17

Vertical and Conglomerate Mergers

In the fall of 2000, General Electric and Honeywell International announced that the two companies would merge with GE acquiring Honeywell. GE is of course a very well known firm with annual revenues well over $100 billion. Its businesses are involved in everything from lighting and appliances to television programming (it owns NBC) and financial services. GE is also a major supplier of jet engines for commercial aircraft for which its chief competitors are Rolls Royce and Pratt-Whitney. Honeywell was originally a leader in temperature and environmental controls but has, over time, developed into a major aerospace firm whose products included electric lighting, ventilation units, and braking systems for aircraft and also starter motors for aircraft engines of the type GE builds. The deal was approved in the United States. However, in July of 2001, the European Commission following the recommendation of Competition Commissioner, Mario Monti, blocked the merger.

The proposed GE–Honeywell merger was a marriage of complementary products. The more aircraft engines GE sells the more starter motors and other related aircraft items Honeywell could sell. A merger of GE and Honeywell is a vertical merger. Often vertical mergers are comprised of firms operating at different levels of the production chain, say, a wholesaler and a retailer. However, the connection between an upstream and a downstream firm is qualitatively the same as the relation between Honeywell and GE, or that between computer hardware and software, or nuts and bolds or zinc and copper, which are combined to make brass. In all of these cases, two or more products are combined to yield the final good or service. Because an upstream–downstream relationship is just one of the many types of complementary relationships that may exist between firms, the term vertical merger has come to have the more general interpretation of a merger between any firms that produce complementary products.

We showed in Chapter 8, section 8.3, that the separate production of complementary goods—each one produced by a firm with monopoly power—reduces the joint profit of the two firms and imposes an efficiency loss on both firms and consumers. The intuition behind this result is straightforward. Each firm's pricing decision imposes an externality on the other firm. A high price for computer hardware reduces demand for PCs. It also reduces demand for programs and operating systems. The hardware manufacturer takes the first effect into account, but not the second. The same is true, of course, in reverse. The software manufacturer does not take into account the impact its price choice has on the demand for hardware. In the noncooperative Nash equilibrium, the prices of both goods are too high. If, say, the hardware firm were to cut its price, this would generate additional demand and additional

profit for the software firm. However, since the hardware firm does not receive any of this additional profit, its incentive to reduce price is weakened. This suggests that, with cooperation, both firms would lower their prices and be better off. Consumers, too, would gain as a result of lower prices and expanded output.

One way to achieve the profit and efficiency gains of cooperation is for the two firms to merge. Such a merger creates a single decision-making entity and, therefore, permits the externality to be internalized. The combined hardware and software firm will maximize its total profit by reducing the prices of both complementary goods so as to maximize the joint profit from each. Whenever firms with monopoly power produce complementary products, they have a strong incentive either to merge or to devise some other method to ensure cooperative production and pricing of the complementary products.

Precisely the same issues of cooperation arise when the complementary relationships arise because the firms occupy different levels in the vertical production chain. This is important because it sheds light on how vertical mergers affect competition and so consumer welfare. In the 1980s the realization that vertical mergers can generate efficiency gains led to something of a revolution in antitrust policy related to vertical mergers. In the decades prior to 1980, vertical mergers were often seen as anticompetitive because of the fear that such mergers they would facilitate foreclosure. That is, the upstream merger partner would, after the merger, refuse to supply its product to other downstream firms and thereby either drive them out of the market or create barriers to entry adversely affecting them.

Economists primarily associated with the Chicago School challenged this negative view of vertical mergers. They argued that vertical mergers could also be seen as ways to achieve complementary efficiencies and that "vertical integration was most likely procompetitive or competitively neutral" (Riordan, 1998, p. 1232). By the 1980s, the Chicago School approach began to gain in the courts and vertical mergers were treated increasingly favorably by the antitrust authorities. However, by the mid-1990s the pendulum once more began to swing the other way. A Post-Chicago approach has now emerged that employs new game theoretic tools to build new and logically consistent models of vertical mergers in which once again the potential for consumer harm is real. This counter-revolution has led to a detailed scrutiny of a number of vertical combinations, most notably, those in the telecommunications sector.

We begin this chapter by developing an analysis of vertical mergers based on the proposition that these are procompetitive and correct market inefficiencies. In section 2, we consider some of the more recent analysis suggesting that such mergers might adversely affect competition in final product markets. Section 3 presents a simple formal model to illustrate this phenomenon.

Section 4 turns to the third and final type of mergers. These are conglomerate mergers involving the combination of firms without either a clear substitute or a clear complementary relationship. Examples include the purchase of Duracell Batteries by Gillette, the purchase of Snapple (iced tea) and Gatorade (a sports drink) by Quaker Oats, and the series of acquisitions in 1986 by Daimler-Benz, a luxury car and truck manufacturer, which turned it into Germany's largest industrial concern, producing aerospace to household goods. Finally, section 5 presents a brief overview of antitrust policy with respect to different types of mergers.

17.1 PROCOMPETITIVE VERTICAL MERGERS

When firms occupy different stages of the production stream the convention is to label those firms farthest from the final consumer of the product as upstream and those closest to that consumer as downstream. Film companies and movie theaters are an example. In this case,

the film company is the upstream firm and the theater that shows the film is the downstream firm. Manufacturers and retailers have a similar upstream–downstream relation. All such relationships can be usefully viewed through the lens of complementarity. Each firm in the vertical chain provides an essential service to other firms in the chain. Vertical relationships between two firms—each with monopoly power—leads to a loss of economic efficiency in the absence of some mechanism to coordinate the decisions of the two firms. In the case of vertically related firms, this is referred to as the problem of *double marginalization*. We now give a formal illustration of this problem.

Suppose that we have a single upstream supplier, the manufacturer, who sells a unique product to a single downstream firm, the retailer. The manufacturer produces the good at constant unit cost, c, and sells it to the retailer at a wholesale price, r. The retailer resells the product to consumers at the market-clearing price, P. For simplicity, we assume that the retailer has no retailing cost. Consumer demand for the good is described by our familiar linear inverse demand function $P = A - BQ$, and we assume of course that $c < A$.

Given that the retailer purchases Q units from the manufacturer at wholesale price r and resells these Q units to consumers at price $P = A - BQ$ the retailer's profit is

$$\Pi^D(Q, r) = (P - r)Q = (A - BQ)Q - rQ \tag{17.1}$$

The retailer maximizes profit by equating marginal revenue with marginal cost. Marginal revenue is $MR = A - 2BQ$ and marginal cost is r. Equating these two terms yields the optimal downstream output,

$$Q^D = (A - r)/2B \tag{17.2}$$

Substituting this expression into the demand function gives the market-clearing retail price $P^D = (A + r)/2$. From equation (17.1) the retailer's profit is, therefore, $\Pi^D = (A - r)^2/4B$. Figure 17.1 illustrates these results.

What about the manufacturer? What wholesale price should be charged? It is clear from equation (17.2) that the wholesale price determines the number of units the upstream

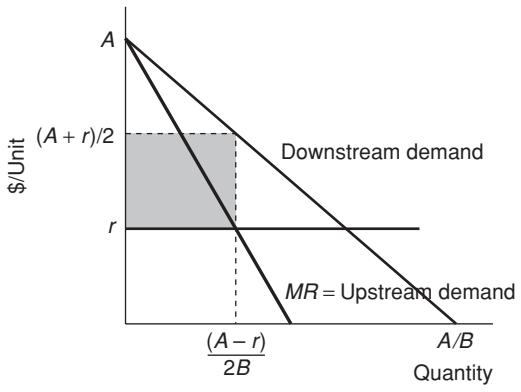

Figure 17.1 Independent retailer's optimum pricing as a function of manufacturer's wholesale price, r

At wholesale price r the retailer will set retail price $P = (A + r)/2$ to maximize profit. Total retail profit is indicated by the shaded region.

supplier is able to sell to the retailer. At the wholesale price r the retailer chooses to sell $Q^D = (A - r)/2B$ units. The retailer must purchase this number of units from the manufacturer. In other words, $Q = (A - r)/2B$ is the demand curve which the upstream manufacturer faces. It describes the relationship between the wholesale price r set by the manufacturer and the quantity of his product demanded by the retailer. But this means that *when the retailer has no marginal costs other than the input price charged by the manufacturer the inverse demand facing the upstream manufacturer at wholesale price r is* $r = A - 2BQ$*, which is also the marginal revenue function facing the retailer.*[1]

17.1 Practice Problem

The inverse market demand curve facing a monopoly retailer of gold bracelets is described by $P = 3{,}000 - Q/2$. The retailer buys gold bracelets at a wholesale price, r, set by the manufacturer and has no other costs. Show that the inverse demand curve facing the manufacturer is $r = 3{,}000 - Q$. Suppose instead that the retailer has additional marginal costs (labor etc.) of c^U. Show that the inverse demand curve facing the manufacturer is $r = (3{,}000 - c^U) - Q$.

We can now derive the profit-maximizing price that the manufacturer charges for its product. Very simply, the manufacturer equates marginal cost with marginal revenue. The inverse demand curve for the manufacturer is $r = A - 2BQ$, so the marginal revenue curve for the manufacturer is $MR = A - 4BQ$. Equating this with marginal cost, c, yields the profit-maximizing output and wholesale price. These are, respectively,

$$Q^U = \frac{A - c}{4B} \text{ and } r^U = \frac{A + c}{2} \tag{17.3}$$

This analysis is illustrated in Figure 17.2. When the upstream manufacturer sets the price $r^U = (A + c)/2$, the downstream retailer charges a price $P^D = (A + r^U)/2 = (3A + c)/4$. The retailer sells $Q^D = (A - c)/4B$ units, which is, of course, precisely the amount the upstream manufacturer anticipated it would sell when it set its upstream price $r^U = (A + c)/2$ in the first place. The profit of the manufacturer, shown in Figure 17.2 as the lightly shaded area $wrgv$, is $\Pi^U = (A - c)^2/8B$. The profit of the retailer, shown as the darkly shaded area $refg$, is $\Pi^D = (A - c)^2/16B$. The combined profit of the two firms is, of course, just the sum of these two areas, $3(A - c)^2/16B$.

Suppose now that the two firms merge so that the manufacturer becomes the upstream division of an integrated firm, selling its output to the downstream retail division of the same parent company. The manufactured good is still produced at constant marginal cost, c. This effectively transforms the integrated firm into a simple monopoly whose goal is to maximize monopoly profit through its choice of retail price P. This profit is just total revenue PQ minus total cost cQ, which is $\Pi^I = (A - BQ) - cQ$.

The marginal revenue curve of the integrated firm is just the marginal revenue curve of the nonintegrated retailer, $MR^I = A - 2BQ$. Equating this with marginal cost c gives the

[1] If, by contrast, the retailer has additional marginal costs of c^U then the inverse demand facing the manufacturer is $(A - c^U) - 2BQ$: see Practice Problem 17.1.

