ECONOMICS OF STRATEGY

6th Edition

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3 The Vertical Boundaries of the Firm

In early 2000, Internet service provider AOL stunned the business community by acquiring entertainment giant Time Warner. AOL's president, Stephen Case, boasted of the synergies that the two companies would realize under a single corporate umbrella. A year later, AOL Time Warner sought to exploit these synergies by promoting a new girl band called Eden's Crush.[1] Warner Music produced their debut album, "Popstars," the WB network aired a program documenting the band's tryouts and rehearsals, and the band was heavily promoted by AOL. The album was not a success, however, with sales falling short of gold-record status (under 500,000 copies sold). In contrast, another teen group called O-Town debuted at about the same time as Eden's Crush but worked with several independent companies. They released their eponymous debut record on BMG, Disney broadcast the obligatory documentary, and they received heavy publicity from MTV. This seemingly fragmented strategy paid off—their debut album went platinum, with sales exceeding 1.5 million copies.

The production of any good or service, from pop recordings to cancer treatment, usually requires many activities. The process that begins with the acquisition of raw materials and ends with the distribution and sale of finished goods and services is known as the *vertical chain*. A central issue in business strategy is how to organize the vertical chain. Is it better to organize all of the activities in a single firm, as AOL attempted, or is it better to rely on independent firms in the market? There are many examples of successful vertically integrated firms, such as Mexican conglomerate Cemex, which produces cement for its own concrete. Other successful firms, such as Nike, are vertically "disintegrated": they outsource most of the tasks in the vertical chain to independent contractors. Former Hewlett-Packard CEO John Young described outsourcing by his firm as follows: "We used to bend all the sheet metal, mold every plastic part that went into our products. We don't do those things anymore, but somebody else is doing it for us."[2] The *vertical boundaries* of a firm define the activities that the firm itself performs as opposed to purchases from independent firms in the market. Chapters 3 and 4 examine a firm's choice of its vertical boundaries and how they affect the efficiency of production.

Make versus Buy

A firm's decision to perform an activity itself or to purchase it from an independent firm is called a *make-or-buy* decision. "Make" means that the firm performs the activity itself; "buy" means it relies on an independent firm to perform the activity, perhaps under contract. A firm that acquires an input supplier is now "making" the input, because it is performing the activity in-house. Typical make-or-buy decisions for a manufacturer include whether to develop its own source of raw materials, provide its own shipping services, or operate its own retail web site. Some firms are highly integrated. Kimberly Clark's Scott Paper division owns forest land, mills timber, and produces consumer paper products. Italian fashion icon Benetton dyes fabrics, designs and assembles clothing, and operates retail stores. Other firms perform a narrow set of activities. Leo Burnett, which created Tony the Tiger, focuses on creating brand icons for consumer products companies. DHL distributes products to customers of many manufacturers and retailers. Korn/Ferry is a successful corporate "headhunting" firm. When other firms buy the services of these specialists, they can obtain a superior marketing program, secure rapid, low-cost distribution, and identify candidates for senior executive positions without having to perform any of these tasks themselves.

Make and buy are two extremes along a continuum of possibilities for vertical integration. Figure 3.1 fills in some of the intermediate choices. Close to "make," integrated firms can spin off partly or wholly owned subsidiaries. Close to "buy," market firms can enter into a long-term contract, tying their interests for several years. In between are joint ventures and strategic alliances, in which two or more firms establish an independent entity that relies on resources from both parents. To illustrate the key economic trade-offs associated with integration decisions, we will focus on the extreme choices of "make" and "buy." As we will discuss in Chapter 4, intermediate solutions share many of the benefits and costs of both the make-and-buy extremes.

Upstream, Downstream

In general, goods in a production process "flow" along a vertical chain from raw materials and component parts to manufacturing, through distribution and retailing. Economists say that early steps in the vertical chain are *upstream* and later steps are *downstream*, much as lumber used to make wooden furniture flows from upstream timber forests to downstream mills. Thinking about these terms more generally,

FIGURE 3.1
MAKE-OR-BUY CONTINUUM

Arm's-length market transactions	Long-term contracts	Strategic alliances and joint ventures	Parent/ subsidiary relationships	Perform activity internally
Less integrated		→ → →		More integrated

Different ways of organizing production lie on a make/buy continuum.

Example 3.1 Licensing Biotechnology Products

The biotechnology sector remains one of the bright stars of the global economy, providing investors with big returns and consumers with life-saving products. It may come as a surprise, but few biotechnology companies actually commercialize and market their products. Over two-thirds of biotechnology products that make it to the early stages of the regulatory approval process are marketed by traditional "big pharma" companies under licensing arrangements. This reflects a broader pattern of industry "disintegration."

John Hagel III and Marc Singer argue that traditional pharmaceutical firms actually comprise three core businesses.[3] These three core businesses consist of a product innovation business, an infrastructure business, and a customer relationship business. The infrastructure business builds and manages facilities for high-volume, repetitive operational tasks such as manufacturing and communications. The customer relationship business is responsible for finding customers and building relationships with them. These businesses remain the province of pharmaceutical firms, which have production and sales experience that start-up biotech research companies cannot hope to match. Hagel and Singer might have added a fourth core business—obtaining regulatory approval. This requires a working relationship with regulatory agencies such as the U.S. Food and Drug Administration and is also largely the province of big pharma, although a substantial percentage of the actual clinical trials have been outsourced to independent "contract research organizations."

Big pharma no longer dominates the business of innovation. A few decades ago, large pharmaceutical firms used an uneconomical trial-and-error process to screen new drug leads. However, the landmark sequencing of the human genome allows the genes themselves to become the new targets of disease research, resulting in more focused and economical approaches to drug discovery. Although technological breakthroughs like genomics may expedite the drug discovery process, they have also, paradoxically, increased its complexity. Smaller biotech companies are more adept in understanding and adapting to changes in technology than are larger pharmaceutical companies. Companies like Millennium Pharmaceuticals, Celera, Incyte Genomics, and Human Genome Sciences are examples of biotechnology companies that have thrived in the New World.

With biotech companies taking the lead in developing new drugs and big pharma shepherding these discoveries through regulatory approval, production, sales, and marketing, an interesting question is how biotech companies are matched to their big pharma partners. A recent study by economist Anna Levine provides some answers.[4] Levine analyzed a sample of 149 biotech drugs approved for marketing in the United States since 1982. She finds that pharma firms are more likely to enter into a licensing arrangement for a biotech product if they already sell products in the same therapeutic category. This allows the pharma firm to exploit its expertise in the core business of sale, by taking advantage of relationships with physicians and scale economies in selling expense. Levine also finds that the terms of the licensing arrangement benefit the pharma company to the extent that the therapeutic category is fairly narrow, so that other potential licensees are unable to develop similar relationships and scale economies.

Cemex cement production is upstream to its concrete production, and cable sports channel ESPN, which assembles a package of sports entertainment programming, is downstream from the National Football League (a content "producer") but upstream to Comcast and other cable companies (content "retailers").

The specific steps required in a vertical chain do not usually depend on the extent of vertical integration. Making and selling wooden chairs begins with chopping down trees and ends with a customer taking delivery of an order, regardless of the extent of vertical integration. In between, someone has to mill the timber, design the chair, assemble it, distribute it, and sell it. And someone will probably be involved in raising capital to support fixed investments while others handle accounting and marketing. Two identical chairs may well go through the same production steps, but the organization of the firms involved in production might be very different. One chair might be made by a fully integrated firm that performs every step in the vertical chain, while another seemingly identical chair might have passed through a series of independent firms, each of which was responsible for one or two specific steps. The make-or-buy decision is not about trying to eliminate steps from the vertical chain. Instead, it is about deciding which firms should perform which steps.

In order to understand the importance of the make-or-buy decision, it is helpful to think about competition between vertical chains. Consider that when consumers choose one of the two chairs discussed above, they are effectively giving their business to all of the firms involved in the vertical chain that made that chair—the timber mill, the designer, and so forth. Consumers will usually choose the finished good produced by the most efficient vertical chain. Thus, if vertical integration improves the efficiency of production of wooden chairs, then the fully integrated chair producer will prosper while the firms in the "independent" vertical chain will struggle. Conversely, if vertical integration is counterproductive, then the independent firms will prosper and the integrated firm will lose out. It follows that firms will want to be part of most successful vertical chains, and the success of the vertical chain requires the right make-or-buy decisions.

