

We know from previous discussion that in very large corporations, stockholder ownership is separate from managerial control. From agency theory we know that this can create a principle–agent problem, as it may not be in management's interest to maximize the welfare of stockholders.

The most obvious way in which managers can abuse their power is through corporate theft, as occurred at Enron Corporation, Tyco International, and WorldCom in the last decade. At Tyco, the chief executive officer (CEO) was charged with enterprise corruption and falsification of business records to support a lavish life style. Tyco paid for his $30 million New York apartment, including a $6,000 shower curtain and $2 million for his wife's fortieth birthday party, disguising it as a shareholder meeting.[44]

Problems can also arise when manager income is closely tied to sales growth, which is true for many firms according to Mueller (2006). When this occurs, managers may trade-off profits for sales to increase their own income. Because growth is easier to generate by merger than internally and because antitrust laws limit horizontal and vertical merger possibilities, managers may overinvest in conglomerate mergers from the owner's perspective.[45]

Another concern is that managers may make acquisitions that increase the value of the manager to the firm. As an example, a manager of an engineering firm with specific expertise in biology may acquire a biotechnology firm, making it difficult for someone to manage the combined enterprise without a background in both engineering and biology. This can reduce the probability of being replaced and enable the manager to extract higher wages from owners. Shleifer and Vishny (1989) call this "**managerial entrenchment.**"

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[43] In 1988, Clorox produced laundry bleach, wood stain, restaurant equipment, bottled water, and frozen foods. For further discussion, see Levine (1988), Lappen (1988), Shao (1991), and Hamilton (1997).

[44] For further discussion, see Newton (2006). For a list of *Time Magazine's* top ten corrupt CEOs over the last decade, see http://www.time.com/time/specials/packages/completelist/0,29569,1903155,00.html#ixzz0zSZrWJXl.

[45] See Marris (1964) and Mueller (1969) for further discussion.

Agency theory has focused on designing incentive compatible contracts that induce managers to pursue the interests of owners. As you might expect, such contracts should closely tie manager compensation with the firm's profits and market value. Nevertheless, addressing every contingency in a contract can be prohibitively costly in an uncertain world. It may be quite difficult for an owner to identify the effort and performance of a manager in markets hit by unexpected demand or cost shocks. Such uncertainty creates a difficult problem because the owner is not qualified or adequately informed to make a rational decision regarding corporate decisions and appropriate management compensation in uncertain times, which is why the owner hired the manager in the first place. As a result, managers generally end up with a considerable amount of discretion and salaries that are not closely tied to profits.

Even if the owner and manager are both motivated by profits, they may still have a different preference for risk. Owners or stockholders are likely to be risk neutral because they can diversify their investments (i.e., put their eggs in a variety of baskets). But managers are likely to be more risk averse because they cannot diversify their employment. Thus, managers will prefer to diversify their risk to a greater extent than owners, which may lead to excessive conglomerate merger activity.

18.5.5 Behavioral Economics and Conglomerate Mergers

This discussion would be incomplete without pointing out the influence of personality on conglomerate merger activity. As Flaherty (2011), president of the National Legal and Policy Center, makes clear, the personalities of company presidents have "a tremendous impact on the decisions, direction, mindset, communications tone, and overall persona of their companies. Much more, in fact, than people realize."[46]

For some CEOs, the psychological rewards of managing a large corporation are more meaningful than the pecuniary rewards. After all, it is the conspicuous **empire building** of large corporations that will get a CEO's picture on the cover of a business magazine or an appearance on CNN. In an emerging market, the potential for internal growth may be sufficient to meet a CEOs desire for empire building. In a mature market where growth and investment opportunities are limited, empire building is more likely to come from conglomerate merger.

In addition, a desire for empire building may interact with CEO hubris and lead to an even greater incentive for overinvestment in mergers. We saw in Chap. 14 that overconfidence can be a persistent problem in business. Recall that Cooper et al. (1988) found that over 80% of business owners were overconfident about their likelihood of success. This is not surprising, as psychologists find that individuals

[46] PR Newswire, March 10, 2011, available at http://www.highbeam.com/doc/1G1-251110190.html/print, accessed September 20, 2010.

are especially overconfident about the outcome of events they believe to be under their control and in which they are extremely committed.[47] Regarding mergers, a CEO may be overconfident that he or she can turn around a failing firm. Roll (1986) argues that this is much like a winner's curse in auction theory, which leads the acquiring firm to pay too much for the failing firm. It also increases the probability that such a merger will take place.[48]

Note that the empire-building and overconfidence motives for mergers imply different remedies. Both waste company resources on bad acquisitions. However, unlike empire-building CEOs, overconfident CEOs believe that they are behaving in the owner's interest. While an incentive compatible contract can align the goals of owners and a CEO who is prone to empire building, it cannot correct the inefficient behavior of an overconfident CEO.