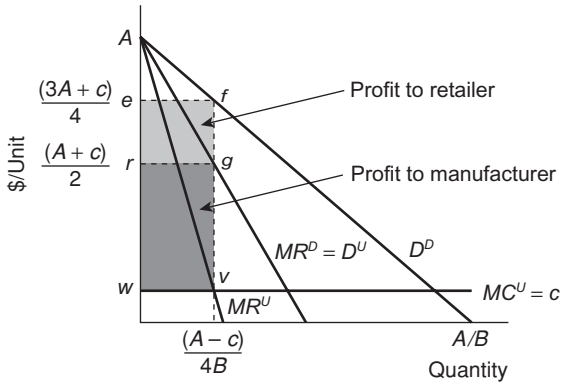

Figure 17.2 Upstream and downstream profit maximization without vertical integration
The retailer's marginal revenue curve MR_B is the manufacturer's demand curve D_U. Double marginalization results when the manufacturer sets its optimal wholesale price $r = (A + c)/2$ above marginal cost c, after which, the retailer adds a further markup by setting retail price $P = (3A + c)/4$. Retail profit is area *refg*. The manufacturer's profit is area *wrgv*.

profit-maximizing output of the integrated firm, $Q^I = (A - c)/2B$. Substitution of this into the inverse demand curve then gives the retail price to consumers, $P^I = (A + c)/2$.

The merger of the manufacturer and retailer results in consumers being charged a lower price. As a result, the merged firm sells more of the product than did the two independent firms. But is this merger profitable? Yes! The profit earned by the integrated firm is $\Pi^I = (A - c)^2/4B$. This is 12.5 percent greater than the aggregate premerger profit of the manufacturer and the retailer, which we saw was $3(A - c)^2/16B$. From a social welfare point of view, *integrating the two monopoly firms has benefited everyone*. Total profit is increased *and* consumer surplus is increased with more of the good being sold at a lower price.

The gains from this vertical merger are illustrated in Figure 17.3. The retailer's premerger profit, area *refg*, is redistributed to consumers as surplus. In addition, consumers gain the

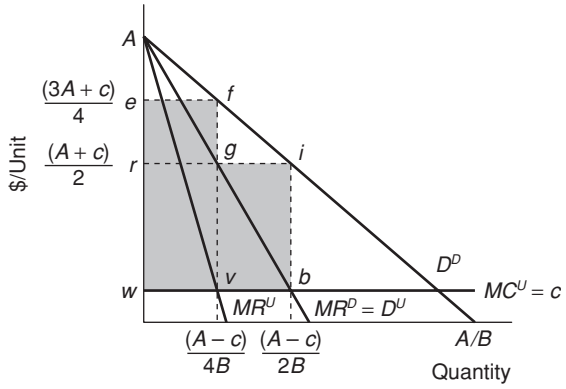

Figure 17.3 Upstream and downstream profit maximization with vertical integration
An integrated manufacturer-retailer sets a retail price to consumers at $P = (A + c)/2$. The area *refg* that would have been profit for a non-integrated retailer now becomes part of consumer surplus. However, the increased sales volume generates a more than offsetting profit gain of area *gjbv*. Total profit for the integrated firm is *rjbw*.

area *fgi*. The manufacturer's profit has doubled from area *wrgv* to *wrib* and this more than offsets the loss of the retailer's profit.

Merger of vertically related firms generates an all round efficiency gain because it allows the separate but related activities to be coordinated and, thereby, to internalize the externality that each imposes on the other. In the absence of coordination, the final product price reflects a double marginalization. The independent manufacturer marks up its price to the retailer who then compounds that price-cost distortion by adding a further markup in setting a price to the consumer. This is the basis of the old saying, "What is worse than a monopoly? A chain of monopolies!"

17.2 Practice Problem

Suppose that the downstream market for widgets is characterized by the inverse demand curve $P = 100 - Q$. Widget retailing is controlled by the monopolist WR Inc., which obtains its widgets from the monopoly wholesaler WW Inc. at a wholesale price of w_w per widget. WW Inc. obtains the widgets in turn from the monopoly manufacturer WM Ltd. at a manufacturing price of w_m per widget. WM Inc. incurs marginal costs of \$10 per unit in making widgets. WW and WR each incur marginal costs of \$5 in addition to the prices that they have to pay for widgets.

a. What is the equilibrium widget price to consumers, P, the equilibrium wholesale price w_w and the equilibrium manufacturing price w_r? What is the profit earned by each firm at these prices?
b. Show that vertical integration by any two of these firms increases profit and benefits consumers.
c. Show that integration of all three firms is even more beneficial.

There are, of course, several qualifications that we should mention. Some are noted in the accompanying Reality Checkpoint. In addition it is important to note that the benefits of vertical merger just described assume that the downstream firm uses a fixed amount of the upstream firm's product for every unit of output that the downstream firm sells. In our example of a manufacturer and a downstream retailer, this assumption makes sense. The retailer has to have one unit of the manufacturer's product for every unit it sells to its customers. But in other situations this assumption could be too strong. For example, if the upstream firm is a steel producer and the downstream firm is an automobile manufacturer, the steel firm's decision to charge the car manufacturer a price r that includes a high markup may induce the automaker to reduce its use of steel in favor of aluminum or perhaps fiberglass. In such a case, the potential gains of the car manufacturer integrating backwards into the steel market are less clear-cut.

In summary, vertical integration of a chain of producers, each of which has monopoly power, is likely to benefit both firms and consumers by correcting the market failure associated with double (and triple and quadruple . . .) marginalization. These benefits are more likely to arise when the technology operated by downstream firms offers limited opportunities for substitution into other inputs.

Reality Checkpoint

Vertical Disintegration in the Automobile Industry

Our analysis of vertical integration has stressed the gains of eliminating "the middle man" and the problem of double marginalization. If this were all there were to it, we would see much more vertical integration and very little outsourcing. Quite to the contrary, however, the business news since the 1990s has been filled with stories of outsourcing and vertical *dis*integration as firms have spun off their former internal divisions. Nowhere has this phenomenon been more dramatic than in the U.S. automobile industry.

Consider the General Motors Corporation. GM founder W. C. Durant and his protégé Alfred Sloan, were devoted to vertically integrating the firm. Their logic was the same as we have presented here. GM could capture more of the surplus its automobiles generated if more of that generation took place within GM. As a result, GM and the U.S. automotive industry in general became models of vertically integrated firms, controlling engine production, body assembly, parts supplies, and extending down to official dealerships.

Over the years however, problems with this organizational strategy emerged, the major one of which concerns incentives. Since GM bought virtually all its parts internally, the parts division did not face outside competition to spur its efficiency. Often, buyers at the automaking divisions did not even know the names of alternative suppliers. To be sure, buyers would sometimes solicit bids from outside suppliers as a means to check the quotes from the internal sources but the outsiders typically knew that they were just being used as a measuring stick—the order would ultimately go to the GM parts division—and were reluctant to make serious bids. At the same time, devising internal schemes to promote efficiency is difficult. Those outside the parts division cannot specify parts cost because they do not have the requisite knowledge. An obvious alternative to asking the division to supply parts at minimal cost is to give it a budget and ask it to supply parts subject to that budget. However, this scheme has problems, too. To begin with, the parts division shares some costs with other divisions and it is difficult to know how to apportion these costs. Further, if the budget is too tight, the parts division may meet this constraint by skimping on quality. In the end, the problems of high costs and/or uncertain quality proved too much. GM spun off its parts division as the independent part firm, Delphi Automotive Systems, in 1999. Ford followed quickly and spun off its parts division as Visteon Corporation.

Source: J. Schnapp. "Lesser Than the Sum of Its Parts," *Wall Street Journal* (Tuesday, April 4, 2006), p. 18.

17.2 POSSIBLE ANTICOMPETITIVE EFFECTS OF VERTICAL MERGERS

The merger analysis of the previous section suggests that the antitrust authorities should be less concerned about the welfare impact of vertical mergers than the impact of horizontal mergers. However, the analysis is based upon important assumptions that may drive the results. In particular, we have assumed that there is a single market in which the final output is sold and that there is monopoly at each stage in the vertical chain. Before coming to the general conclusion that "vertical mergers are good for firms and consumers" we should check on the effects of relaxing these assumptions.

17.2.1 Vertical Merger to Facilitate Price Discrimination

While life is good for a monopolist, it is even better for a monopolist who price discriminates. This is equally true for an upstream monopolist selling to a number of downstream firms. Moreover, there are many cases in which those downstream firms differ in their willingness to pay for the upstream firm's product. Examples include a wholesaler supplying retailers in different cities, a manufacturer of motorcar parts supplying automakers in different countries, a consultant advising different firms in different industries, and so on. In these circumstances, the upstream firm would like to charge a high price for its product or service to those firms whose demand is inelastic and a low price to those whose demand is elastic.

Our earlier discussion of price discrimination showed, however, that successful price discrimination has two requirements. First, the firm must be able to identify which buyers have elastic and which have inelastic demand. Second, the firm must somehow prevent resale of its product among its buyers. Such arbitrage would clearly undo any price discrimination efforts. We will assume that the firm has somehow solved the identification problem. The question then becomes, what strategies can the firm use to surmount the arbitrage problem?

The simplest approach would be to for the upstream firm to write a no-resale contract with its buyers. In many circumstances, however, such contracts are unenforceable—for example when the client firms are in different legal jurisdictions—in which case some other approach is necessary. One such approach is for the upstream firm to merge with some or all of its downstream customers.

Suppose that the upstream firm supplies a series of downstream firms and that, because of financial constraints, the upstream firm can integrate forwards with only some of the downstream firms. Then, as Practice Problem 17.3 shows, the firm needs to act strategically in determining the market into which it will integrate. The merger allows the upstream firm to prevent resale, solving the arbitrage problem and so restores the upstream firm's ability to price discriminate. Is such a merger pro- or anti-competitive? Successful price discrimination can improve economic efficiency. When success is achieved by means of a vertical merger the effect on economic efficiency is, however, ambiguous. The reason is that while the merger increases profits and removes double marginalization in one group of markets, the merger also leads to increased prices in the remaining markets. In other words, some consumers gain and others lose from the vertical merger. The overall effect is uncertain and can be resolved only when we have more information on the precise nature of demand in the various markets.

17.3 Practice Problem

Assume that Widget International supplies widgets to Gizmo Inc. in Boston, where the demand for gizmos is $P_{gb} = 1 - Q_{gb}$, and TruGizmo Inc. of New York, where demand for gizmos is $P_{gn} = 0.5 - 0.2Q_{gn}$. Assume that WI's marginal costs of supplying both markets is \$0.1 per widget and that both Gizmo Inc. and TruGizmo Inc. need exactly one widget for every gizmo they sell. Both gizmo dealers have other costs of production that amount to \$0.1 per gizmo.

a. What are the profit-maximizing prices for widgets and gizmos in these two markets if Widget International cannot price discriminate? What are the profits of the three firms?
b. What are the profit-maximizing prices for widgets and gizmos in these two markets if Widget International can price discriminate? What are the profits of the three firms?
c. Show that if WI can merge with either Gizmo Inc. or TruGizmo Inc., it prefers to merge with TruGizmo Inc.
d. What is the effect of the merger on consumer prices and consumer surplus when WI (i) cannot and (ii) can price discriminate pre-merger?

17.2.2 Vertical Merger, Oligopoly, and Market Foreclosure

Now consider the second important assumption underlying the analysis in section 17.1. The gains from the merger hinge crucially on the fact that prior to the merger there was monopoly at both levels of activity, manufacture and retail. Suppose, instead, that we had started with either a competitive manufacturing sector upstream selling to a monopoly downstream, or a monopoly upstream selling to a competitive retail sector. Price competition upstream among manufacturers leads to a wholesale price equal to marginal cost. Alternatively, competition among retailers downstream brings the retail price equal to the upstream price P^U plus downstream marginal cost r. In either case, no double marginalization can occur, and there is no efficiency gain to vertical integration.