Defining Boundaries

Regardless of a firm's position along the vertical chain, it needs to define its boundaries. To resolve the associated make-or-buy decisions, the firm must compare the benefits and costs of using the market as opposed to performing the activity in-house. Table 3.1 summarizes the key benefits and costs of using market firms. These are discussed in detail in the remainder of this chapter.

Table 3.1
Benefits and Costs of Using the Market

Benefits
- Market firms can achieve economies of scale that in-house departments producing only for their own needs cannot.
- Market firms are subject to the discipline of the market and must be efficient and innovative to survive. Overall corporate success may hide the inefficiencies and lack of innovativeness of in-house departments.

Costs
- Coordination of production flows through the vertical chain may be compromised when an activity is purchased from an independent market firm rather than performed in-house.
- Private information may be leaked when an activity is performed by an independent market firm.
- There may be costs of transacting with independent market firms that can be avoided by performing the activity in-house.

Some Make-or-Buy Fallacies

Before detailing the critical determinants of make-or-buy decisions, we need to dispense with five common, but *incorrect*, arguments:

1. Firms should make an asset, rather than buy it, if that asset is a source of competitive advantage for that firm.
2. Firms should buy, rather than make, to avoid the costs of making the product.
3. Firms should make, rather than buy, to avoid paying a profit margin to independent firms. (This fallacy is often expressed this way: "Our firm should backward integrate to capture the profit of our suppliers for ourselves.")
4. Firms should make, rather than buy, because a vertically integrated producer will be able to avoid paying high market prices for the input during periods of peak demand or scarce supply. (This fallacy is often expressed this way: "By vertically integrating, we obtain the input 'at cost,' thereby insuring ourselves against the risk of high-input prices.")
5. Firms should make, rather than buy, to tie up a distribution channel. They will gain market share at the expense of rivals. This claim has merit on some occasions, but it is used to justify acquisitions on many other occasions when it lacks merit.

Though widely held, the first argument is easy to reject. An asset that is easily obtained from the market cannot be a source of advantage, whether the firm makes it or buys it. If it is cheaper to obtain an asset from the market than to produce it internally, the firm should do the former.

The second argument, which stems from the mistaken belief that the correct make-or-buy decision can eliminate steps from the vertical chain, is also easy to reject. Consider an activity on the vertical chain, say, the distribution of finished goods from a manufacturer to retailers. Choosing to buy, rather than make, does not eliminate the expenses of the associated activity. Either way, someone has to purchase the trucks and hire the drivers. And either way, the firm will pay the cost. Once again, if the firm can perform the activity at a lower cost than it takes to buy it from the market, it should do so. But firms often take a look at market prices and the apparent profitability of market firms and fool themselves into thinking they can make at a lower cost. This is the third fallacy.

There are two potential flaws in the third fallacy. The first flaw stems from the difference between *accounting profit* and *economic profit* discussed in the Economics Primer. Accounting profit is the simple difference between revenues and expenses. Economic profit, by contrast, represents the difference between the accounting profits from a given activity and the accounting profits from investing the same resources in the most lucrative alternative activity. Because economic profit speaks to the relative profitability of different investment decisions, it is more useful than accounting profit when making business decisions. Even if an upstream supplier is making accounting profits, this does not imply that it is making economic profits or that a downstream manufacturing firm could increase its own economic profits by internalizing the activity.

But suppose the upstream supplier is generating substantial positive economic profits. The downstream manufacturer might believe that it could make at a cost below the "exorbitant" supply price. Before doing so, however, the manufacturer should ask a critical question: "If the supplier of the input is so profitable, why don't other firms enter the market and drive the price down?" Perhaps it is difficult to obtain the expertise needed to make the desired input, or maybe the existing supplier

is the only one large enough to reap economies of scale. In these circumstances, the manufacturer would likely find it cheaper to pay the supplier's high price rather than make the input itself.

Avoiding Peak Prices

To illustrate the subtle issues raised by the fourth fallacy, consider a fictitious manufacturer of log homes, Honest Abe Log Homes. Honest Abe sells log cabins that it assembles from specially milled lumber. The market price of this lumber varies from year to year, and for this reason, Rustic's managers are contemplating backward integration into the raising and milling of trees. This is a tempting but fallacious reason for vertical integration.

To see why, suppose that Honest Abe sells its log cabins for $30,000 each. Besides the costs of milled lumber, it incurs $12,000 in labor costs for every cabin it assembles. During the next year, Honest Abe has 100 confirmed orders for log cabins. It contemplates two options for its raw materials needs:

1. It can purchase lumber in the open market. Honest Abe believes that there is a chance that the price of the lumber needed to build one cabin will be $21,000, a chance that the price will be $15,000, and a chance that the price will be $9,000.
2. It can backward integrate by purchasing forest land and a lumber mill. To finance the purchase, Honest Abe can obtain a bank loan that entails an annual payment of $1,050,000 (or $10,500 per cabin). In addition, the cost of harvesting timber and milling it to produce the finished lumber for one cabin is $4,500. Thus, the effective cost of timber would be $15,000 per cabin.

Table 3.2 illustrates Honest Abe's annual income under these options. Under the vertical integration option, Honest Abe has an assured annual profit of $300,000. Under the nonintegration option, its net income is uncertain: it could be $900,000, it could be $300,000, or it could be −$300,000. The expected value of this uncertain income is $300,000.[5]

Even though the vertical integration and nonintegration options entail the same expected profit, it is tempting to argue in favor of vertical integration because it eliminates Honest Abe's risk of income fluctuations. This is an especially tempting argument if management is concerned that when lumber prices are high ($21,000), Honest Abe will not have enough cash to cover its loss and thus will go

TABLE 3.2
RUSTIC LOG HOMES

		Nonintegration and Lumber Price Is . . .		
	Vertical Integration	*$3,000*	*$5,000*	*$7,000*
Revenue	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Cost of Goods Sold				
Lumber	$150,000	$300,000	$500,000	$700,000
Assembly	$400,000	$400,000	$400,000	$400,000
Total	$550,000	$700,000	$900,000	$1,100,000
Interest Expense	$350,000	—	—	—
Profit	$100,000	$300,000	$100,000	($100,000)

bankrupt. If Honest Abe is committed to being an ongoing business concern, according to this argument it should vertically integrate to eliminate the risk of being unable to pay its bills.

Honest Abe does not, however, need to vertically integrate to eliminate its income risk. It could counteract price fluctuations by entering into long-term (i.e., futures) contracts with lumber suppliers or by purchasing lumber futures contracts on the Chicago Mercantile Exchange (CME). Examples of other inputs hedged on the CME include natural gas, soybeans, copper, and oil. Even if Honest Abe could not hedge, the argument for vertical integration is still flawed. After all, if Honest Abe could raise the capital to purchase the forest land, it could instead create a capital reserve to weather short-term fluctuations in lumber prices (e.g., perhaps through a line of credit from the same bank that was willing to loan it the money to buy the land and the lumber mill).

Tying Up Channels: Vertical Foreclosure

Integration to tie up channels is known as vertical foreclosure. Using our upstream/downstream terminology, we can envision four ways for a firm to foreclose its rivals.

1. A downstream monopolist acquires an upstream firm and refuses to purchase from other upstream suppliers.
2. An upstream monopolist acquires a downstream competitor and refuses to supply other downstream firms.
3. A competitive downstream firm acquires an upstream monopolist and refuses to supply its downstream competitors.
4. A competitive upstream firm acquires a downstream monopolist and refuses to purchase from its upstream competitors.

In each of these scenarios, foreclosure extends monopolization across the vertical chain and therefore seems to increase profits.

Foreclosure can increase profits but not for the seemingly obvious reasons. One danger of this strategy is that competitors may open new channels. A second danger specific to scenarios (3) and (4) is that the competitive firm will have to pay a steep fee to acquire a monopolist. The acquirer could still prosper if the merger increases the total profits available in the vertical chain. But this is impossible according to an argument associated with the Chicago School of Economics, an argument that also sheds doubt on the profitability of scenarios (1) and (2).