Throughout history, there are numerous cases of CEOs who have grand aspirations. Here are two notable examples:

- Harold Geneen, CEO of International Telephone and Telegraph Corporation (ITT) from 1959 to 1977, made more than 300 mergers and acquisitions. Although he helped make ITT a conglomerate corporation, many of these mergers proved unprofitable and many of the company holdings were sold off after Geneen's retirement.
- From 1956 to 1981, Charles G. Bluhdorn took Gulf + Western from a small auto parts company to a Fortune 500 company (ranking 61st by 1981). Along the way, he purchased Paramount Pictures, Madison Square Garden, and Simon & Schuster Publishing. In a 1969 interview, he is quoted as saying: "The sky is the limit ... I came to this country without a penny, and built a company with 100,000 employees. This is what America is all about ... to be able to do what I've done is a matter of pride to me and to the country." (*Business Week*, July 5, 1969, p. 34) Subsequent downsizing in the 1980s after Bluhdorn's death suggests that many of these acquisitions were unprofitable.

18.5.6 Empirical Evidence

Assessing the causes and economic consequences of a real-world conglomerate merger is difficult. One problem is that there are many reasons and potential consequences of a conglomerate merger. It will increase profits if it is efficient or it raises market power, but it can lower profits if it is driven by various managerial or behavioral motives. In empirical work, it is generally difficult to control and test

[47] For a review of the psychology literature, see Malmendier and Tate (2008).

[48] Bogan and Just (2009) argue that confirmation bias, where individuals attach too much (little) importance on information that confirms (refutes) their beliefs, can also affect a CEO's merger decision. It is unclear whether this will lead to more or less merger activity.

for each of these motives. Another problem is that one can only speculate whether or not the merged firm would have outperformed the separate enterprises had the merger never taken place. Moreover, there are generally no comparator conglomerates by which to judge the merged firm.

In spite of these difficulties, economists have investigated conglomerate mergers in a number of ways. Early studies examined three types of evidence regarding the effect of conglomerate mergers on performance. In the first, event studies examined the effect of a merger announcement on the stock market value of the acquiring and targeted firms. This evidence shows that mergers have a positive net effect on the value of targeted firms, increasing their value from 16 to 30%. In contrast, acquiring firms experienced neutral and sometimes negative returns. The net effect is to increase their joint value. Although this evidence is inconsistent with managerial/behavioral motives for conglomerate mergers that lead to inefficiency, *ceteris paribus*, we still do not know whether this higher value is due to increased efficiency or market power.[49]

The second type of evidence examines the premerger performance of acquiring and targeted firms. If efficiency drives mergers, then successful firms will buy inefficient or failing firms, as the market for corporate control suggests. After reviewing the evidence, Ravenscraft and Scherer (1987, 74) concluded that "[w]hen would-be acquirers 'fished' among the population of relatively small manufacturing enterprises for noncoercive acquisitions, they tended to haul in mainly specimens with superior records." This does not mean that all such mergers are inefficient, however. For instance, it may be efficient for a successful regional firm to go national if a conglomerate partner can provide distributional or marketing assistance. In addition, more recent work by Lichtenberg (1992) indicates that targeted firms did tend to have inefficient plants and that a merger improved their efficiency over time.

The third type of performance evidence comes from the post-merger data on profitability. Early studies showed that many conglomerate mergers that raised short-run corporate value never translated into higher profits later on. This was especially true during the conglomerate merger wave of the 1960s and early 1970s, when approximately half of the acquisitions were so unsuccessful that the acquired firms or their assets were eventually sold off (Ravenscraft and Scherer 1987). The decline in profits due to a conglomerate merger is consistent with the prevailing wisdom in the finance literature of the existence of a "conglomerate discount," meaning that the shares of conglomerate firms are sold at a relative discount. If true, then conglomerate mergers are inefficient, which supports the managerial and behavioral merger motives.

Firms may have learned from their mistakes of the 1960s and 1970s, as more recent evidence questions the conglomerate discount. Healy et al. (1992) found an increase in post-merger performance for the 50 largest mergers between 1979 and 1984.