It could be argued, of course, that assuming perfect competition rather than monopoly in either the upstream or downstream market merely replaces one extreme assumption by another. We now turn, therefore, to the more realistic case in which both upstream and downstream markets are oligopolies. This raises another important issue that needs to be considered explicitly. Beyond the desire to reduce or eliminate double marginalization, there is an additional motive for vertical integration that is more clearly anticompetitive. The motive is the possibility of *market foreclosure*. That is, the merger of vertically related firms might result in an upstream–downstream company that can either deny downstream rivals a source of inputs, or upstream competitors a market for their products.

Consider a hypothetical case in which two suppliers of computer chips compete for sales to two downstream computer manufacturers who in turn sell to the general public. The chips of the two upstream firms are identical so that, if the two suppliers compete in price, they must sell at marginal cost. Hence, only the two downstream firms earn any economic profit. Suppose now that one of the chip manufacturers and one of the computer firms merge. The argument that this merger may be anticompetitive goes roughly as follows. The upstream chip division of the newly merged firm will no longer offer to sell any chips to the remaining independent computer firm, that is, it may foreclose sales of its product to this downstream rival. Why? The answer is that such foreclosure leaves the independent computer firm with only one supplier, namely, the remaining independent chip firm. That independent chip producer will have monopoly power vis-à-vis the independent computer firm and, accordingly, set a monopoly wholesale price for its chips. In turn, this will raise the costs of the independent computer firm relative to the pre-merger situation and make it less able to compete with the downstream computer division of the integrated firm. This will permit the merged firm to raise the price of its computers and earn more profit. Because the upstream market was initially competitive there was no double-marginalization and since there are no other cost savings as a result of the merger, this vertical integration is clearly anticompetitive.[2] The merger raises the cost of the nonintegrated rivals on the supply side and thereby leaves them at a disadvantage relative to the integrated firm.

The telecommunications industry is one in which foreclosure concerns have been quite real for regulatory authorities in both the United States and in Europe. In this industry, the local telephone network has generally been monopolized by a firm that also competes in the more competitive long-distance market. Since a long-distance provider, such as Sprint Nextel has to gain access to its potential customers by connecting to the local network, the local network provider has the potential to price its long-distance competitors out of the

[2] For a description many ways in which an integrated firm can impose a cost squeeze see Krattenmaker and Salop (1986).

market by charging them a very high price for network access or, in an extreme case, denying them access to the network at all. Accordingly, a major concern of the regulatory authorities has been the prices that suppliers of local telephone networks are allowed to charge for access to the local network.

Alcoa has been accused of subjecting its rivals to a similar price squeeze- both by making contractual arrangements with power companies to prevent them from supplying vital electricity to competing aluminum producers and by charging very high prices for aluminum ingots that were used by rivals that competed with Alcoa in downstream markets such as the aluminum sheet market. In short, foreclosure arguments suggest that monopoly power in one, say upstream, market may be leveraged into power in another, downstream market.

17.4 Practice Problem

Suppose that the downstream market for widgets is perfectly competitive and characterized by the inverse demand curve $P = 100 - Q$. Retailers have zero production costs, but do incur a fee, r, for every unit sold. This fee is the payment that retailers must pay to the only manufacturer of widgets, the monopolist Widget International (WI). WI bears no fixed cost. It does, however, have a constant marginal cost of \$10.

a. What is the equilibrium price to consumers, P, and fee to retailers, r? What is the profit earned by retailers and WI at these prices?
b. Show that vertical integration by which WI becomes the single producer and retailer of widgets does not raise WI's profit and does not lower the price to consumers.
c. What is the price to consumers if both widget manufacturing and retailing are competitive?

17.3 FORMAL OLIGOPOLY MODELS OF VERTICAL INTEGRATION

The conventional foreclosure argument that we just presented is compelling, particularly when buttressed by the accompanying examples. However, there are also some clear weaknesses in the argument that need to be confronted. The local phone network and Alcoa examples are different from our hypothetical computer chip story in that the real world cases begin with something less than competition in the upstream market. We have not identified why this may be the case. Apart from this practical consideration, the logic of the argument is still incomplete. We have not explained why the integrated firm will definitely stop selling chips to the independent downstream computer firm. Nor have we considered an obvious response by the remaining independent firms, namely, to merge and similarly enjoy the benefits of vertical integration. In the next section, we describe two models of foreclosure through vertical integration that address these concerns. One is due to Salinger (1988) and is based on Cournot competition. The other is due to Ordover, Saloner, and Salop (1990) and is rooted in price competition.

17.3.1 Vertical Integration and Foreclosure in a Cournot Model

To illustrate Salinger's (1988) contribution we return to our basic Cournot model except that we now assume that there is Cournot competition both in an upstream market populated by two firms and in a downstream market, also with two firms. The upstream firms produce a

homogeneous intermediate good that is used by the downstream firms to make a good for final consumption. One unit of downstream output requires exactly one unit of the intermediate product. Each upstream firm has constant marginal costs of c^U per unit and each downstream firm has constant marginal costs, excluding the cost of the intermediate good, of c^D per unit. Inverse demand for the final consumption good is:

$$P = A - BQ = A - B(q_1 + q_2) \tag{17.4}$$

The market game has two stages. In the first stage the two upstream firms compete in quantities, generating a price P^U for the intermediate product. In the second stage the downstream firms compete in quantities taking the upstream price P^U as given. We consider first what happens when there is no vertical merger and then compare this outcome with what happens when there is vertical merger. Such a comparison is easier to make when we have a specific numerical example and so for purposes of illustration we shall assume: $A = 100$; $B = 1$; and $c^U = c^D = 23$.

No vertical mergers

Cournot competition upstream in the first stage leads to a market-clearing intermediate product price of P^U so that each downstream firm in the second stage faces marginal cost $P^U + c^D$. Cournot competition downstream leads each downstream firm to produce[3]:

$$q_1^D = q_2^D = \frac{A - P^U - c^D}{3B} \tag{17.5}$$

and to earn a downstream profit of

$$\pi_1^D = \pi_2^D = \frac{(A - P^U - c^D)^2}{9B} \tag{17.6}$$

We can use equation (17.5) to identify the *derived demand* that the upstream firms face. Aggregate downstream output is $Q^D = 2(A - P^U - c^D)/3B$. Since each unit of final product output requires one unit of the intermediate product, this is also the aggregate demand, $Q^U = Q^D$ for the intermediate product, which we can write in inverse form as:

$$P^U = (A - c^D) - \frac{3B}{2}Q^U \tag{17.7}$$

This is in the standard linear form $P = a - bQ$, where $a = A - c^D$ and $b = 3B/2$. As a result, we know that in the first stage of the game the Cournot equilibrium output of each upstream firm is:

$$q_1^U = q_2^U = \frac{a - c^U}{3b} = \frac{(A - c^D) - c^U}{9B/2} = \frac{2(A - c^U - c^D)}{9B} \tag{17.8}$$

[3] See section 9.4 Chapter 9 for the derivation of the Cournot equilibrium.

It follows that aggregate output in the upstream market is $Q^U = 4(A - c^U - c^D)/9B$. Substituting this into the upstream demand in equation (17.7) gives the equilibrium upstream price for the intermediate product:

$$P^U = (A - c^D) - \frac{3B}{2} \cdot \frac{4(A - c^U - c^D)}{9B} = \frac{(A - c^D + 2c^U)}{3} \tag{17.9}$$

Profit of each upstream supplier is $(P^U - c^U)q_i^U$, which from (17.8) and (17.9) gives

$$\pi_1^U = \pi_2^U = \frac{2(A - c^U - c^D)^2}{27B} \tag{17.10}$$

Finally, substituting the upstream price into equations (17.7) and (17.8) gives the equilibrium output and profit for each downstream firm:

$$q_1^D = q_2^D = \frac{2(A - c^U - c^D)}{9B} \tag{17.11}$$

$$\pi_1^D = \pi_2^D = \frac{4(A - c^U - c^D)^2}{81B} \tag{17.12}$$

It is easy to check that, as we would expect, aggregate downstream demand equals aggregate upstream output. Using the numbers from our specific example, total output is 24 units. The wholesale price is \$41 and the price to consumers is \$76. Each upstream firm earns \$216 in profit and each downstream firm earns \$144.

Vertical integration of an upstream and downstream firm

Now consider what happens if one of the downstream firms $D1$ and one of the upstream firms $U1$ merge. Assume for the moment that this newly merged firm refuses to supply the independent downstream firm at all. Hence, the downstream firm $D2$ has to turn to the remaining independent wholesaler $U1$ for its input supply. Suppose that $U2$ sets a price P^U for its intermediate product. Then we know that $D2$ has marginal cost $P^U + c^D$ while $D1$ has marginal cost $c^U + c^D$. In other words, the integrated firm has removed the double-markup in its pricing. As a result, it now competes in the downstream market as a low-cost competitor vis-à-vis $D2$. Applying the standard Cournot equations we know that the post-merger equilibrium outputs of the two firms downstream are:

$$\begin{aligned} q_1^D &= \frac{A - 2(c^U + c^D) + (P^U + c^D)}{3B} = \frac{A - 2c^U - c^D + P^U}{3B} \\ q_2^D &= \frac{A - 2(P^U + c^D) + (c^U + c^D)}{3B} = \frac{A - 2P^U - c^D + c^U}{3B} \end{aligned} \tag{17.13}$$

and their equilibrium profits are:

$$\begin{aligned} \pi_1^D &= \frac{(A - 2(c^U + c^D) + (P^U + c^D))^2}{9B} = \frac{(A - 2c^U - c^D + P^U)^2}{9B} \\ \pi_2^D &= \frac{(A - 2(P^U + c^D) + (c^U + c^D))^2}{9B} = \frac{(A - 2P^U - c^D + c^U)^2}{9B} \end{aligned} \tag{17.14}$$

Because of our foreclosure assumption that the integrated firm $D1$ will not sell its upstream good to the non-integrated downstream firm $D2$, it follows that the upstream firm $U2$ has monopoly power and will set a price to $D2$ of $P^U > c^U$. Equation (17.13) then confirms that, under our foreclosure assumption, the downstream division of the integrated firm has a greater output than its non-integrated rival.