Noted French economic theorists Patrick Rey and Jean Tirole sum up the Chicago School argument as follows:

> The motivation for foreclosure cannot be the desire to extend market power, since there is a single final product and thus a single monopoly profit.[6]

In other words, only so much money can be squeezed out of consumers—the monopoly profit. A firm that monopolizes a single stage in the vertical chain, sometimes said to create a *bottleneck* in the vertical chain, can command that monopoly profit in its entirety. Vertical integration cannot increase profits above the monopoly profit, and therefore there is no reason to foreclose. Because integration cannot increase monopoly power, the Chicago School argument concludes that the courts should ignore vertical integration between a monopolist and another firm. (A variant of this argument applies to horizontal integration.)

It turns out that the Chicago School argument is about half right.[7] There is only so much profit to be squeezed from the vertical chain, and foreclosure does not increase the available profit. But in some situations foreclosure may still be profitable,

by allowing monopolists to *protect their profits*. The quintessential example goes as follows. Suppose that an upstream monopolist wants to charge a premium price for its input. In principle, this will translate into premium prices for the finished good, high enough to allow downstream firms to pay for the input and remain in business. In order to assure high downstream prices, the upstream firm must limit its sales of the input. But this creates a conundrum. Once the upstream firm has sold the monopoly level of the input, there is nothing to prevent it from selling even more, in the process flooding the market and driving down prices of the finished good. This must be very tempting to the monopolist. But if downstream firms are aware of this possibility, they will be reluctant to pay monopoly prices for the input. And if that happens, the upstream monopolist cannot realize monopoly profits!

The monopolist might solve this problem by establishing some sort of reputation for limiting output, for example, through a long history of resisting temptation. But this creates a chicken/egg problem; how does the monopolist establish that reputation in the first place? Foreclosure provides a way out of the conundrum. By acquiring the downstream firm and refusing to deal with downstream competitors, the upstream monopolist can now easily limit output. This assumes, of course, that the upstream "division" of the integrated firm does not act rashly and sell the input to the competition. But this does seem easier to control within the integrated organization.

The theory that foreclosure "protects" monopoly profits underlies much of the antitrust laws involving vertical integration. As a result, courts take a careful look at deals that exclude competitors from essential inputs. By the same token, other theories suggest that there are opportunities to increase profits through horizontal combinations between monopolists and competitive firms and that these also motivate antitrust activity—for example, when firms tie together the purchase of two goods, one of which is monopolized. In these situations, the courts must weigh the potential for monopoly profits against the potential for lower costs. Managers must do the same thing, of course. In Chapter 2 we discussed the potential efficiencies of horizontal combinations. In the remainder of this chapter, we do the same for vertical mergers.

EXAMPLE 3.2 EMPLOYEE SKILLS: MAKE OR BUY?

In 2001, Adobe Systems CEO Bruce Chizen executed a major change in strategy. Rather than relying on consumer products like Photoshop, Chizen wanted to focus the firm on selling its Portable Document Format (PDF) standard to large corporate clients. With this change in strategy, however, came a change in the skills required of Adobe's sales force. The firm's pre-2001 salespeople were experts in selling to graphic designers. The new strategy would require salespeople who were more comfortable in a boardroom than at a drafting table. But how should these new capabilities be developed? Should the firm "make" the new employee skill set, by retraining its existing sales force? Or would it be better to "buy" the new skills, by hiring an entirely new sales team?

Firms face this make-or-buy decision any time they consider a corporate training program, and many of the lessons of this chapter apply. Scale economies offer one major benefit of using the market. Many of the costs associated with education are fixed; for example, a university's costs do not rise much when an additional student attends classes. Thus, while accounting firms could, in principle, make their own CPAs with in-house training, this would entail considerable inefficiencies as investments in training facilities are duplicated. It is more cost-effective for the firms to buy their

accountants after they have completed university training.

When scale economies are less important, firms often offer training in-house. Consider, as an example, the "mini-MBA" program offered by the consulting firm McKinsey and Company. The firm offers this program to employees who have strong analytical backgrounds—often individuals with MDs or PhDs in hard sciences—but lack direct business experience. While most top MBA programs aim to offer both business knowledge and training in analytical skills, the McKinsey "mini-MBA" program focuses only on business knowledge. Peter Attia, an associate who joined the firm in 2006, is a typical participant. Trained as a surgeon, Attia left medicine after determining it wasn't a good fit for him; he described the mini-MBA as a "boot camp covering all the aspects of business that I didn't have coming in."[8] Because the McKinsey program is somewhat more specialized than, say, a bachelor's degree in accounting, the firm is not at a large cost disadvantage relative to outside providers of education.

Using the market for procuring employee skills has several additional advantages. First, education often generates information that is useful in matching the right employee to the right employer. Suppose two firms each need to hire a computer programmer. One firm's programming tasks are quite complex, and so this firm is willing to pay a very high wage to attract a programmer from the top of his or her class. The second firm's tasks are not as complex, and so it has a lower willingness to pay for programming ability. By going to the market to hire programmers, the firms can each make their hiring decisions contingent on how individuals did in their bachelors of computer science coursework. If the firms adopted a "make" strategy where they hired individuals with no programming background and then offered training, it might be difficult for the first firm to identify which of two prospective programmers would turn out to be a star.

Second, potential employees often develop valuable networks with other students when attending college or graduate school. For example, an investment bank that hires a Kellogg School MBA is also importing connections with that MBA's classmates. It would be very difficult for the bank to match this "network effect" if it relied on in-house training.

As the Nobel Prize–winning economist Gary Becker has pointed out, the problem of determining the best way to invest in employees' skills is complicated by the fact that returns to human capital investments are inalienable.[9] That is, unlike physical capital, human capital cannot be separated from the person making the investment. A firm that pays for an employee to gain skills that are valued by other employers—what Becker refers to as "general-purpose" human capital—may find the employee's wage is bid up after the skills are acquired. Thus, while the employee's productivity may rise as he or she gains skills, the firm does not benefit because of the increased wage bill. Firms that offer general-purpose training (such as McKinsey's mini-MBA) need to think about how to earn a return on this investment in the face of labor-market competition.

While firms may thus be hesitant to invest in building employees' general-purpose skills, employees may be similarly concerned about investing in firm-specific skills. Employees' investments in specific human capital are subject to the holdup problem, which we discuss later in this chapter. Adobe's sales force, for example, may worry that investments in learning how to sell the PDF standard will not be rewarded by the firm, because there is no other employer willing to pay for skills that are specific to PDF.

Reasons to "Buy"

Firms use the market (or "buy") primarily because market firms are often more efficient. Market firms enjoy two distinct types of efficiencies: they exploit economies of scale and the learning curve, and they eliminate "bureaucracy."

Exploiting Scale and Learning Economies

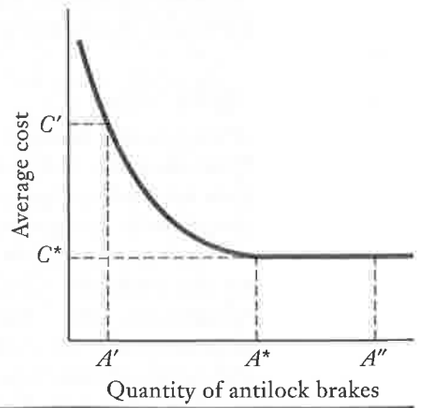
It is conventional wisdom that firms should focus their activities on what they do best and leave everything else to market firms. There are several reasons for this. First, market firms may possess proprietary information or patents that enable them to produce at lower cost. Second, market firms might be able to aggregate the needs of many customers, thereby enjoying economies of scale. Third, market firms might exploit their experience in producing for many customers to obtain learning economies.

The first argument requires no additional analysis; the last two arguments are more subtle. Recall from Chapter 2 that when economies of scale or learning economies are present, firms with low production levels or little experience in production may be at a severe cost disadvantage relative to their larger, more experienced rivals. Market firms can often aggregate the demands of many potential buyers, whereas a vertically integrated firm typically produces only for its own needs. Market firms can therefore often achieve greater scale, and thus lower unit costs, than can the downstream firms that use the input.