[49] For a review of the evidence, see Caves (1989), Montgomery (1994), Martin and Sayrak (2003), and Mueller (2006).

An important contribution of their study was to compare the performance of the merged firm with an appropriate set of benchmark firms that have similar characteristics. Healy et al. found that conglomerate mergers actually improved performance, consistent with Graham et al. (2002), Jandik and Makhija (2005), and Villalonga (2004), and that the conglomerate discount disappears when the appropriate benchmark and other controls are taken into account. Overall, it may not be surprising that some conglomerate mergers are profitable and others are not. As Andrade et al. (2001, 119) point out regarding conglomerate mergers, "Ultimately, what the evidence shows is that it is hard to consistently make investment decisions that earn economic rents, which perhaps should not be too surprising in a competitive economy with a fairly efficient capital market."

A more direct way to determine whether a conglomerate merger improves efficiency is to estimate its effect on the firm's overall productivity. Lichtenberg and Siegel (1987) found an increase in plant productivity 3 years after a change in corporate ownership took place during the 1973–1981 period. In their study of US plant level data from 1977 to 1987, McGuckin and Nguyen (1995) found that conglomerate mergers generally improved total factor productivity. These studies are consistent with the efficiency motive for merger. At the same time, Harris and Robinson (2002) found that foreign mergers of U.K. plants led to productivity declines. They attribute the decline to the transition cost of assimilating the plant into a new corporation, something that overconfident managers may overlook. Thus, the limited evidence using this approach suggests that both efficiency and overconfidence may play a role in conglomerate mergers.

The evidence on the market power motive for conglomerate mergers is somewhat inconsistent. Caves (1981) failed to find support for the market power motive for firm diversification. In reviewing the evidence, Montgomery (1994, 175) concluded that it is unlikely that market power "plays a central role in firm diversification." On the other hand, an international comparison on the effect of mergers by Gugler et al. (2003) showed that over 25% of mergers exhibited patterns consistent with the market power motive. Jans and Rosenbaum (1997) provided convincing evidence in support of the mutual forbearance hypothesis. They investigated the performance of regional cement producers and found that price–cost margins in a region rose with multimarket contact among firms in that region.

There is considerable evidence in support of the managerial motives for merger. First, when comparing firms that are owner-controlled versus manager-controlled, Amihud and Lev (1981) found that manager-controlled firms tended to engage in more conglomerate mergers and to be more diversified than owner-controlled firms. This suggests that managers are more interested in sales growth than owners. Second, managers appear to pursue conglomerate mergers in an effort to reduce risk. Marshall et al. (1984) found that acquiring firms tend to purchase targets that have negatively correlated cash flows. In addition, May (1995) found evidence that CEOs tend to make investments in technologies in which they have greater expertise, which is consistent with the managerial entrenchment hypothesis.

Evidence on the behavioral motives for conglomerate mergers is rather limited. We have already discussed examples of CEOs with Napoleonic aspirations, but the only evidence on the effect of CEO overconfidence on conglomerate merger activity comes from Malmendier and Tate (2008). They develop a measure of CEO overconfidence and use it to analyze merger activity in the USA from 1980 to 1994. They find that overconfident CEOs are more likely to make an acquisition and that the market reaction to the merger announcement is substantially more negative than for mergers carried out by nonoverconfident CEOs. Although the evidence is limited, the evidence confirms that a CEO's personality can affect firm behavior.

We are not surprised that the evidence is mixed regarding the motives for conglomerate mergers. After all, conglomerate firms are multifaceted entities. There are many reasons why one firm may buy another, and they are not mutually exclusive. A merger may promote efficiency, increase market power, and serve managerial motives, and each has a different effect on firm performance. Further, the relative importance of these motives is likely to differ among firms, across industries, and over time. This suggests that generalizations are rather difficult and individual case studies may be the only way to fully understand a particular conglomerate merger.

18.6 Summary

1. A firm can rapidly increase its size by merging with another firm. When competitors merge, this is called a **horizontal merger**. A **vertical merger** involves firms that have a buyer–seller relationship. Others are called **conglomerate mergers**.
2. Conglomerate mergers can be pure and impure. Firms involved in a **pure conglomerate merger** produce completely unrelated products that compete in separate markets. An **impure conglomerate merger** involves firms that compete in markets that are not entirely separate. A merger of firms that produce the same product but in different geographic locations is called a **market extension merger**. When firms produce "somewhat" related products, a merger is called a **product extension merger**.
3. There have been four major merger waves in the USA. The first involved predominately horizontal mergers, which occurred at the end of the nineteenth century. The second occurred in the 1920s and involved a greater number of vertical and conglomerate mergers, as well as horizontal mergers between smaller competitors. The third wave of the 1960s involved mostly conglomerate mergers. The final wave has continued since the 1990s and has been influenced by government deregulation.
4. The classic profit motives for mergers are enhanced market power and efficiency. Firms may also merge to reduce risk and in response to changes in government policy. According to the **market for corporate control hypothesis**, mergers may

be an efficient way of disciplining inefficient managers and transferring assets from failing to successful firms.