We can in fact use (17.13) to identify the derived demand, $q_2^U = q_2^D$ facing the independent upstream firm. Again writing this in inverse form we have

$$P^U = \frac{A - c^D + c^U}{2} - \frac{3B}{2} q_2^U \tag{17.15}$$

This is in the form $P = a - bq$ and we know that with this demand function the monopoly output is $(a - c^U)/2b$; where $a = (A - c^D + c^U)/2$ and $b = 3B/2$. This then gives the equilibrium output for upstream firm 2:

$$q_2^U = \frac{A - c^U - c^D}{6B} \tag{17.16}$$

The equilibrium price for the intermediate product is, therefore

$$P^U = \frac{A - c^D + c^U}{2} - \frac{3B}{2} \cdot \frac{(A - c^U - c^D)}{6B} = \frac{(A + 3c^U - c^D)}{4} \tag{17.17}$$

Profit of the independent upstream firm is $(P^U - c^U)q_2^U$, which from (17.16) and (17.17) is

$$\pi_2^U = \frac{(A - c^U - c^D)^2}{24B} \tag{17.18}$$

Finally, we can substitute the equilibrium intermediate product price into equations (17.13) and (17.14) to identify the equilibrium outputs, prices, and profits in the downstream market:

$$\begin{aligned} q_1^D &= \frac{5(A - c^U - c^D)}{12B} \\ q_2^D &= \frac{(A - c^D - c^U)}{6B} \end{aligned} \tag{17.19}$$

$$P^D = \frac{5A + 7c^U + 7c^D}{12} \tag{17.20}$$

$$\begin{aligned} \pi_1^D &= \frac{25(A - c^U - c^D)^2}{144B} \\ \pi_2^D &= \frac{(A - c^D - c^U)^2}{36B} \end{aligned} \tag{17.21}$$

The downstream division of the integrated firm is noticeably larger and more profitable than its independent downstream rival. This is the result of the foreclosure of supply to $D2$, which has given monopoly power to $U2$ that it has exploited in setting a high upstream price. Again, using our specific numbers, the upstream price to $D2$ is \$36.5. Since the integrated retailer buys its input at cost, it sells 22.5 units downstream while its independent rival sells just 9 units. The resulting retail price is \$68.5. Prior to the merger, $D2$ earned a profit of \$144. That has now been reduced to \$81. The merging firms, however, have benefited. Their combined profit before the merger was \$360. It has risen through integration to \$506.25.

Two points need to be considered. First, does our assumption of foreclosure make sense? Is it profit-maximizing for the integrated firm not to sell any inputs to its independent downstream rival? This is where Salinger's (1988) argument comes into play. The integrated firm has a total input cost of $c^U + c^D$. It therefore earns $P^D - (c^U + c^D)$ on each unit that it sells downstream. Further, we know that for the rival $D2$ to be in business, it must be the case that $P^D > (P^U + c^D)$. Suppose that the integrated firm did sell one unit of its intermediate good to its independent rival $D2$ at price P^U. What would happen if instead it withdrew this unit and sold it internally to the downstream division so that the total output and therefore the price in the downstream market remain unchanged? In withdrawing the unit originally sold to $D2$, the integrated firm loses the profit $P^U - c^U$. However, it then gains the profit $P^D - (c^U + c^D)$ that it makes on every internal sale. It will therefore be profitable to stop selling to the downstream rival or to foreclose if $P^D - (c^U + c^D) > P^U - c^U$. This condition is in fact identical to $P^D > (P^U + c^D)$, which we know has to hold given that the downstream rival is in business. In other words, if the integrated firm were selling to $D2$ then it could always do better by withdrawing those units and, instead sell them internally to increase its own downstream production. In our numerical example, the integrated firm ultimately earns \$68.5 − \$23 − \$23 = \$22.5 for every upstream unit sold internally. By contrast, it would earn only \$36.5 − \$23 = \$13.5 on upstream sales to $D2$. So, foreclosure of sales to downstream rivals does seem to be optimal.

The second feature worth noting is that the vertical merger brings benefits to consumers despite the foreclosure that also accompanies it. In our numerical example, the vertical integration of firms $U1$ and $D1$ causes the price in the downstream market to fall from \$76 to \$68.5. The elimination of double marginalization by the integrating firms benefits consumers. Salinger (1988) shows, however, that this need not be the case. The competitive impact of a vertical merger is determined by the balance between two forces. On the one hand, vertical merger and market foreclosure reduces the number of independent upstream suppliers and so reduces competitive pressure on upstream—and downstream—prices. On the other hand, vertical merger eliminates double marginalization for the merged firms and, by reducing their input costs, makes them fiercer competitors in the downstream market, tending to reduce consumer prices. It is difficult to predict how this will play out. What is likely to be the case is that the anticompetitive effect will be weak if the number of independent upstream competitors remains large.

Moreover, there is an important strategic issue that is not addressed by the Salinger (1988) model. The independent downstream firms that are foreclosed upon may well have any incentive to react to integrated rivals by merging with an upstream firm themselves. If vertical integration brings business advantages, then all firms should have an incentive to pursue them. Policy should not penalize any one firm because it happens to be first in line in this process. To address this point, as well as to explore other features of vertical mergers, we now consider the model of Ordover, Saloner, and Salop (1990) (OSS).

17.3.2 Vertical Integration and Foreclosure in a Model with Differentiated Products

To understand the OSS model, we again consider an industry in which there are two upstream firms and two downstream firms. The upstream firms produce a homogeneous product one unit of which is needed for every unit of downstream production. Firms compete in prices in both markets. Since the upstream firms supply a homogenous product, price in that market prior to any integration must be marginal cost, which is again denoted by c^U. However, in this model, the downstream products are differentiated. We capture this feature by letting the demand for either downstream product be:

$$q_i^D = A - p_i - B(p_i^D - p_j^D);\ i = 1,2 \text{ and } 0 < B < \infty \tag{17.22}$$

The fact that B is finite means that neither downstream firm loses all its customers when its rival undercuts its price. As in our discussion of the Salinger (1988) model, we will find it useful to have a specific numeric example. For this purpose, we assume that the constant marginal upstream is $c^U = 10$; that any additional downstream cost c^D is zero; and that $A = 100$ and $B = 2$.

We describe first the outcome in the absence of any vertical integration. Price competition in a homogenous upstream product means that the upstream price $P^U = c^U$. Our assumption that there are no additional retailing costs in turn implies that each downstream firm i will set a downstream price p_i^D to maximize profit:

$$\pi_i^D = (p_i^D - P^U)[A - p_i^D - B(p_i^D - p_j^D)];$$

where $i = 1,2$ and $P^U = c^U$. This gives rise to the best response functions:

$$\begin{aligned} p_1^D &= \frac{A + (1+B)c^U}{2(1+B)} + \frac{B}{2(1+B)}p_2^D \\ p_2^D &= \frac{A + (1+B)c^U}{2(1+B)} + \frac{B}{2(1+B)}p_1^D \end{aligned} \tag{17.23}$$

The downstream equilibrium prices, outputs, and profits are therefore:

$$\begin{aligned} p_1^D &= \frac{A + (1+B)c^U}{2+B} \\ p_2^D &= \frac{A + (1+B)c^U}{2+B} \end{aligned} \tag{17.24}$$

$$\begin{aligned} q_1^D &= \frac{(1+B)(A - c^U)}{2+B} \\ q_1^D &= \frac{(1+B)(A - c^U)}{2+B} \end{aligned} \tag{17.25}$$

$$\pi_1^D = \frac{(1+B)(A-c^U)^2}{(2+B)^2}$$
$$\pi_2^D = \frac{(1+B)(A-c^U)^2}{(2+B)^2} \tag{17.26}$$

For our numerical example, we have $p_1^D = p_2^D = \$32.5$; $q_1^D = q_2^D = 67.5$; and each downstream firm earns a profit of $\pi_1^D = \pi_2^D = \$1518.75$. The upstream price is \$10 and upstream profits are zero. Because of the upstream competition there is no double marginalization. Any and all profits are earned at the retail level. This also means that the profit earned by a downstream firm in this case is, all else equal, the same profit as that earned by an integrated firm, which sell its final product for more than the true marginal cost upstream.

Now what happens if upstream firm $U1$ and downstream firm $D1$ vertically merge? As in the Cournot case, we will suppose that the integrated firm can refuse to supply the independent downstream firm $D2$. Once again this means that upstream firm $U2$ becomes a monopoly supplier to $D2$ and so these two firms will independently set prices that reflect the familiar double marginalization problem. Specifically, let W be the wholesale price $U2$ now charges $D2$. Then the best response functions for the downstream rivals are now:

$$p_1^D = \frac{A+(1+B)c^U}{2(1+B)} + \frac{B}{2(1+B)}p_2^D$$
$$p_2^D = \frac{A+(1+B)W}{2(1+B)} + \frac{B}{2(1+B)}p_1^D \tag{17.27}$$

This yields a downstream equilibrium set of prices, conditional on W of:

$$p_1^D = \frac{(2+3B)A + 2(1+B)^2c^U + B(1+B)W}{(2+B)(2+3B)}$$
$$p_2^D = \frac{(2+3B)A + B(1+B)c^U + 2(1+B)^2W}{(2+B)(2+3B)} \tag{17.28}$$

From (17.28) we can check that p_2^D will exceed p_1^D for any upstream price W greater than c^U. Substitution of the prices in (17.28) yield downstream firm $D2$'s output q_2^D as a function of the wholesale price W set by upstream independent $U2$.

$$q_2^D = \frac{(1+B)(2+3B)A + (1+B)^2Bc^U}{(2+B)(2+3B)} - (1+B)\frac{[2(1+B)+B(2+B)]}{(2+B)(2+3B)}W \tag{17.29}$$

Equation (17.29) is the demand curve now facing upstream firm $U2$. Given its constant marginal cost of c^U the upstream firm $U2$ maximizes profit by setting a price W^*:

$$W^* = \frac{(2+3B)A + (2+B)(1+2B)c^U}{2[2(1+B)+B(2+B)]} \tag{17.30}$$

It is straightforward to show that $W^* > c^U$ for any $A > c^U$, which must hold for the downstream market to be viable. In our numerical example, $W^* = \$35.7143$, far above the \$10

input cost paid by $D1$. Hence, as in the Salinger (1988) model, vertical integration has disadvantaged the independent downstream firm. It now has a higher input cost than its integrated rival and therefore charges a higher price losing both customers and profits as a result. Moreover, because p_2^D has increased, the integrated firm can now raise p_1^D. In our numerical example, the new prices are: $p_1^D = \$37.321$ and $p_2^D = \$46.964$. Since $D1$ still buys at marginal cost, its post-merger profit is higher. However, the increase in all retail prices means that consumers are worse off.

As OSS point out, however, the foregoing need not be the end of the story. From the perspective of the independent firms, their problem lies as much in their own non-cooperative behavior as in the integration of their rivals. $U2$ must charge a wholesale price $W^* > c^U$ if it is to make any profit. Since $D2$ must in turn set a retail price $p_2^D > W^*$ if it is to make profit, the two firms suffer together the problem of double marginalization. An obvious solution would be that $U2$ and $D2$ mimic their rivals and merge themselves. In this way, $D2$ could buy at cost from its upstream division and compete against $D1$ on an even playing ground.

We already know what the outcome will be if both pairs of firms merge. Recall that the upstream firms were forced by competition to sell at marginal cost in the pre-merger world. Since these same firms also sell at marginal cost after they become divisions of an integrated firm, downstream prices and outputs must be the same when both pairs of firms vertically integrate as they were when neither was integrated. There does seem to be an easy remedy to the anticompetitive effects of the vertical merger of $D1$ and $U1$ and that is $D2$ and $U2$ should also merge. Since they have every incentive to do this, this remedy should happen.

Of course, a merger of $U2$ and $D2$ will undo the advantage of the already integrated firm. Is there anything the integrated firm can do to prevent this? OSS say yes. Perhaps somewhat surprisingly, the integrated firm has a strategy that will prevent the vertical merger of its independent rivals. Rather than withdraw its supply from $D2$ altogether, the integrated firm can instead commit to selling it to $D2$ at some price $\bar{W}$ above marginal cost, so that $D2$ is disadvantaged, but less disadvantaged that it was paying W^*.