To illustrate this point, consider automobile production. An automobile manufacturer requires a vast variety of upstream inputs: steel, tires, antilock brakes, stereos, computer equipment, and so forth. A manufacturer, Audi, for example, could backward integrate and produce inputs such as antilock brakes itself, or it could obtain them from an independent supplier, such as Bosch or Denso. Figure 3.2 illustrates an average cost function for antilock brakes. According to the figure, the production of antilock brakes displays L-shaped average costs, indicating that there are economies of scale in production. In this example, the minimum efficient scale of production—the smallest level of output at which average cost is minimized—is output level A^*, with resulting average cost C^*.

Suppose that Audi expects to sell A' automobiles with antilock brakes, where $A' > A^*$. Thus, Audi expects to sell enough automobiles to achieve minimum efficient scale in the production of antilock brakes by producing for its own needs alone. This is seen in Figure 3.2, where the average cost of output A' roughly equals C^*. From a cost perspective, Audi gets no advantage by using the market.

Figure 3.2
Production Costs and the Make-or-Buy Decision



Firms need to produce quantity A^* to reach minimum efficient scale and achieve average costs of C^*. A firm that requires only A' units to meet its own needs will incur average costs of C', well above C^*. A firm that requires output in excess of A^*, such as A'', will have costs equal to C^* and will not be at a competitive disadvantage.

Suppose instead that Audi expects to sell A' automobiles with antilock brakes, where $A' < A^*$. In this case, Audi cannot achieve minimum efficient scale by producing only for its own needs. This is seen in Figure 3.2, where the average cost associated with output A', denoted C', exceeds the minimum average cost C^*. Audi could try to expand antilock brake output to A^*, thereby achieving scale economies. Audi would be producing more brakes than cars, so it would need to sell its excess stock of brakes to other car makers. This is a reminder that, in principle, activities organized through market firms could be organized through vertical integration, and vice versa.

In reality, Audi might have a hard time selling brakes to its rivals. Rivals may fear that Audi will withhold supplies during periods of peak demand or that Audi might gain vital information about planned production levels. Rivals may simply be unwilling to provide financial support to Audi operations. These concerns notwithstanding, competitors sometimes do buy inputs from each other. For example, the Taiwanese firm Giant makes frames for its own bicycles as well as for competitors such as Trek. California-based Oppo Digital makes its own line of Blu-Ray players but also produces for high-end brands such as Theta, Lexicon, and Ayre Acoustics.

Instead of trying to reach minimum efficient scale doing in-house brake production, Audi could purchase antilock brakes from an independent manufacturer such as Bosch. Bosch would reach production of A' in Figure 3.2 just from its sales to Audi. Because there are many more car manufacturers than there are antilock brake makers, Bosch will probably sell its antilock brakes to other car makers. This will allow it to expand output beyond A', thereby exploiting scale economies.

It may be more efficient if Bosch produces the brakes, but Audi benefits only if Bosch passes along some of the cost savings. Under what circumstances will this occur? Recall from the Economics Primer that if markets are competitive, prices will approach average cost. With only four major competitors, the antilock brake market probably falls somewhere between perfect competition and monopoly. Bosch may be able to charge a price in excess of C^*, but it could not charge a price above C'. If it did so, Audi could produce the antilock brakes itself at a lower cost. It is likely that Audi would be able to negotiate a price somewhere between C^* and C', so that Bosch earned positive profits while Audi enjoyed some of the benefits of using an efficient market supplier.

Bureaucracy Effects: Avoiding Agency and Influence Costs

Analysts often state that large firms suffer from "bureaucracy." This catchall term includes a number of specific problems associated with agency and influence costs.

Agency Costs

Managers and workers make many decisions that contribute to the profitability of a firm. Managers and workers who knowingly do not act in the best interests of their firm are *shirking*. *Agency costs* are the costs associated with shirking and the administrative controls to deter it.

It may seem that there is a way to limit agency costs—reward managers and workers for the profit that their efforts contribute to the firm. But as we explain in detail in Chapter 12, this is easier said than done. One problem is that most large firms have common overhead or joint costs that are allocated across divisions. This makes it difficult for top management to measure and reward an individual division's contribution to overall corporate profitability. A second reason is that in-house divisions in many large

firms serve as *cost centers* that perform activities solely for their own firms and generate no outside revenue. An example of a cost center would be the laundry service in a hospital or the data processing department in a bank. Cost centers are often insulated from competitive pressures because they have a committed "customer" for their inputs. Moreover, it can be difficult to evaluate the efficiency of cost centers because there is often no obvious market test for judging their performance. The absence of market competition, coupled with difficulties in measuring divisional performance, makes it hard for top management to know just how well a cost center is doing relative to its best achievable performance. This, in turn, gives cost center managers the latitude to shirk.

Even when management is aware of agency costs, it may prefer to ignore them rather than to eliminate them. Many firms are unwilling to endure the ill-will generated by firing a nonproductive worker or ending a costly perk that has pervaded the organization. This is particularly likely if the firm possesses some inherent advantages in the market that insulates it from competition and relieves top management from the pressure of controlling agency costs. Unfortunately, ignoring agency costs can have lasting consequences. As the famous economist Frederick von Hayek pointed out, "How easy it is for an inefficient manager to dissipate the differentials on which profitability rests."[10]

Influence Costs

Another class of costs that arise when transactions are organized internally is what Paul Milgrom and John Roberts have called *influence costs*.[11] To understand influence costs, it is helpful to recall the concept of internal capital markets introduced in Chapter 2. Internal capital markets allocate available working capital within the firm. One of the potential benefits of horizontal integration and diversification is the ability to use internal capital markets to fund investments when access to external funding is limited. The central office of a firm that relies on internal capital faces a conundrum: How does it allocate its scarce capital across many potentially deserving projects?

In order to evaluate competing proposals, the central office must work closely with divisional and department heads, for department heads are best positioned to understand the merits and weaknesses of various projects. But this creates a potential conflict of interest. Lower-level managers will naturally seek to command more of their company's resources so as to advance their own careers and boost their own incomes, possibly at the expense of corporate profits. Milgrom and Roberts describe how lower-level managers may engage in an array of *influence activities* as they seek to move their own projects to the top of the central office's "must fund" list. Lower-level managers may exaggerate the likely success of their pet projects or badmouth proposals from other departments. They may refuse to play ball with other departments, for example by withholding demand forecasts or key personnel. If one department does agree to help another, it might quote a high "transfer price" (a price quote for internal resources that is counted against another department's accounting profits). The end result of these influence activities is that the central office is unable to obtain objective information with which to compare competing projects. The result is an inefficient allocation of internal capital.

When we discussed internal capital markets in Chapter 2, we observed that one reason why firms may find it difficult to attract outside capital is the asymmetry of information between the firm and the bank; banks expect borrowers to exaggerate the profitability of their projects. This same asymmetry exacerbates influence costs within the integrated firm. But it may be more problematic within the integrated firm, where

the influence activities of one department manager can hinder the success of others. This is yet another reminder that what goes on among independent market firms also goes on within the vertically integrated firm.

Supply relationships within General Motors nicely illustrate how influence activity can harm a vertically integrated firm. Suppose that the program manager for a new GM product is unhappy with the in-house supplier's bid—it's too high, and in the past the supplier had quality and delivery problems. No sooner does the manager identify an alternative bidder outside the company than the in-house supplier goes to corporate headquarters and explains that the loss of business on his part will require an increase in the costs of similar parts already being supplied by other GM products. Why? Because economies of scale will be lost and the in-house supplier will have excess capacity.

Headquarters, always respectful of scale-economy and capacity-utilization justifications in a mass-production firm such as GM then has a talk with the program manager. The in-house supplier makes solemn (but ultimately empty) promises to try harder to reduce costs while improving quality and delivery reliability—and gets the business. This process explains how, not too long ago, GM managed to have both the world's highest production volume and the world's highest costs in many of its component supply divisions.[12]

One way that firms can limit influence activities is by loosening the connection between a business unit's profitability on the one hand and managerial compensation on the other. Managers are less likely to lobby for resources for their own units when compensation is tied to corporate profits. But this cuts both ways; it may limit influence activities, but it also limits the incentives of managers to take genuine steps to improve their unit's profitability.