5. Non-profit-maximizing motives may also influence merger activity. First, when manager compensation is closely tied to company growth, excessive merger activity may result. Second, behavioral theories suggest that some managers are motivated by empire building and suffer from overconfidence. These motives can lead to excessive merger activity.
6. The market power motive is most likely with horizontal mergers. However, the **merger paradox** indicates that merging firms do not necessarily benefit from the resulting increase in market power. In a simple Cournot model, the horizontal merger must involve firms with a combined market share of over 80% for the merger to be profitable for firms involved in the merger. The merger paradox need not hold if the merger produces a Stackelberg leader or if firms compete in a Bertrand-type game with sufficient product differentiation.
7. **Williamson's trade-off** says that when evaluating the social efficiency of a merger, we must compare the resulting efficiency gain with the market power loss. In the Cournot model, it takes a relatively small efficiency gain for a horizontal merger to increase total surplus. It takes a substantially greater efficiency gain for it to increase consumer surplus. Thus, mergers that are socially efficient need not benefit consumers.
8. A vertical merger can improve efficiency when it involves technical economies, lowers transaction costs, and improves product or service quality. It can also eliminate the problem of **double marginalism**, where a chain of monopolies along each stage of vertical suppliers is more *in*efficient than a chain of competitive producers or a monopolist that is completely vertically integrated. The policy implication is captured in the **principle of double marginalism**: vertical integration either increases or has no effect on market efficiency. Caution is warranted, however, as this principle need not always hold.
9. Vertical mergers can increase market power, especially if they lead to foreclosure and enhance the combined firm's ability to price discriminate.
10. In most cases, the empirical evidence shows that vertical mergers promote efficiency and not market power.
11. A conglomerate merger is efficient when it enables the firm to take advantage of economies of scope, reduces transaction costs, and facilitates the transfer of management control from inefficient to efficient management teams.
12. An important way in which a conglomerate merger can increase market power is when it eliminates potential competition, as with a market extension merger. Market power may also be enhanced when a conglomerate merger leads to greater reciprocity, cross subsidization, and coordinated behavior.
13. The separation of owners and managers in large corporations can create a principle–agent problem. This may cause managers to make decisions that are in their interest rather than the interest of owners. Managerial theories of the firm suggest that this can induce a manager to put too high a value on sales growth and to diversify in directions that increase the value of the manager to

the firm (i.e., **managerial entrenchment**). It can also induce managers to over diversify to reduce management's exposure to risk.

14. Behavioral economics suggests that the personality of a company's CEO can influence conglomerate activity. CEOs who are overconfident and interested in **empire building** may overinvest in conglomerate mergers, which is bad for owners. CEOs with a preference for empire building actively pursue different goals from owners, whereas overconfident CEOs believe that they are behaving in the owner's interest. Thus, developing contracts that align the goals of managers and owners will not correct overconfident CEO behavior.
15. Although it is difficult to accurately control for all variables that are likely to influence conglomerate mergers, the available evidence is generally consistent with many of the theories discussed in this chapter. Many, but not all, conglomerate mergers enhance the market value of the firm. Direct productivity studies provide mixed results on a conglomerate merger's ability to lower production costs. Some studies show that conglomerate mergers have increased market power. Finally, there is evidence to support the managerial and behavioral motives for conglomerate mergers. That is, managers with greater discretion and who are overconfident are more likely to engage in conglomerate mergers.
16. In summary, economic theory demonstrates that there are multiple motives for mergers, and they are not mutually exclusive. The empirical evidence provides support for a variety of motives, depending on the type of merger (i.e., horizontal, vertical, and conglomerate), the industry under consideration, and the time period involved. From a policy perspective, this suggests that the causes and economic consequences of mergers should be judged on a case by case basis.