What is the advantage of this strategy? The commitment of the integrated firm serves to check the monopoly power of $U2$. If the independent upstream producer $U2$ wishes to sell any positive output, it must do so at a price of $\bar{W}$ or less. Because $\bar{W} < W^*$, the independent downstream firm $D2$ will sell more and earn more profit. For the integrated firm, this is the bad news. However, there is good news. There will always be values of $\bar{W}$ satisfying $c^U < \bar{W} < W^*$ such that the combined profits of the two independent firms, $U2$ and $D2$, are greater than they would be in the case in which all firms become integrated. By constraining the wholesale price that $U2$ can charge, the integrated firm creates a situation in which these two firms earn at least as much total profit as they would if they merged. Hence, this strategy removes the merger incentive for $U2$ and $D2$ and the risk of returning to the prices set in the initial equilibrium.

The underlying intuition in OSS is relatively clear. Although $D2$ has to raise its price and lose some customers when its input price W rises, the nature of price competition downstream is that $D1$ takes this as an opportunity to raise its own price as well. In turn, this softens the blow for non-integrated firms because their own price increase will now not lose as many customers. The rise in W lessens the intensity of downstream price competition. As long as W does not rise too much, firms $U2$ and $D2$ will prefer this softened downstream price competition to merging and returning to the market outcome, prices and profits, prior to any integration.

Table 17.1 illustrates the model for our numerical example where $A = 100$; $B = 2$; and $c^U = 10$. The first row indicates the market equilibrium before any vertical mergers. In this case,

Table 17.1 Vertical integration, foreclosure, and strategic commitment

	Wholesale price W	*D1s downstream price* p_1^D	*D2s downstream price* p_2^D	*D1s quantity* q_1^D	*D2s quantity* q_2^D	*Combined profit of U1 and D1*	*Combined profit of U2 and D2*
No vertical integration	10	32.5	32.5	67.5	67.5	1518.75	1518.75
*U*1 and *D*1 integrate	35.71	37.32	46.96	81.96	33.75	2239.38	1247.54
*U*1 and *D*1 integrate and U2 and *D*2 integrate	10	32.5	32.5	67.5	67.5	1518.75	1518.75
*U*1 and *D*1 integrate and commit to maximimum *W*	21.43	34.64	38.93	73.93	52.50	1821.71	1518.78

the wholesale price set by *U*2 is just equal to marginal cost. The downstream firms compete symmetrically and each makes a profit of $1518.75. Since the upstream firms earn no profit, this is also the combined profit of each upstream and downstream pair. The second row illustrates the outcome after *U*1 and *D*1 merge and withdraws all supply from *D*2. The monopoly power that this confers on *U*2 then allows it to set a wholesale price of $35.71. This forces independent retailer *D*2 to raise its price to $46.96. In turn, this allows the integrated firm to raise its downstream price to $37.32 even though its own input costs are still $10. Total profit for the merged firms rises to $2239.38. However, total profit for the independents now falls to $1247.54, with some of this profit being earned by upstream firm *U*2. The third row shows what happens if firms *U*2 and *D*2 vertically merge just as their rivals did. This move restores the original price equilibrium with the one difference that both upstream firms are no longer independent but are now divisions of vertically integrated companies. Finally, the fourth row illustrates what happens if, instead of foreclosing supply to *D*2 altogether, the integrated firm *U*1 – *D*1 now strategically commits to selling supplies to *D*2 at a maximum price $\bar{W}$ equal in this case to $21.43. Faced with such a prospect, the upstream independent *U*2 can no longer charge a wholesale price of $W^* = \$35.71$. Instead, it has to match or slightly undercut this price ceiling. This hurts *U*2 but helps *D*2 and, together, they earn just as much as they would if they fully integrated. This strategy therefore removes the incentive these remaining independent firms have to merge. Of course, this is precisely the point. Had *U*2 and *D*2 merged, prices and the profit of integrated firm *U*1 – *D*1 would have fallen back to their original, pre-merger level. Committing to $\bar{W} = \$21.43$ prevents this, albeit at some cost.

Another vertical merger is not a viable remedy in the OSS model to the anticompetitive impact that a first vertical merger can have. The integrated firm can prevent such mergers from being attractive by offering to sell inputs to its independent downstream rival. This means, of course, abandoning a strict foreclosure strategy. However, as Chen (2001) points out, such foreclosure seems to be a rarity in practice as we often see integrated firms selling to independent downstream rivals. Chen (2001) takes the OSS model one step further. He notes that whenever the wholesale price offered by the integrated firm and independent producer *U*2 are the same, the independent downstream firm *D*2 will prefer to buy from the integrated producer. Why? Because in so doing, *D*2 gives the integrated firm another source of profit—a source that rises as *D*2 sells more downstream. As a result of selling to *D*2, the integrated firm will price less aggressively in the downstream market because this would cut into its profit on input sales to *D*2. Of course, less aggressive downstream pricing also helps *D*2 and that is precisely why *D*2 would prefer to buy from the integrated firm rather than from *U*2. Indeed, Chen (2001) suggests that if there are cost efficiencies associated with the

vertical merger so that c^U falls at the integrated firm, the merger could lead to a different sort of foreclosure altogether. Instead of cutting off independent downstream firms from a source of supply, the vertical merger may leave independent upstream firms without any customers.[4]

17.3.3 Reappraisal and Application: The GE–Honeywell Merger

Let us return to the GE–Honeywell merger described at the start of this chapter. As noted, the European Commission eventually ruled against the merger. Their reasoning is summarized in the following extract from the Commission's report (paragraph 355):

> Because of their lack of ability to match the bundle offer . . . [independent] suppliers will lose market shares to the benefit of the merged entity and experience an immediate damaging profit shrinkage. As a result, the merger is likely to lead to market foreclosure on the existing aircraft platforms and subsequently to the elimination of competition in these areas.[5]

There are several points to make in regard to this judgment. First, the "bundling" and unfair competitive advantage that the commission feared would give GE–Honeywell a competitive advantage is nothing more than the elimination of the double marginalization that we have described above. Eliminating double marginalization gave a similar advantage to the integrated firms in the oligopoly models that we have studied in this chapter. Packaging jet engines with engine starter motors is economically equivalent to combining the upstream manufacturing with the retail services of a downstream dealer. Thus, there is some legitimacy in the Commission's fear that GE-Honeywell would gain some advantage over independent rivals.

Whether the merger would lead to foreclosure and whether, if it did, this would raise prices is another matter. In part, that would depend on the nature of initial competition. If the market were very competitive with lots of jet engine firms and avionics companies, then the merger could have very little anticompetitive impact. The nature of competition in both the upstream and the downstream affects the likelihood of foreclosure and its ultimate impact. In short, some understanding of the real world marketplace is necessary to make an informed judgment regarding this merger.

It is fair to say that neither pre-merger market was competitively structured. Estimates of GE's share of the jet engine market for large commercial aircraft range from 28 to 52 percent, and it had just two major rivals, the Pratt-Whitney division of United Technologies and the Rolls-Royce Group. Likewise, Honeywell's share of the avionics market was on the order of 50 percent, and it had just three rivals: Rockwell Collins (25 percent); Thales (15 percent); and Smiths Industries (5 percent). In reaching its decision, the European Commission appears to have been persuaded that the preeminence of GE and Honeywell made subsequent integration by their rivals impossible. As a result, and as the quote above makes clear, the Commission feared foreclosure of GE's competitors and the ultimate loss of competition in the jet engine market.

The Commission is implicitly claiming that rivals could not integrate as well and this would need to be documented. More importantly, we should in this case show that even with foreclosure, the resulting market outcome would be worse than the pre-merger case. This was *not* the case in our numerical example of the Salinger (1988) model. In that example, integration by one firm did lead to foreclosure of its rival. Nevertheless, the post-merger

[4] Pepall and Norman (2001) offer a similar analysis to Chen (2001) in which vertical foreclosure is never an equilibrium precisely because, again, this leads to competition between multiple vertically integrated firms.

[5] The full decision is available at http://ec.europa.eu/comm/competition/mergers/cases/decisions/m2220_en.pdf.

Reality Checkpoint

Going Whole Hog on Vertical Integration

Nowhere have the strategic advantages of vertical integration been more aggressively pursued in recent times than in meat and poultry markets. Firms in these markets have made a concerted effort to control all aspects of production from the farm to the store counter or, as they say in the pork business, from "birth to bacon and squeal to meal."

The largest pork producer in both the U.S. and the world is Smithfield Industries. It controls 26 percent of the U.S. market—and control is the right word. Smithfield has either ownership or decision-making rights over every single stage of the production chain up until the product is displayed in a local store. It owns the DNA line for the hogs that it uses and the feed that they eat. It directly owns hundreds of mega hog farms. In addition, thousands of farms work as Smithfield contractors in which case Smithfield still owns the hogs if not the farms themselves.

The advantages of such control are clear. By directing insemination and breeding, Smithfield can maintain a supply of new, and bigger litters that allow it to slaughter more hogs each year without threatening the sustainability of its herds. Feed and genetic control give the firm a tight grip on the leanness and other key features of its pigs. Contracts and ownership also permit Smithfield to design the warehouse barns in which the hogs are raised. This has the added virtue of insuring that the hogs will mature on schedule and be ready for transport to the pork processing plant in a timely fashion. This is important because the plants are designed to operate efficiently at a particular level of use and even small deviations from this capacity utilization rate can lead to rapidly escalating costs.

Thus, vertical integration has permitted standardization, quality control and, of course, the elimination of double marginalization. As a result, Smithfield has become the world's largest pork producer, annually slaughtering close to 20 million hogs to turn out over 5 billion pounds of pork. Nor is Smithfield the only pork processor that has pursued this strategy. Tyson, which with its poultry, beef, and pork operations is even bigger than Smithfield and is, in fact, the world's largest meat producer, is also highly integrated. In fact, it was Tyson that introduced such large-scale integration to farming when it began to reorganize its poultry business. Other pork firms such as ConAgra and Swift have also organized their operations in this same, vertical manner. It's the swine of the times.

Sources: S. Kilman, "Smithfield to Buy Hog Farmer Premium Standard," *Wall Street Journal*, Tuesday, September 19, 2006, p. A4; and S. Martinez, "A Comparison of Vertical Coordination in the U.S. Poultry, Egg, and Pork Industries," *Current Issues in Economics of Food Markets*, Agriculture Information Bulletin, AIB-747-05 (May, 2002).

downstream price of $68.5 was still well below the pre-merger price of $76. As a review of that example will quickly reveal, even if the foreclosure eventually led the integrated firm to enjoy a complete downstream monopoly, the retail price would still decline to $73. This is, of course, a stylized example. Nevertheless, it reveals just how large the inefficiencies of double-marginalization could be, and perhaps why many economists thought the ruling a mistake.[6]

[6] For a similar analysis of the GE–Honeywell case, but one that is set in a framework of differentiated products see, Nalebuff (2004). To be fair, the Commission also expressed other fears besides foreclosure. One of these was that GE already had an unfair advantage in that its large financial operations allowed it to package financing with jet aircraft in a way that Pratt–Whitney and Rolls-Royce could not. In addition, there was a horizontal element to the case in that GE and Honeywell were the only two suppliers of engines for large regional jets.