Example 3.3 Disconnection at Sony[13]

Sony is one of the most recognizable brand names in the world. Long a leader in home electronics, Sony vertically integrated into "software" (music and movies) with its 1988 acquisition of Columbia/CBS Records, which it rechristened Sony Home Entertainment. The partnership between the Sony hardware and software divisions helped the firm in the late 1990s when Sony joined other hardware makers in launching the DVD technology. While most independent movie studios sat on the fence, Sony Home Entertainment (SHE) released several popular titles from the massive Columbia movie library.

The partnership between hardware and software divisions has not always gone smoothly. In 1998, Sony considered developing digital music technology through the integrated efforts of its hardware and software divisions. From the beginning of this endeavor, conflicts between divisions were the norm. Sony's personal computer and Walkman groups each had their own technologies to push. SHE opposed any effort, fearful that it would encourage illegal downloading that would eat into software sales. Sony allowed each of its groups to take a separate path; the PC and Walkman groups released rival products, while SHE launched an online music portal that was not integrated with either hardware offering.

In the meantime, Apple had launched its iPod. In early 2003, Sony responded by launching the Connect project, to be headed by Howard Stringer and Philip Wiser, two executives from Sony USA. Connect would be a joint effort of Sony's top hardware makers, programmers, and SHE. Unfortunately, Stringer and Wiser did not control the hardware, programming, or SHE groups. The hardware designers were skeptical of Connect, fearing that opposition from SHE would eventually block the entire project. But there were many, more practical problems.

Stringer and Wiser were aware that Sony's software for downloading and playing digital music paled beside Apple's iPod, yet Sony's software division refused to make improvements. Wiser and Stringer wanted Connect to store data on hard drives using the MP3 format. But the hardware folks in Japan's Walkman division opted for the proprietary Atrac format to be stored on minidiscs (a smaller version of the CD that was popular in Japan). The Walkman division eventually gave in on the hard disc, though not the MP3 formatting, but only after the division head complained that hard drives "aren't interesting because anyone can make them." The lack of interest showed in the quality of the finished product. Reviewers of Sony's digital Walkman complained about the Atrac format and the user-unfriendly software interface. To make matters worse, Sony's PC division had launched its own digital music player without any coordination with Connect.

In November 2004, Sony pulled the plug on Connect only to set up Connect 2.0—a new division within Sony that would have its own hardware and software groups. The new Connect turned to a Sony software team in San Jose to revamp the user interface. After some resistance, Connect was also able to recruit a team of flash memory designers from the Walkman group. Sony's PC group even pulled its digital music player from the market. In May 2005, Sony released its new MP3 digital player in Japan and followed up with summer 2005 releases in the United States and Europe. With minimal features and plagued by critical bugs that affected usability, Connect 2.0 met the same fate as its predecessor. In 2006, Sony switched its Connect service to SonicStage, an older in-house product designed to manage portable devices plugged into computers running Windows. This proved to be a case of "too little, too late"; Sony shut down its Connect music store in 2008.

Organizational Design

In Chapter 13, we will describe organizational design, or hierarchy, which defines the lines of reporting and authority within the firm. The organizational design of one firm may not be right for another, and independent firms are free to choose the design that best meets their needs. When firms integrate, they usually unify their organizational design to avoid complexity and limit pay differentials for workers with similar responsibilities in different business units. But a uniform design forces some divisions to give up the lines of reporting and authority that had previously served it best.

To illustrate the pitfalls of organizational design in diversified firms, Oliver Williamson offered the seminal example of Tenneco's acquisition of Houston Oil and Minerals.[14] Houston was an energy exploration company that offered high-powered incentives that allowed key exploration personnel to become very wealthy. Tenneco was a conglomerate with uniform compensation policies across its divisions. After the acquisition, Tenneco imposed its compensation practices on Houston, which prompted Houston's most talented (and best paid) workers to quit.

Reasons to "Make"

Thus far we have provided ample reasons for firms to focus on a narrow set of activities and leave everything else to market firms. But just as markets are not dominated by one or two megafirms, they are not exclusively the province of focused market firms. Sometimes it makes sense for firms to make rather than buy. Transactions among market firms can create serious problems for the profitability of all firms in the

vertical chain, however, because owners of market firms have hard-edged incentives to maximize their own profits, without regard to the profits of their trading partners. Firms could write contracts to blunt these incentives, by penalizing market firms that look after their own interests and rewarding those market firms that help their trading partners become more profitable. As we describe below, such contracts would assure efficient production and maximum profits, while rendering meaningless the distinction between integrated firms and market firms. Unfortunately, it is costly to write and enforce such contracts. As a result, the decision to vertically integrate is far from meaningless. Thus, we begin our discussion of "reasons to make" by exploring the limitations of contracts.

The Economic Foundations of Contracts

Contracts define the conditions of exchange. They may take standardized forms, such as the "conditions of contract" on the back of an airline ticket or the terms and conditions of purchase printed on the back of a company's purchase order. Or they may be lengthy and complicated because they are carefully tailored to a specific transaction. For example, the contract for the sale of the Empire State Building in the 1960s involved more than 100 attorneys and was over 400 pages long.[15]

To understand the importance of contracts in the make-or-buy decision, it is useful to ask why firms use contracts. Contracts are valuable, in part, because they list the set of tasks that each contracting party expects the other to perform. But contracts also specify remedies in the event that one party does not fulfill its obligations. If necessary, an injured party may go to court to enforce the contract. It follows that an important reason for contracts is that firms do not completely trust their trading partners. If a firm could be certain that its partners would never shirk, there would be no reason to specify penalties in the event that they do.

Contracts are not equally effective at preventing shirking. Their effectiveness depends on (1) the "completeness" of the contract and (2) the available body of contract law. We discuss each of these factors in turn.

Complete versus Incomplete Contracting

A *complete contract* eliminates opportunities for shirking by stipulating each party's responsibilities and rights for each and every contingency that could conceivably arise during the transaction. A complete contract specifies particular courses of action as the transaction unfolds and makes penalties for breach sufficiently large that neither party shirks. By using a complete contract, a firm can get its trading partners to mimic any and all of the steps that would have been taken by a vertically integrated firm, as well as replicate the profits accruing to each participant in the vertical chain. With complete contracts, the make-or-buy decision becomes moot.

The requirements for complete contracting are severe. Parties to the contract must be able to contemplate all relevant contingencies and agree on a set of actions for every contingency. The parties must also be able to stipulate what constitutes satisfactory performance and must be able to measure performance. Finally, the contract must be enforceable. This implies that an outside party, such as a judge or an arbitrator, must be able to observe which contingencies occurred and whether each party took the required actions. For example, a contract in which the price of an item is tied to the seller's production costs might not be enforceable without an independent auditing mechanism that could verify those costs. Moreover, any specified damages

must be within the financial reach of the shirking party. Otherwise it could choose to violate the terms of the contract with impunity.

Virtually all real-world contracts are incomplete: they do not fully specify the "mapping" from every possible contingency to enforceable rights, responsibilities, and actions. Incomplete contracts involve some degree of open-endedness or ambiguity; there are circumstances under which neither party's rights and responsibilities are clearly spelled out. Consider, for example, the case *Cook v. Deltona Corp.*[16] In 1971 Deltona Corporation, a land developer, sold Cook a piece of property in Marco Shores, Florida. The land was under water at the time of the sale. The title to the land was to be delivered in 1980, by which time Deltona was to have dredged and filled the land. However, during the 1970s changes in federal policy toward wetlands made it difficult for developers to obtain dredge-and-fill permits from the Army Corps of Engineers. In 1976, after failing to obtain permits on nearby land, Deltona gave up trying to obtain a permit for Marco Shores. The sales contract did not specify the buyer's rights and the developer's responsibilities under these circumstances, so the contract was incomplete. Because the contract was silent on this unanticipated turn of events, it was not clear whether Deltona had breached the contract by not delivering the land in the condition promised. The outcome was a lawsuit that took nine years to resolve. (Cook won.)