18.7 Review Questions

1. Compare and contrast horizontal, vertical, and conglomerate mergers. What is the difference between a pure and an impure conglomerate merger?
2. Identify the four merger waves in the USA from the late nineteenth century to present. Briefly identify the motives for each of these merger waves.
3. Regarding the market-for-corporate-control hypothesis:
   A. Briefly explain the market-for-corporate-control hypothesis and how it provides an efficiency motive for mergers.
   B. How can the event study method be used to test the market-for-corporate-control hypothesis?
   C. Explain how the market-for-corporate control hypothesis is derived from the efficient-market hypothesis. What are the main weaknesses with the efficient-market hypothesis, and, therefore, the market-for-corporate-control hypothesis?
4. (Advanced) Consider a market with three firms (1, 2, and 3) that produce homogeneous goods. The inverse market demand function is $p = 24 - Q$,

where Q is market output ($q_1 + q_2 + q_3$, with q_i representing firm i's output). The total cost equation for firm i is $TC_i = 12q_i$.

A. Find the Cournot equilibrium price (p^*), output (q_i^*), and profit (π_i^*) levels for each firm.
B. Will it be profitable for firms 1 and 2 to merge and form firm 1–2?

5. Consider a market with three firms (1, 2, and 3) that produce homogeneous goods. The market demand function is $Q = 24 - p$, and firm total cost equations are $TC_1 = 10q_1$, $TC_2 = 10q_2$, and $TC_3 = 12q_3$.

A. Find the Bertrand equilibrium price (p^*), output (q_i^*), and profit (π_i^*) levels for each firm.
B. If firm 1 has the option of acquiring another firm, will it prefer to buy firm 2, buy firm 3, or make no acquisition? Explain.

6. If the primary goal of society is efficiency, explain how the Williamson trade-off is important to antitrust.
7. Explain the difference between an upstream and a downstream vertical merger.
8. You are the CEO of the Macrosoft Corporation and decide to buy a custom motorcycle from US Choppers. The purpose of the motorcycle is to help promote your company, and your only request is that the Macrosoft logo be prominently displayed on the motorcycle.

A. Explain how the hold-up problem applies to this purchase.
B. Who is at greater risk of being held up, you or US Choppers?
C. Identify 2 ways in which to eliminate the hold-up problem.

9. Consider a market much like that which is described in Fig. 18.5. In this problem, there is a monopoly wholesaler and a competitive retailer (the *monopoly–competitive case*).

A. On your own figure, identify the equilibrium wholesale price (p_W), retail marginal cost (MC_R), retail price (p_R), and output level.
B. How does this output level compare to the equilibrium output levels in the competitive–competitive case (Q_S in Fig. 18.4), competitive–monopoly case (Q_1 in Fig. 18.5), and monopoly–monopoly case (Q_2 in Fig. 18.6)?
C. Identify the profits going to the wholesaler and retailer.

10. Consider a market with a monopoly wholesaler and a monopoly retailer. The retailer uses a fixed-proportions technology.

A. Briefly show how double marginalism applies to these vertically related firms.
B. Show how a merger between the manufacturer and the distributor can increase consumer and producer surplus.
C. How could your answer to part B change if the retailer has a variable-proportions technology?

11. Define what is meant by economies of scope. Under what conditions will the presence of economies of scope justify a conglomerate merger from society's perspective?
12. Define the mutual forbearance hypothesis and describe a trigger strategy that would support it.
13. Discuss how the principle–agent problem can explain the tendency of larger corporations to overinvest in conglomerate mergers.
14. The principle–agent problem can induce managers to make acquisitions that are not in the interest of stockholders. Explain how this can lead to "managerial entrenchment."
15. Provide two behavioral motives for conglomerate mergers.

Appendix A: The Economics of Double Marginalism

Here, we formally analyze the economics of double marginalism by considering the problem described in Sect. 18.4.1.5. This is a market for gasoline with a monopoly manufacturer or wholesaler (W) and a monopoly distributor or retailer (R). Gasoline is supplied using a fixed-proportions technology. The total cost of wholesaling is $\mathrm{TC_W} = c_\mathrm{W}Q$, where c_W is marginal and average cost and Q is output. The retailer pays the wholesale price of gasoline, and there are no added costs to the retailer of doing business. Thus, the retailer's total cost is $\mathrm{TC_R} = c_\mathrm{R}Q$, where c_R is the retailer's marginal and average cost. Because there are no added costs of retailing, $c_\mathrm{R} = p_\mathrm{W}$, the wholesale price of gas. The inverse demand at the retail level is linear: $p_\mathrm{R} = a - bQ$, where p_R is the retail price.[50] Firms compete in a two-stage game. In the first stage, the wholesaler sets its price. In the second stage, the retailer chooses its output level given the wholesale price of gasoline.