17.4 CONGLOMERATE MERGERS

The final type of merger to consider is a conglomerate merger. Such mergers bring under common control firms whose products are neither direct substitutes nor complements. The outcome is a set of firms producing a diversified range of products with little or nothing in common. While conglomerate companies have been with us for some time, the U.S. merger wave starting in the 1960s and continuing into the early 1980s is, particularly in the earlier years, when many of the conglomerates that we see today were formed. The question is whether we can develop a convincing economic rationale for these mergers. If not, then we should think of conglomerates as an accident of history that are being gradually corrected through corporate downsizing and the focus on "core businesses," strategies that appear to characterize corporate change as we move into the new millennium. A number of reasons have, however, been advanced to support the emergence of conglomerate firms. We examine these in turn.

17.4.1 Possible Economies Associated with Conglomeration

Scope economies and saving on transactions costs are two possible advantages that may accrue to conglomerate firms. By scope economies we mean that a variety of products or services are more cheaply produced by one firm than by two or more firms. By transaction costs we mean the costs that are incurred by firms when they use external markets in order to exchange goods and services.[7] These include, for example, the costs of searching for the desired inputs, negotiating supply contracts, monitoring and enforcing these contracts and the risk associated with unforeseen changes in supply conditions.

Scope economies derive primarily from the ability of the firm to exploit common inputs in the manufacture of a range of products. The same production line can be used for several products, marketing efforts can promote the whole range of goods a firm produces, and the fruits of research and development may extend to a number of diverse products. Advertising and promotional activities also frequently exhibit scope economies across a variety of activities. This line of argument implies that for scope economies to be an important element in conglomerate mergers it is necessary that the firms that merge are related in some respect. Either they sell in similar markets or they have similarity production technologies. The data on conglomerates do not appear to be consistent with this hypothesis. A detailed study by Nathanson and Cassano (1982) concludes that there are at least as many conglomerate firms that produce goods with little in common, whether this be technology or the markets at which they are targeted, as there are firms that have relatively low product and market diversity.

Transactions costs are particularly significant when specialized or knowledge-intensive assets are traded. Consider a specialized asset, such as a sophisticated machine that is specifically designed to produce two goods, A and B. Let us also suppose that the markets for A and B are highly concentrated with a small number of producers, and that the owner of the machine has spare capacity if the machine is used only to produce A. This might arise, for example, if demand for A is limited relative to the productive capacity of the machine. If such spare capacity exists, the owner of the machine may wish to use it to produce B goods as well. A conglomerate merger or the machine owner merging together A and B

[7] For an excellent discussion of transactions costs, see Besanko et al. (2007).

production is one way that this can happen. However, as Teece (1982) and others have argued, conglomeration is not strictly necessary. The machine owner, a producer of A, can instead simply lease the spare capacity to B producers.

There is a potential problem with the leasing arrangement, however. Because the number of B producers is small, each will have some monopoly power in bargaining over the terms of the lease. As a result, the machine owner may find that the costs and risks associated with the negotiations between the interested parties are large as each side tries to get the best possible deal. Conglomeration may be a means of avoiding such costs. By using the machine to produce both A and B within the same firm, the machine owner avoids all the bargaining hassles. There is no longer any conflict over how to divide the gains from using the machine because those gains all go to the same owner.

Transaction cost problems are particularly important when the asset involved is knowledge or information intensive. The knowledge of such matters as organizational routines or specialized customer needs is generally embodied in specific individuals or teams employed by the company. It is difficult to envision contracts to "lease" such personnel.

In short, the effort to minimize the transactions costs associated with contracting between firms may explain conglomerate mergers to some extent. Nevertheless this motivation seems unlikely to be the major factor behind such mergers. The reason is that here again, we are talking about some asset that is common to all the lines of production operated by the conglomerate, and such commonality in productive assets does not seem to be a feature of conglomerate firms.

17.4.2 Managerial Motives

The skepticism surrounding the explanations based on scope economies, transaction cost savings, and other arguments why conglomerate mergers improve production efficiency has led some to postulate a different, less benign motivation. The motive for conglomeration may be that it is in the interest of management even if it is not in the interest of shareholders. Because management calls the shots, it is the managerial interest that prevails.

In any reasonably large public company, ownership, which essentially resides with the shareholders, may be separated from control, which essentially resides with the management team. This separation would not matter too much if management performance could be perfectly observed and monitored by shareholders. Yet perfect monitoring is rare, and absent such monitoring, management can pursue its own agenda at least to some extent. This would not matter so long as the best interests of management are served by maximizing shareholder wealth. It is precisely the attempt to secure this harmony of interest that lies behind the use of performance-related clauses and payment in stock options in many executive compensation schemes. Still, the match between the interests of shareholders and management is rarely perfect, leaving management with at least some ability to pursue goals other than maximization of shareholders' returns.

Suppose that management compensation is based upon company growth.[8] Growth is far from easy to generate internally. It requires that market share be won from competitors who can hardly be expected to sit passively by when they lose market share. Nor is it easy to buy growth through horizontal merger since this is the kind of acquisition that is watched by the antitrust authorities. In these circumstances, we should not be surprised to find management supporting a conglomerate merger, even if this is not necessarily in the

[8] This analysis is treated in detail in Mueller (1969).

Reality Checkpoint

A Conglomerate of Errors: Cendant Corporation

In the early 1970s, Walter Forbes, a recent graduate of Harvard Business School and a business consultant, was convinced of the eventual triumph of home shopping using computers and credit cards. His faith in this market led him to launch a new company, Comp-U-Card, designed to build on this idea. Home computers were a rarity in those days and the new firm struggled until it finally hit on a discount telephone shopping club service called Shopper's Advantage. After paying a fee of about $40, members could call a toll free number to purchase hundreds of goods at a discount. Even this might not have been enough to win success if it had not been that the credit card business was in a competitive boom and, to attract members, credit card firms began to seek arrangements with other companies, such as airlines, in order to attract members. Shopper's Advantage was one of those companies. Credit card firms competed for customers in part by offering a membership in the home shopping club. Soon the Comp-U-Card was CUC International and owned many shopping clubs for travel, dining, and health services along with financial interests such as Benefit Consultants, an insurance firm. It suffered in 1989–90 when the firm had to acknowledge some sloppiness in its accounting systems that overstated its profits. However, growth resumed in 1994, as CUC bought NetMarket Company to help bring its shopping services to the Internet. In 1996, it diversified further by purchasing computer software firms, Sierra On-Line and Davidson & Associates.

HFS was formed in 1990 to exploit undervalued brand names. Under the leadership of Henry Silverman, it quickly focused on hotel brands and quickly bought the rights to both the Howard Johnson and Ramada (U.S.) hotel chains. Overnight, it had become a major player in the U.S. lodging industry. These purchases were soon followed by the acquisition of the Day's Inn and Super 8 Motel chains. In 1993, HFS surpassed Holiday Inn as the world's largest hotel operator. As the buying spree continued, HFS diversified into real estate by acquiring Century 21, Coldwell Banker, and ERA as well as into car rental services, acquiring Avis and Budget in 1996. Like CUC, analysts also raised questions about HFS and, in particular, its heavy reliance on debt to finance its numerous acquisitions.

In 1997, CUC and HFS surprised everyone by merging to form the Cendant Corporation. The deal was completed in December of that year. By April of 1998, the share price of Cendant had climbed 25 percent. Then disaster struck. Cendant was forced to admit that its earnings, especially those generated by the former CUC, were vastly overstated. The share price fell from $41 to $11 within a few months. It fell below $10 within a year as shareholders filed a lawsuit for accounting fraud.

The conglomerate came to an end over the course of 2005–06. The firm broke into four separate companies: (1) Travelport took over all travel related services, including the recently acquired Orbitz; (2) Realogy took control of Cendant's former real estate businesses; (3) Wyndham now operates the hotel chains; and (4) Cendant Car Rental Group now controls the Avis and Budget car rental firms. The longevity of management at CUC, HFS, and later Cendant despite continued accounting problems suggests that management entrenchment and self-enrichment is a problem at conglomerate firms.

Sources: G. Morgenson, "Market Watch: A Fanfare for the Vanities of 1998," *New York* Times, Sunday December 27, 1998, p. D1; *Wall Street Journal*, September 19, 2006, p. A4; and R. Chittum and I. McDonald, "Cendant to Test Appeal of Spinoffs," *Wall Street Journal*, Tuesday May 30, 2006, p. C2.

best long-term interests of shareholders. Such a merger offers management the desired growth while avoiding antitrust problems. In this light it is, perhaps, significant that the greatest wave of conglomerate mergers in the United States coincided with a period in which the antitrust authorities were particularly fierce in their examination of mergers between related companies.

Management may also pursue conglomeration as a means to minimize risk. When a firm is involved in many distinct markets it avoids putting "all its eggs in one basket." Such diversification may be important to management.[9] Shareholders often use compensation schemes that closely tie management's pay to the firm's profit performance.[10] Yet while these practices work to ally management's interest more closely to that of the stockholders, they also increase the risk that management faces. As profits go up and down, management's compensation rises and falls irrespective of whether the profit results were management's fault or not. To protect against such fluctuations, management may seek to diversify the sources of the firm's income by pursuing conglomeration. This smoothes the firm's income stream because with many product lines operating, positive and negative shocks tend to cancel each other out. The derived income stream of the firm's executives is also smoother. Even shareholders might prefer this approach if, in the absence of such diversification, the firm would have to pay its executives higher salaries to compensate them for the greater risk. This may be particularly true for managers who are heavily invested in the firms so that not only their labor income but also their capital income is subject to the same risk.

Some evidence in support of diversification as a means of diversifying managerial risk is found in studies by Ahimud and Lev (1981) and by May (1995). The first of these studies finds that when no shareholder owns 10 percent or more of the stock and management control is high, firms tend to be more diversified. May (1995) finds that a comparison of CEOs in terms of the proportion of their wealth invested in the firm reveals that as this proportion rises, CEO's tend to favor conglomeration.

There are also less attractive or more self-serving managerial goals that may be pursued through conglomeration. These include entrenchment and rent-seeking. It may be more difficult to replace managers who run more complicated firms. Obvious candidates to replace the existing CEO and other executives may be hard to find when the firm is a complex conglomerate. Similarly, the more complex the organization, the more difficult it is for shareholders to monitor management and to guard against managers skimming off profits to their own benefit. These problems are sufficiently real that shares in a conglomerate are often considered low-priced and subject to a conglomerate discount. (Aggarwal and Samwick 2003).

17.5 A BRIEF DIGRESSION ON MERGERS AND THE THEORY OF THE FIRM

A merger involves the acquisition of one company by another. As a result of that purchase, the acquiring firm gets the physical capital—buildings, equipment, and land—and perhaps certain intangible assets, such as reputation or brand name, that formerly belonged to the acquired company. The ultimate question raised by any merger is, what does the change in ownership permit the merged firm to do that could not be done before?

[9] For a detailed discussion of these ideas, see Ahimud and Lev (1981).

[10] For example, Boeing Corp. linked its annual award of stock options to its 1,500 top executives to the performance of the company's share price over the next five years. See F. M. Biddle, "Boeing Links Managers' Stock Options to Five-year Performance of Shares," *Wall Street Journal*, February 26, 1998, p. B12.