We now consider three factors that prevent complete contracting:

1. Bounded rationality
2. Difficulties specifying or measuring performance
3. Asymmetric information

Bounded Rationality

Bounded rationality refers to limits on the capacity of individuals to process information, deal with complexity, and pursue rational aims. Boundedly rational parties cannot contemplate or enumerate every contingency that might arise during a transaction. As a result, they cannot write complete contracts. In *Cook v. Deltona Corp.*, Deltona offered a defense based on bounded rationality. It argued that changes in regulatory requirements by the Army Corps of Engineers seemed so unlikely when the contract was written as to be unforeseeable. The court acknowledged that, in principle, this could be a valid defense, but it held that evidence that the Army Corps of Engineers had begun to toughen its policy meant that Deltona should have accounted for this risk in the contract.

Difficulties Specifying or Measuring Performance

When performance under a contract is complex or subtle, not even the most accomplished wordsmiths may be able to spell out each party's rights and responsibilities. Language in contracts is thus often left so vague and open-ended that it may not be clear what constitutes fulfillment of the contract. For example, a standard clause in lease contracts for new cars allows the company to bill the lessee for "excess wear and tear." However, the contract does not specify what this means. Some leasing companies have used this clause to charge customers who return the car in less-than-showroom condition.

A related problem is that performance may be ambiguous or hard to measure. For example, public and private health care payers have initiated a "pay for performance" movement intended to improve the quality of care. Primary care physicians can be rewarded if the "process" of care delivery meets established norms—for example, if

pediatric patients receive timely vaccinations or if diabetics receive regular eye exams. These metrics are not necessarily the best indicators of quality, but they are easily measured from available patient billing records. Some industry experts want to replace narrow process measures with "patient reported outcomes" that capture the patient's overall quality of life.

Asymmetric Information

Even if the parties can foresee all contingencies and specify and measure relevant performance dimensions, a contract may still be incomplete because the parties do not have equal access to all contract-relevant information. If one party knows something that the other does not, then information is *asymmetric*, and the knowledgeable party may distort or misrepresent that information. For example, suppose that Audi would like to award Bosch a bonus if Bosch maintains stringent quality control in the production of antilock brakes. Because Bosch is responsible for quality control, it is the only one that can verify that appropriate measures have been taken. If the antilock brakes did not perform as expected, Bosch could claim that it took the required steps to assure durability even when it did not. Bosch might even claim that the fault lay in an associated electronics system manufactured by another firm. Understanding Bosch's self-interest, Audi might protest these claims. To enforce this contract, a court would have to look at evidence (e.g., an independent quality audit or testimony from each party) to ascertain whether the contract was fulfilled. But given the complexity of automotive braking systems, this evidence may well be inconclusive, and the court would have little basis on which to resolve the dispute. Under these circumstances, Audi and Bosch may be unable to contract for "quality control."

The Role of Contract Law

A well-developed body of contract law makes it possible for transactions to occur smoothly when contracts are incomplete. In the United States, contract law is embodied in both common law and the *Uniform Commercial Code* (*UCC*), the law governing contracts in all states except Louisiana. (There is no uniform European Civil Code, although many academics have urged European nations to embrace the "Principles of European Contract Law," which is styled after the UCC.) The doctrines of contract law specify a set of "standard" provisions applicable to wide classes of transactions. These doctrines eliminate the need for parties to specify these provisions in every single transaction. However, contract law is not a perfect substitute for complete contracting for two important reasons. First, the doctrines of contract law are phrased in broad language ("reasonable time," "reasonable price") that is open to differing interpretations when applied to specific transactions. Uncertainty about how particular doctrines will be applied raises the costs of transacting the exchange relative to an ideal world in which complete contracting is possible.

Second, litigation can be a costly way of "completing" contracts, both in dollars and time. Litigation can also weaken or destroy business relationships. As Stewart Macauley writes, "A breach of contract suit may settle a particular dispute, but such action often results in 'divorce,' ending the 'marriage' between two businesses, since a contract action is likely to carry charges with at least overtones of bad faith."[17]

By now it should be clear that contracts are an imperfect way to dissuade trading partners from behaving opportunistically at the expense of the entire vertical chain. If the resulting inefficiencies are large enough, it might make sense to limit opportunism by vertically integrating—choosing make over buy. We now describe three situations

in which the inefficiencies might prove to be especially large: when it is important to coordinate activities in the vertical chain, when firms must share vital information, and when firms must make crucial investments.

Coordination of Production Flows through the Vertical Chain

Workers at different stages of the vertical chain must often make complementary decisions, that is, decisions that "fit together." Examples include:

- *Timing Fit* The launch of a Heineken marketing campaign must coincide with increased production and distribution by its bottlers.
- *Sequence Fit* The steps in a medical treatment protocol must be properly sequenced.
- *Technical Specification Fit* The sun roof of a car must fit precisely into the roof opening.
- *Color Fit* The tops in Benetton's spring lineup must match the bottoms.

Without good coordination, bottlenecks may arise. The failure of one supplier to deliver parts on schedule can shut down a factory. The failure to coordinate advertising across local markets can undermine a brand's image and dampen sales.

Firms often rely on contracts to ensure coordination. Contracts may specify delivery dates, design tolerances, or other performance targets. A supplier who fails to meet the specified targets might have to pay a penalty; a supplier who exceeds expectations may receive a bonus. For example, penalties and bonuses are commonplace for road construction firms facing completion deadlines. Firms may also assure coordination in the vertical chain by relying on *merchant coordinators*—independent firms that specialize in linking suppliers, manufacturers, and retailers.

The use of contracts and middlemen clauses is widespread, yet in some circumstances the protections afforded by contracts and middlemen may be inadequate. Paul Milgrom and John Roberts explain that coordination is especially important in processes with *design attributes*, which are attributes that need to relate to each other in a precise fashion; otherwise they lose a significant portion of their economic value.[18] Table 3.3 lists activities that are design attributes and those that are not. What the former have in common but the latter lack is that small errors can be exceptionally costly. For example, a slight delay in delivering a critical component can shut down a manufacturing plant. On the other hand, a slight delay in delivering landscaping supplies is unlikely to be critical to completing construction of an office tower.

TABLE 3.3
EXAMPLES OF DESIGN ATTRIBUTES

Are Design Attributes	*Are Not Design Attributes*
Timely delivery of part necessary for manufacturing process to begin	Timely completion of building construction
Sequencing of courses in MBA curriculum	Sequencing of sports activities in summer camp
Fit of automobile sunroof glass in opening of auto roof	Fit of bicycle handlebar covers on handlebars
Matching colors of sportswear ensembles within narrow tolerances	Matching sizes of sportswear ensembles within narrow tolerances

Because contracts are incomplete, firms cannot rely on them to ensure adequate coordination of design attributes. Whether by accident or design, an upstream supplier may fail to take the steps necessary to ensure a proper fit. If the resulting cost is substantial, then even if the downstream firm seeks compensation in court, it may be unable to recover full economic damages. Confronting such a possibility, the downstream firm may wish to integrate all critical activities and rely on administrative control to achieve the appropriate coordination.

Many firms bring design attributes in-house. Benetton dyes its own fabrics, because slight mismatches of color can ruin a production run. Caremark, which provides home intravenous drug infusion therapy for patients with AIDS, cancer, and other illnesses, writes its own applications software so as to beat its competitors to the market with new drug therapies. Silicon chip makers make both the wiring and the wafers in order to assure a precise fit. In each example, the cost of a small error along the critical design attribute can be catastrophic.

Firms could in principle write contracts to force each trading partner to take precautions to avoid catastrophes. But incomplete contracts may not offer sufficient protection, for all of the reasons we described earlier. When coordination of design attributes is critical to production, the central office of an integrated firm can avoid catastrophes by complementing traditional employment contracts with informal tools associated with governance. For example, top management can promote some managers and fire others without having to abide by precise contractual terms. Or it can promote a culture in which coordination is valued in its own right, regardless of contract. We further explore the important role of governance in the integrated firm in Chapter 4.