We use backwards induction to identify the SPNE. The problem in the second stage is for the retailer to maximize its profit (π_R), given p_W. The firm's profit equation is

$$\begin{aligned}\pi_\mathrm{R} &= \mathrm{TR_R} - \mathrm{TC_R} \\ &= p_\mathrm{R}Q - c_\mathrm{R}Q = (aQ - bQ^2) - c_\mathrm{R}Q. \end{aligned} \tag{A.1}$$

Recalling that $c_\mathrm{R} = p_\mathrm{W}$, the first-order condition of profit maximization is

$$\begin{aligned}\frac{\partial \pi_\mathrm{R}}{\partial Q} &= \frac{\partial \mathrm{TR_R}}{\partial Q} - \frac{\partial \mathrm{TC_R}}{\partial Q} \\ &= \mathrm{MR_R} - \mathrm{MC_R} \\ &= (a - 2bQ) - p_\mathrm{W} = 0, \end{aligned} \tag{A.2}$$

[50] Given fixed proportions, wholesale and retail output are the same.

where MR_R is the retailer's marginal revenue and MC_R is the retailer's marginal cost. Solving for Q gives the retailer's best-reply function (Q^{BR})

$$Q^{BR} = \frac{a - p_W}{2b}. \tag{A.3}$$

Notice that if the retailer owns the wholesaler or if the wholesale price equals MC_W, then this would be the simple monopoly solution.

Next, we solve the wholesaler's problem. The wholesaler is assumed to be sequentially rational and can look forward and reason back. This enables it to identify the retailer's best-reply and maximize its profits given Q^{BR}. From the wholesaler's perspective, Q^{BR} is the wholesaler's demand. Solving (A.3) for p_W gives the wholesaler's inverse demand: $p_W = a - 2bQ$. Notice that it equals MR_R (from A.2). The wholesaler's profit equation is

$$\begin{aligned}\pi_W &= TR_W - TC_W \\ &= p_W Q^{BR} - c_W Q^{BR} = (p_W - c_W)Q^{BR} \\ &= (p_W - c_W)\left(\frac{a - p_W}{2b}\right).\end{aligned} \tag{A.4}$$

The first-order condition with respect to p_W is

$$\begin{aligned}\frac{\partial \pi_W}{\partial p_W} &= \frac{\partial TR_W}{\partial p_W} - \frac{\partial TC_W}{\partial p_W} \\ &= MR_{pW} - MC_{pW} \\ &= \left(\frac{a - 2p_W}{2b}\right) + \left(\frac{c_W}{2b}\right) = 0,\end{aligned} \tag{A.5}$$

where MR_{pW} is the wholesaler's marginal revenue with respect to price, and MC_{pW} is the wholesaler's marginal cost with respect to price. Solving this for p_W gives the profit-maximizing wholesale price. Substituting this value into Q_{BR} and the demand and profit equations gives the other SPNE values:

$$p_R^* = \frac{3a + c_W}{4} > p_W^* = \frac{a - c_W}{2}, \tag{A.6}$$

$$Q^* = \frac{a - c_W}{4b}, \tag{A.7}$$

$$\pi_R^* = \frac{(a - c_W)^2}{16b} < \pi_W^* = \frac{(a - c_W)^2}{8b}, \tag{A.8}$$

$$\pi_R^* + \pi_W^* = \frac{3(a - c_W)^2}{16b}. \tag{A.9}$$

If the firms were to merge, this would produce the simple monopoly solution:

$$p_{\mathrm{R}}^{**} = \frac{a + c_{\mathrm{W}}}{2}, \tag{A.10}$$

$$Q^{**} = \frac{a - c_{\mathrm{W}}}{2b}, \tag{A.11}$$

$$\pi^{**} = \frac{4(a - c_{\mathrm{W}})^2}{16b}. \tag{A.12}$$

This demonstrates the principle of double marginalism: compared to a single merged firm, separate wholesale and retail monopolies are (1) less efficient because $Q^{**} > Q^{*}$; (2) less profitable ($\pi^{**} > \pi_{\mathrm{R}}^{*} + \pi_{\mathrm{W}}^{*}$), providing an incentive for vertical merger; (3) bad for consumers, because the retail price is lower and production is greater with the merger. Notice too that this problem is similar to the problem of complementary products that we discussed in Chap. 13.