In the case of a horizontal merger, the possibility of enhanced market power is clearly part of the motivation. Yet we often see horizontal mergers in which such an increase in market power does not occur. The merger paradox discussed in the last chapter suggests that increases in market power as the result of a merger could be rare. In the case of a vertical merger, the market power motivation is even more suspect. If the upstream and downstream firm each had 5 percent of their respective markets before the merger, little seems changed by moving the ownership of those market shares from two different firms to two different divisions of the same firm.

With upstream downstream firms there is the issue of double marginalization. We have suggested a vertical merger as a response to that problem. It is not the only response, however. Various contracts between two vertically related firms can be written to overcome the problem of double marginalization, and these contracts do not require integrating the two firms into one. We will examine such contracts in depth in the next chapter. Here we simply want to raise the question as to why firms merge rather than make use of such contracts. Alternatively, why don't more firms merge? What in fact limits the size of a firm? What stops firms from merging into bigger and bigger firms?

This question is really about what determines the boundaries of a firm. What is the difference between organizing the production of a commodity through many independent companies, on the one hand, and organizing that production through many divisions of the same company, on the other? Viewing the matter in this light makes transparent that what determines the boundaries of the firm is an important question for industrial organization theory.

Many alternative theories of the firm have been developed since the last 1970s. There is sufficient work in this area now to comprise a course, or a field in itself. Our aim here is not to cover this material in depth. Instead, we wish simply to offer a brief discussion of the limits on firm size. Now seems a particularly appropriate point to raise this topic since a merger, by definition, is a transaction that increases those limits.

Neoclassical theory does not tell us much as to what such a transaction gains for the parties. Nor does it tell us why firms operate internal divisions rather than "spinning them off" into individual companies. However, neoclassical theory is not alone in this regard. Other approaches to the theory of the firm also fall short of a complete answer. Take, for instance, the agency view of the firm. Under this view, a firm is an organization designed to generate the proper incentives when the various parties engaged in the production process have different and private information. For example, a supplier of glass may contract with an automobile producer to provide windshields of a particular quantity and quality according to a particular schedule. Obviously, the actual quality of such windshields is beyond the complete control of the glass supplier but the supplier does know whether it gave its full effort to supplying the specified quality. The automaker, though, is not so well informed. It cannot be sure whether a batch of low-quality glass is due to bad luck or, instead, bad faith on the part of its supplier. Agency theory has generated extremely useful insights into the types of contracts that might be used to surmount such informational problems and provide the proper incentives for both parties to live up to their contractual obligations. Yet it does not tell us whether such contracts must be between two separate firms, as in the automaker and the glass supplier of our story, or whether the contract could simply be the incentive scheme offered to the windshield division of a giant car manufacturer.

Similar problems arise with the transactions cost approach to the firm. Under that approach, the firm is viewed as an organization designed to minimize the costs of negotiating, interpreting, enforcing, and renegotiating contracts. However, the precise mechanism by

which this cost reduction is achieved is not typically spelled out. There is no reason, a priori, to assume that haggling is less a problem between two divisions within one firm than between two separate firms.

The issue of corporate mergers reveals a weakness in economic theory regarding the limits or boundaries of a firm's activities. Why is it that we observe General Motors supplying auto bodies internally rather than purchasing them from an independent supplier? What advantages are gained and then lost when these divisions are instead independent firms?

One answer is provided in the work of Hart (1995) and centers on the issue of ownership. A merger changes the ownership of assets and ownership gives control. The carmaker that owns its own windshield supply unit is in a position to resolve, by itself, any dispute between its assembly line and the glass unit. This does not necessarily minimize the cost of haggling. However, common ownership may permit investments that increase efficiency that would be less likely to occur otherwise.

Suppose that there is specific machinery that can be used to produce, inexpensively, windshields of a quality and style unique to the automaker in question. An independent glass company might not invest in such equipment because it ties the glassmaker too closely to supplying the particular auto firm. If the glass supplier did make the investment, its bargaining position in disputes with the automaker would be weak because it has no other buyer for the one product that this machinery permits it to make. From the perspective of the glass supplier, it is less risky to use more general equipment that makes it easy to produce glass products for other firms as well. This is true even though the use of such generic processes requires the firm to incur an extra cost to mold the windshield to the specific dimensions specified by the carmaker.

A merger or acquisition of the glass company by the automaker offers a way out. By operating windshield production as a unit within its own firm, the automaker removes the potential conflict. Now, the specialized machinery can be bought and the windshields produced at lower cost because there is no longer any friction over how the gains from this investment will be shared. They all go to the one, common owner of the assets.

In other words, common ownership is desirable whenever there are complementarities—or synergies—between different assets. As a result, we should expect firms to combine whenever such complementarities are present—and to split apart if such complementarities vanish. Since technological changes are ever present, and since such innovations are constantly altering the extent of production complementarities, we should also expect a constant fluctuation in the size and organization of firms. This approach may help explain the recent wave of mergers in the telecommunications industry where rapid innovations have greatly altered the production technology.

17.6 EMPIRICAL APPLICATION
Vertical Integration in the Ready-mixed Concrete Industry

Ready-mixed concrete is one of the most widely used construction materials. It is comprised mainly of cement, water, and aggregates such as sand and gravel. Of these, cement is clearly crucial as the binding agent that hardens the aggregates into a solid mass. Almost invariably, cement comprises 12 percent of the concrete mixture by weight. Hence, cement and ready-mixed concrete match the assumptions of the Salinger (1988) and Ordover, Saloner, and Salop (1990) models in that cement is an upstream product used in fixed proportion per

Table 17.2 Vertical integration in cement/ready-mixed concrete market

Year	*1963*	*1967*	*1972*	*1977*	*1982*	*1987*	*1992*	*1997*
Fraction of cement sales Accounted for by vertically integrated firms	25.2	51.2	48.4	41.0	49.5	51.3	75.1	55.4

unit of the downstream product, ready-mixed concrete. This makes it an ideal industry in which to study the effects of vertical integration.[11]

Ali Hortaçsu and Chad Syverson (2006) point out that there is a further aspect of the concrete business that makes studying vertical integration in that industry interesting. This is the fact that the different phases of antitrust policy over the late twentieth century were very much evidenced in the ready-mixed concrete market. In the 1960s, cement makers were interested in integrating forward into ready-mixed concrete and the percentage of vertically integrated plants rose steadily throughout the decade. Fearing that these consolidations would lead to foreclosure and anticompetitive price squeezes, the Justice Department filed 15 antitrust cases in this industry and each one led to divestiture. This vigorous policy also deterred further mergers with the result that during the 1970s, the fraction of cement firms that were vertically integrated fell noticeably. Then came the 1980s and rise of the "Chicago School" approach to antitrust policy, which viewed vertical integration much more favorably. There was a new wave of mergers that again sharply increased the extent of vertical integration in the concrete market. Finally, in the 1990s, the "post-Chicago" school began to make its influence felt and antitrust policy became less lenient. Vertical integration in concrete again declined. This pattern is shown in Table 17.2.

Of course, transport costs are far too high for there to be one, national market for ready-mixed concrete. Using Commerce Department data, Hortaçsu and Syverson (2006) identify 348 local markets over the years 1963 to 1997. They then use this data to determine whether the differences in ready-mixed concrete prices across markets are systematically related to the extent of vertical integration in those markets. A simple regression aimed at answering this question might have the form: $P_{it} = A + \beta VI_{it} + e_{it}$, where P_{it} is the average concrete price (measured in logs) in market i in year t; A is an intercept term; VI_{it} is the market share of output accounted for by vertically integrated firms in market i in year t, and e_{it} is a random error term centered on zero. Such a simple model though leaves out many other variables that are likely to be important in determining concrete prices in any given market-year, and therefore would lead to a biased estimate of the coefficient β.

To begin with, the average price over time might be different in each market. There might be something about the Chicago market for example that makes its price of cement always relatively high. This effect can be handled by letting the intercept term vary across each market. Then too, industrial organization theory suggests that market structure, as measured by the Herfindahl Index (HI), could also be important for the behavior of prices, as might be the level of demand coming from the local construction industry in that year. In fact, given our discussion of antitrust policy, we might also think that the precise year is important as well because firms might try to keep prices low in years when antitrust pressure is more

[11] See Chipty (2001) for a study of vertical integration in cable television.

Table 17.3 Results for regressions explaining ready-mixed concrete prices in the U.S.

Independent variable	*Dependent variable: weighted average market price (log)*	*Dependent variable: weighted average market price (log)*	*Dependent variable: weighted average market price (log)*
Market share of vertically integrated firms	–0.090[a] (0.041)	–0.086[a] (0.041)	–0.043 (0.039)
Market share of multiple plant firms	—	–0.015 (0.022)	0.001 (0.024)
Weighted average total factor productivity	—	—	–0.293* (0.054)
R^2	0.433	0.434	0.573

[a] Significant at 5% level.

intense than in years when it is lenient. We need to control for such time-specific factors and the many other forces that could affect concrete prices if we are to isolate the influence of changes in vertical integration alone. The easiest way to do this is to include measures of concentration and local demand and put in a dummy variable for each market and each year.

Hortaçsu and Syverson (2006) make the foregoing adjustments and some others as well to estimate regressions explaining the variation in concrete prices across markets and time. Their central results are shown in Table 17.3.

In all the regressions, results for the time and market dummies are suppressed, as are those for the HI and construction demand, which are never significant. The first column shows the results when, apart from the control variables just mentioned, the only explanatory variable is the extent of vertical integration in the local market. This effect is both negative and statistically significant. It is also economically meaningful. For their entire sample, Hortaçsu and Syverson (2006) find that on average, vertically integrated firms account for 31.5 percent of the typical market. The estimated coefficient shown in the first column then implies that ready-mixed concrete prices would be 4 percent lower in such a market than they would be in a market with no vertically integrated firms. Thus, this result suggests that the efficiency results of vertical integration typically outweigh any anticompetitive effects so that consumers benefit.

The next two columns test additional variables that may be important for concrete prices. In column 2, a second independent variable is added for the fraction of firms that operate more than one plant. This includes all the vertically integrated firms plus all those that operate multiple plants horizontally. Including this variable is a means of testing whether the vertically integrated variable is really capturing efficiencies that come from coordinating different plants, e.g., better-timed production, lower transport costs, rather than from vertical integration per se. However this variable is insignificant and does not materially affect the results in column 1.

The third column is perhaps the most interesting. Here, Hortaçsu and Syverson (2006) include as an additional regressor a measure of average productivity in the local market. This is clearly an important variable. Including it reduces the magnitude of the effects of vertical integration and eliminates their statistical significance. What are the implications of this finding?

First, it makes intuitive sense that concrete prices will be lower in markets where firms are more productive. In this sense, the results in column 3 are not surprising. Second, we should recall that vertical integration has potentially two effects, a price-reducing effect due to greater efficiency and a price-increasing effect due to foreclosure-type forces. Including the productivity variable should control for any efficiency effects so that the vertical integration term now picks up only the price-increasing impact of vertical mergers. The findings in column 3 suggest that once this control for efficiency effects is included, the price-increasing effects appear very weak. Finally, Hortaçsu and Syverson (2006) produce other evidence to show that vertically integrated firms have higher productivity. If vertical integration in this industry has an impact on prices it does so through the efficiency effect. Overall, these results imply that vertical integration has been welfare-enhancing and good for consumers, at least in the ready-mixed concrete business.