Example 3.4 Nightmares at Boeing: The 787 Dreamliner

Boeing, the world's leading aerospace company, promised its customers that it would produce a dream of an airliner for twenty-first-century commercial air travel. Boeing designed the 787 Dreamliner to be the most fuel-efficient commercial aircraft ever built and the world's first major airliner to use composite materials for most of its construction. After Boeing announced the 787 project in April 2004, 56 different customers placed orders for over 900 aircraft, making the 787 the most anticipated launch of a new commercial airplane in Boeing's history. Boeing promised to make its first delivery in 2008. As of summer 2011, the next-generation airliner was billions of dollars over budget and Boeing had postponed delivery of the first plane (to All Nippon Airways) until the fall of 2011. Some of these problems could be attributed to the plane's advanced design, engineering, and materials, which made it harder to build. But much of the blame belongs to the company's aggressive strategy of outsourcing the design, manufacture, and assembly of crucial components to subcontractors. It was a costly lesson both for Boeing and the world.

In order to reduce costs and accelerate design and production, Boeing adopted an innovative manufacturing model of being a system integrator and outsourcing most of the design, engineering, manufacturing, and production to external suppliers around the world. Each supplier was fully responsible for detail design and production. Suppliers would complete each section in its entirety before shipping it to Boeing's aircraft hangars in Everett, Washington, for final assembly and inspections. Boeing contracted with over 50 suppliers, some 28 of them outside of the United States. As much as 70 percent of the total value of the 787 was foreign content, compared with 30 percent for the 777 (launched in the 1990s) and just 2 percent for the 727 (launched in the 1960s).

If all went well, Boeing could piece together a 787 from its component parts much the same way that a child assembles a Lego. But all did not go well. Problems emerged as early as the designing stage: instead of providing its subcontractors with detailed blueprints as was done for its previous planes, Boeing gave less detailed specifications about the design and required suppliers to create their own blueprints. However, many of Boeing's first-tier subcontractors did not have the capability to perform this highly uncertain and complex designing and engineering work. Some of them even farmed out their part of designing and engineering to their own subcontractors.

As subcontractors waited on subassembly designs, delays began to mount up. This was just the beginning of Boeing's problems. Boeing required that subcontractors integrate their own sections and send the preassembled sections to Everett for final assembly. But just as some contractors lacked the expertise to do complex design work, so others lacked experience at subassembly integration. They either could not procure the needed parts or perform the subassembly in time, or both. Boeing had to take over the remaining assembly work and complete it as "traveled work." To make matters even worse, some components manufactured by different subcontractors did not fit together, and some sections that were sent to final assembly were missing sufficient documentation of instructions, which almost made Boeing lose control of the process.

Coordination may also involve an *assignment* problem—ensuring that the right people do the right jobs with minimal duplication of effort. As with coordination of design attributes, the assignment problem may be easier to solve by the central office of an integrated firm than by reliance on the market. Again, firms could try to use contracts to solve the assignment problem, but this requires considerable qualitative judgment, which is difficult to specify in a contract.

Coordination can be especially difficult for innovative processes, where there may be no blueprints to facilitate the matching of complementary inputs. The following example, adapted from Qian, Roland, and Xu, combines the coordination and assignment problems in an innovative process:

> Consider the GMC Sierra and Chevrolet Silverado. Suppose a technological innovation in transmission will make a better truck, but requires a change in the technical specification for engines. Unless the development of transmission and engine are coordinated, the trucks will not operate. Because neither the transmission nor engine teams will have each other's final blueprints during the development process, it may be difficult to rely on contracts to assure that the two components are interoperable. In addition, coordination by an integrated General Motors will avoid duplication of efforts required to assure the proper fit. Costs can be further reduced if the Sierra and Silverado can share the same transmission, suggesting that there can be economies of scope in achieving coordination.[19]

Leakage of Private Information

A firm's *private information* is information that no one else knows. Private information may pertain to production know-how, product design, or consumer information. When firms use the market to obtain supplies or distribute products, they risk losing control of valuable private information. Well-defined and well-protected patents afford research-driven organizations the ability to outsource downstream activities from production through marketing without compromising the intellectual property (IP) that is their principal source of competitive advantage.

Patents are not foolproof, however, for many of the same reasons that contracts are incomplete: bounded rationality and difficulties in specifying what is covered by a patent. The urgent need to protect IP can profoundly influence outsourcing decisions. Consider the plight of Peerless Industries, an Illinois manufacturer of flatscreen and projector television mounts. Peerless had outsourced production to a supplier in China, but as its chief operating officer soon discovered, "Knockoffs of our products started showing up in markets here in our own backyard. It wasn't necessarily our supplier doing it; it was our supplier's supplier."[20]

Concerns about IP are not limited to outsourcing in developing nations. Like contracts, patents are often incomplete and rival firms can often "invent around" them. This explains why independent research companies, such as fledgling biotech firms, often bear the considerable expense of bringing their discoveries to market rather than license to larger companies. To convince a big drug maker to pay for a license, a biotech start-up must reveal some technological secrets. Reveal too much and the drug maker will learn enough to invent around the patent.

Firms may find it especially difficult to protect critical information that it must share with employees. Urban legend has it that the secret formula in Coca-Cola is known to only two executives, and each only knows one-half! (The reality is that a small handful of Coke execs know the entire formula.) Professional services firms that jealously guard privileged information and client lists may require employees to sign *noncompete clauses* that bar exiting workers from competing with the firm for several years. But these clauses can be difficult to enforce due to that familiar bugaboo, contractual incompleteness, and some firms remain reluctant to reveal vital information to all but their top employees.

Transactions Costs

The concept of transactions costs was first described by Nobel Prize winner Ronald Coase in his famous paper, "The Nature of the Firm."[21] Coase raised the following question: In light of the efficiencies of the market emphasized in economic theory, why does so much economic activity take place within integrated firms? Coase concluded that there must be costs to using the market that can be eliminated by using the firm. These have come to be known as *transactions costs*. Coordination and protecting information are examples of transactions costs, but the term is usually confined to specific inefficiencies first identified by Nobel Prize–winning economist Oliver Williamson.

In the book, *The Economic Institutions of Capitalism*, Williamson summarizes his pathbreaking work on transactions-costs economics.[22] Williamson notes that transactions costs include the time and expense of negotiating, writing, and enforcing contracts as well as potentially far greater costs that arise when firms exploit incomplete contracts to act opportunistically (i.e., seek private gain at the expense of the greater good). The adverse consequences of opportunistic behavior, as well as the costs of trying to prevent it, are the main focus of Williamson's theory of transactions-costs economics.

Contract law might ameliorate the opportunism that can arise under incomplete contracting, but it is unlikely to eliminate it. Thus, incomplete contracting will inevitably entail some transactions costs. To help explain more precisely the nature of these transactions costs and how they might influence decisions to integrate, this section introduces three important theoretical concepts from transactions-costs economics: *relationship-specific assets*, *quasi-rents*, and the *holdup* problem. The following subsections define these concepts and explain their significance.

Relationship-Specific Assets

A relationship-specific asset supports a given transaction and cannot be redeployed to another transaction without some sacrifice in productivity or some additional cost. Firms that have invested in relationship-specific assets cannot switch trading partners without seeing a decline in the value of these assets. This implies that investments in relationship-specific assets lock the parties into the relationship to some degree.

Forms of Asset Specificity

Asset specificity can take at least four forms:

1. Site specificity
2. Physical asset specificity
3. Dedicated assets
4. Human asset specificity

Site Specificity. Site specificity refers to assets that are located side-by-side to economize on transportation or inventory costs or to take advantage of processing efficiencies. Traditional steel manufacturing offers a good example. Side-by-side location of blast furnaces, steelmaking furnaces, casting units, and mills saves fuel costs, as the pig iron, molten steel, and semifinished steel do not have to be reheated before being moved to the next process in the production chain.

Physical Asset Specificity. Physical asset specificity refers to assets whose physical or engineering properties are specifically tailored to a particular transaction. For example, glass container production requires molds that are custom tailored to particular container shapes and glass-making machines. Physical asset specificity inhibits customers from switching suppliers.

Dedicated Assets. A dedicated asset is an investment in plant and equipment made to satisfy a particular buyer. Without the promise of that particular buyer's business, the investment would not be profitable. The government-run Associated British Ports (ABP) often invests in dedicated facilities to serve the specific needs of import and/or export customers. For example, one facility might be designed with specialized bagging equipment to accommodate construction materials, whereas another may be equipped with concrete batching machines to handle marine aggregates (sand and gravel). ABP usually requires long-term contracts from its customers before making these multimillion pound investments.