Summary

We have considered two broad types of merger in this chapter: vertical and conglomerate. A vertical merger typically involves the merging of companies operating at different stages of production in the same product line. A conglomerate merger is when two firms merge that have little or no common markets or products.

Vertical mergers raise complicated issues. On the one hand, such mergers can benefit firms and consumers by eliminating the practice of double marginalization. On the other hand, they may be a means to foreclose either upstream or downstream markets to rivals, and to facilitate price discrimination. There is no simple way of determining which of these forces is likely to be the stronger. Some argue that the negative impact of potential vertical foreclosure itself sets up a countervailing force that will induce remaining independent companies to integrate as well. If so, this can reduce inefficiencies still further. However, we have seen that the vertically integrated firm may have both the means and the motive to prevent such subsequent mergers. Resolution of these issues in any particular case must, as always, depend on careful evaluation of the realities of the specific situation.

It is worth noting however that even when foreclosure and a price squeeze for independent rivals do happen, it may nonetheless be the case that final consumers are made better off with the vertical merger. Policy makers should therefore not be too hasty in condemning a vertical merger simply because it disadvantages rival firms. The goal of antitrust policy is to preserve the benefits of competition, not the fortunes of competitors.

Conglomerate mergers probably raise the fewest problems from an antitrust perspective. However, for this very reason, the motivation for such mergers can be difficult to identify. They may reflect an attempt to minimize risk either for stockholders or managers. But there would seem to be other means to achieve these same ends.

The ambiguous effects of mergers that characterize our economic models are also found in empirical analysis. To date, there is little clear evidence that vertical mergers have led to significant increases in monopoly power. A recent study of the ready-mixed concrete industry suggests that such vertical integration tends to bring greater productive efficiency and lower consumer prices. The combination of ambiguity in the theory and, if anything, favorable empirical evidence has led the legal authorities to take a much less aggressive and much less rigid stand against proposed vertical mergers. Today these are inevitably handled on a case-by-case approach. In the absence of definitive results—either from economic theory or economic data—this is the best approach to follow.

Problems

1. Norman International has a monopoly in the manufacture of *whatsits*. Each *whatsit* requires exactly one *richet* as an input and incurs other variable costs of $5 per unit. *Richets* are made by PepRich Inc., which is also a monopoly. The variable costs of manufacturing *richets* are $5 per unit. Assume that the inverse demand for *whatsits*

is: $p_w = 50 - q_w$ where p_w is the price of *whatsits* in dollars per unit and q_w is the quantity of *whatsits* offered for sale by Norman International.

a. Write down the profit function for Norman International assuming that the two monopolists act as independent profit-maximizing companies, with Norman International setting a price p_w for *whatsits* and PepRich setting a price p_r for *richets*. Hence, derive the profit-maximizing price for *whatsits* as a function of the price of richets, and use this function to obtain the derived demand for *richets*.

b. Use your answer in (a) to write down the profit function for PepRich. Hence, derive the profit-maximizing price of *richets*. Use this to derive the profit-maximizing price of *whatsits*. Calculate the sales of *whatsits* (and so of *richets*) and calculate the profits of the two firms.

2. Now assume that these two firms merge to form NPR International.

a. Write down the profit function for NPR given that it sets a price p_w for *whatsits*. Hence, calculate the postmerger profit-maximizing price for *whatsits*, sales of *whatsits*, and the profits of NPR.

b. Confirm that this merger has increased the joint profits of the two firms while reducing the price charged to consumers. By how much has consumer surplus been increased by the merger in the market for *whatsits*?

c. Assume that the two firms expect to last forever and that the discount factor R is 0.9. What is the largest sum that PepRich would be willing to pay the owners of Norman International to take over Norman International? What is the lowest sum that the owners of Norman International would be willing to accept? (Hint: Calculate the present value of the profit streams of the two firms before and after the merger, and notice that neither firm will want to be worse off with the takeover than without it.)

3. Now assume that PepRich gets the opportunity to sell to an overseas market for *whatsits*, controlled by a monopolist FC Hu Inc., which has the same operating costs in making *whatsits* as Norman International. PepRich knows that it will have to pay transport costs of $2 per *richet* to supply the overseas market. Inverse demand for *whatsits* in this market is: $p_w = 40 - q_w/2$.

a. Repeat your calculations for question 8a.

b. The authorities in the overseas market are contemplating taking an antidumping action, accusing PepRich of dumping *richets* into its market. They calculate that by doing so, they will induce PepRich to offer to take over FC Hu. Assume that PepRich has limited access to funds, so that it can take over only one of the two firms Norman International and FC Hu. Are the overseas authorities correct in their calculations? (Hint: Compare the maximum amounts that PepRich would be willing to pay for Norman International and FC Hu.)

4. Go back to the conditions of question 1, so that PepRich is supplying only Norman International. But now assume that the manufacture of each *whatsit* requires exactly one *richet* and one *zabit*. Zabits are made by ZabCor, another monopolist, whose variable costs are $2.50 per *zabit*.

a. Assume that the three firms act independently to maximize profit. Calculate the resulting prices of *richets*, *zabits*, and *whatsits* and the profits of the three firms.

b. Assume an infinite life for all three firms and a discount factor $R = 0.9$. PepRich and ZabCor are each contemplating a takeover of Norman International. Which of these two companies would win the bidding for Norman International? What will be the effect of the winning takeover on consumer surplus in the market for *whatsits*?

5. As an alternative to buying Norman International, the owners of PepRich and ZabCor contemplate merging to form PRZ, which will control the manufacture of both *richets* and *zabits*.

a. Calculate the impact of this merger on (1) the prices of *richets*, *zabits*, and *whatsits*, (2) the profits of these firms,

and (3) consumer surplus in the *whatsit* market.

b. Which merger will be preferred
   (i) by consumers of *whatsits*?
   (ii) by the owners of PepRich and ZabCorp.?
   (iii) by the owners of Norman International?

6. (More difficult) Ginvir and Sipep are Bertrand competitors selling differentiated products in the carbonated drinks market. The demands for the products of the two firms being given by the inverse demand functions:

   $p_G = 25 - q_G - q_S$ for Ginvir and

   $p_S = 25 - q_S - q_G$ for Sipep.

   Both companies need syrup to make their drinks that is supplied by two competing companies, NorSyr and BenRup. These companies incur costs of \$5 per unit in making the syrup. Both Ginvir and Sipep can use the syrup of either supplier.
   a. Confirm that competition between NorSyr and BenRup leads to the syrup being priced at \$5 per unit.
   b. What are the resulting equilibrium prices for Ginrip and Sipep and what are their profits?

7. Now suppose that Ginvir and NorSyr merge and that NorSyr no longer competes for Sipep's business.
   a. What price will Benrup now charge Sipep for the syrup?
   b. What are the resulting profits to the three post-merger companies?
   c. Do Benrup and Sipep have an incentive also to merge?

8. Return to the model of Cournot competition presented in section 17.3. Show that when both pairs of upstream–downstream firms vertically integrate, total industry profit falls below what it was with no vertical integration.

9. (Hart and Tirole 1990.) Consider a monopolist upstream supplier $U1$ selling to two downstream producers $D1$ and $D2$ engaged in Cournot competition. Downstream demand is described by: $P = 100 - Q$ and marginal cost is zero at both the upstream and downstream level.
   a. Show that the monopoly level of output is 50 and that monopoly profit is \$2500.
   b. Imagine a contract by which $U1$ sells 25 units as a package to each of $D1$ and $D2$ at a price of \$1,250. Each firm can either accept the package or reject it. Show that if decisions are made simultaneously, and each firm has full information about the other's actions, the Nash equilibrium is for each to accept this offer.

10. Imagine now that deals between $U1$ and $U2$ are done in secret. This can be thought of as raising the possibility that one player goes first. If that player accepts 25 units at a package price of \$1,250, $U1$ can then offer a second package to the other retailer.
    a. Show that in a sequential setting the first downstream firm will never accept the $U1$'s offer.
    b. Show that by vertically integrating with one of the downstream firms and foreclosing the other, $U1$ can earn the monopoly profit of \$2,500.

References

Aggarwal, R. K. and A. Samwick. 2003. "Why Do Managers Diversify Their Firms? Agency Reconsidered." *Journal of Finance* 58 (February): 71–118.

Ahimud, Y. and Lev, B. 1981. "Risk Reduction as a Managerial Motive for Conglomerate Mergers." *Bell Journal of Economics* 12 (Autumn): 605–17.

Besanko, D., D. Dranove, S. Schaefer, and M. Shanley. 1996. *Economics of Strategy*. 4th edn. New York: John Wiley and Sons.

Chen, Y. 2001. "On Vertical Measures and Their Competitive Effects." *Rand Journal of Economics* 32 (Winter): 667–85.

Chipty, T. 2001. "Vertical Integration, Market Foreclosure, and Consumer Welfare in the Cable Television Industry." *American Economic Review* 91 (June): 428–53.

Hart, O. 1995. *Firms, Contracts, and Financial Structure*. Oxford: Oxford University Press.

Hart, O. and J. Tirole. 1990. "Vertical Integration and Market Foreclosure." *Brookings Papers on*

Economic Activity (Special Issue), (February): 205–76.

Hortaçsu, Ali and Chad Syverson. 2006. "Cementing Relationships: Vertical Integration, Foreclosure, Productivity, and Prices." Working Paper, University of Chicago.

Krattenmaker, T. and S. Salop. 1986. "Anticompetitive Exclusion: Raising Rivals' Costs to Achieve Power over Price." *Yale Law Journal* 96 (December): 209–95

May, D. O. 1995. "Do Managerial Motives Influence Firm Risk-reduction Strategies?" *Journal of Finance* 50 (November): 1291–1308.

Mueller, D. C. 1969. "A Theory of Conglomerate Mergers." *Quarterly Journal of Economics* 83 (November): 643–59.

Nalebuff, B. 2004. "Bundling: GE–Honeywell." In J. Kwoka and L. White, eds., *The Antitrust Revolution*. 4th edition. Oxford: Oxford University Press, 388–412.

Nathanson, D. A. and J. Cassano. 1982. "What Happens to Profits When a Company Diversifies?" *Wharton Magazine* 24 (Summer): 19–26.

Ordover, J. A., G. Saloner, and S. Salop. 1990. "Equilibrium Vertical Foreclosure." *American Economic Review* 80 (March): 127–42.

Pepall, L. and G. Norman. 2001. "Product Differentiation and Upstream Downstream Relations." *Journal of Economics and Management Strategy* 10 (Summer): 201–33.

Riordan, M. 1998. "Anticompetitive Vertical Integration by a Dominant Firm." *American Economic Review* 88 (December): 1232–48.

Salinger, M. A. 1988. "Vertical Mergers and Market Foreclosure." *Quarterly Journal of Economics* 103 (May): 345–56.

Salop, S. C. 1979. "Monopolistic Competition with Outside Goods." *Bell Journal of Economics* 10 (Spring): 141–56.

Teece, D. 1982. "Towards an Economic Theory of the Multiproduct Firm." *Journal of Economic Behavior and Organization* 3 (March): 39–63.