Human Asset Specificity. Human asset specificity refers to cases in which a worker, or group of workers, has acquired skills, know-how, and information that are more valuable inside a particular relationship than outside it. Human asset specificity not only includes tangible skills, such as expertise with company-specific software, but it also encompasses intangible assets. Every organization has unwritten "routines" and "standard operating procedures." A manager who has become a skillful administrator within the context of one organization's routines may be less effective in an organization with completely different routines. For example, as hospitals develop new treatment protocols, the training of nurses and other specialized staff will become more firm-specific.

The Fundamental Transformation

The need to create relationship-specific assets transforms the relationship as the transaction unfolds. Before individuals or firms make relationship-specific investments, they may have many alternative trading partners and can choose to partner with those that afford the highest possible profit. But after making relationship-specific investments, they will have few, if any, alternatives. Their profits will be determined by bilateral bargaining. In short, once the parties invest in relationship-specific assets, the relationship changes from a "large numbers" bargaining situation to a "small numbers" bargaining situation. Williamson refers to this change as the *fundamental transformation*.

Rents and Quasi-Rents

The fundamental transformation has significant consequences for the economics of bargaining between buyer and seller, which in turn affects the costs of arm's-length market exchange. To set the stage for our discussion of these costs, we must first define and explain *rent* and *quasi-rent*.

These are hard concepts. To explain them, we will walk through a numerical example about a hypothetical transaction. Suppose your company contemplates building a factory to produce cup holders for Ford automobiles. The factory can make up to 1 million holders per year at an average variable cost of C dollars per unit. You finance the construction of your factory with a mortgage from a bank that requires an annual payment of I dollars. The loan payment of I dollars thus represents your (annualized) cost of investment in this plant. Note that this is an unavoidable cost: You have to make your payment even if you do not do business with Ford.[23] Your total cost of making 1 million cup holders is thus $I + 1{,}000{,}000C$ dollars per year.

You will design and build the factory specifically to produce cup holders for Ford. Your *expectation* is that Ford will purchase your holders at a profitable price. But if you build the factory and *do not* end up selling cup holders to Ford, you still have a "bail-out" option: You can sell the holders to jobbers who, after suitably modifying them, will resell them to other automobile manufacturers. The "market price" you can expect to get from these jobbers is P_m. If you sell your cup holders to jobbers, you would thus get total revenue of $1{,}000{,}000P_m$.

Suppose that $P_m > C$, so the market price covers your variable cost. Thus, *you are more than willing to sell to the jobbers* if you had no other option. Ignoring the investment cost I for a moment, your profit from selling to the jobbers is $1{,}000{,}000(P_m - C)$. Suppose also that the annual investment cost $I > 1{,}000{,}000(P_m - C)$. This implies that even though you are better off selling to jobbers than not selling at all, *you will not recover your investment cost if you sell only to jobbers*. In this sense, a portion of your investment is specific to your relationship with Ford. In particular, the difference $I - 1{,}000{,}000(P_m - C)$ represents your company's *relationship-specific investment* (*RSI*).

- The RSI equals the amount of your investment that you cannot recover if your company *does not* do business with Ford.
- For example, if $I = \$8{,}500{,}000$, $C = \$3$, and $P_m = \$4$, then the RSI is $\$8{,}500{,}000 - 1{,}000{,}000(4 - 3) = \$7{,}500{,}000$. Of your $8,500,000 investment cost, you lose $7,500,000 if you do not do business with Ford and sell to jobbers instead.

We can now explain rent and quasi-rent. First, let us explain rent.[24] Suppose that before you take out the loan to invest in the cup holder plant, Ford agreed to buy

1 million sets of cup holders per year at a price of P^* per unit, where $P^* > P_m$. Thus, your company expects to receive total revenue of $1{,}000{,}000P^*$ from Ford. Suppose that $I < 1{,}000{,}000(P^* - C)$, so that given your expectation of the price Ford will pay, you should build the plant. Then,

- Your *rent* is $1{,}000{,}000(P^* - C) - I$.
- In words: Your rent is simply the profit you expect to get when you build the plant, assuming all goes as planned.

Let us now explain quasi-rent. Suppose, after the factory is built, your deal with Ford falls apart. You should still sell to the jobbers, because $1{,}000{,}000(P_m - C) > 0$; that is, sales to jobbers cover your variable costs.

- Your quasi-rent is the difference between the profit you get from selling to Ford and the profit you get from your next-best option, selling to jobbers. That is, quasi-rent is $[1{,}000{,}000(P^* - C) - I] - [1{,}000{,}000(P_m - C) - I] = 1{,}000{,}000(P^* - P_m)$.
- In words: Your *quasi-rent* is the *extra* profit that you get if the deal goes ahead as planned, versus the profit you would get if you had to turn to your next-best alternative (in our example, selling to jobbers).

It seems clear why the concept of rent is important. Your firm—indeed any firm—must expect positive rents to induce it to invest in an asset. But why is quasi-rent important? It turns out that quasi-rent tells us about the possible magnitude of the holdup problem, a problem that can arise when there are relationship-specific assets.

The Holdup Problem

If an asset was *not* relationship-specific, the profit the firm could get from using the asset in its best alternative and its next-best alternative would be the same. Thus, the associated quasi-rent would be zero. But when a firm invests in a relationship-specific asset, the quasi-rent must be positive—it will always get more from its best alternative than from its second-best alternative. If the quasi-rent is large, a firm stands to lose a lot if it has to turn to its second-best alternative. This opens the possibility that its trading partner could exploit this large quasi-rent, through *holdup*.[25]

- A firm *holds up* its trading partner by attempting to renegotiate the terms of a deal. A firm can profit by holding up its trading partner when contracts are incomplete (thereby permitting breach) and when the deal generates quasi-rents for its trading partner.

To see how this could happen, let's return to our example of Ford and your cup holder company. Ford could reason as follows: You have already sunk your investment in the plant. Even though Ford "promised" to pay you P^* per cup holder, it knows that you would accept any amount greater than P_m per unit and still sell to it. Thus, Ford could break the contract and offer you a price *between* P^* and P_m; if you accept this renegotiation of the deal, Ford would increase its profits.

Could Ford get away with this? After all, didn't Ford sign a contract with you? Well, if the contract is incomplete (and thus potentially ambiguous), Ford could assert that, in one way or another, circumstances have changed and that it is justified breaking the contract. It might, for example, claim that increases in the costs of commodity raw materials will force it to sharply curtail production unless suppliers, such as yourself, renegotiate their contracts. Or it might claim that the quality of your cup holders

Example 3.5 Power Barges

How do you deal with trading partners who are reluctant to make investments that have a high degree of site specificity? This is the problem that many developing nations face in convincing foreign corporations to construct power plants. Power plants are usually highly specialized assets. Once a firm builds a power plant in a developing nation, the associated investment undergoes the "fundamental transformation" and becomes a site-specific asset. If the purchasing government defaults on its payments, the manufacturer has few options for recovering its investment. (The firm could route the power to consumers in other nations, but the defaulting government could easily prevent it.) Even though no manufacturer has had to repossess a plant, the fear of default has scared them off. As a result, growing economies in developing nations may be slowed by power shortages.

The solution to the problem is ingenious. Manufacturers have eliminated the geographic asset specificity associated with power generation! They do this by building power plants on floating barges. Floating power plants are not new. Since the 1930s, U.S. Navy battleships have used their turboelectric motors to provide emergency power to utilities. The idea of installing a power plant on a barge deck originated with General Electric, which manufactured power barges for use by the U.S. military during World War II and have been in use ever since. Recent innovations have reduced the size and increased the reliability of gas turbines, making it possible to house large-capacity generators on a small number of barges. This makes them especially attractive to developing nations that lack the infrastructure to build their own power generation facilities, but have sufficient reserves of natural gas, oil, or geothermal energy to fuel the power barges. A few power barges feature nuclear reactors, requiring minimal on-site fueling.

During the 1990s, power barges became a popular way of providing energy to developing nations. Companies including Raytheon, Westinghouse, Smith Cogeneration, and Amfel built floating power plants for customers such as Bangladesh, Ghana, Haiti, Kenya, and Malaysia, as well intermediaries such as the Power Barge Corporation. There are even a few power barges in developed nations. For example, Consolidated Edison operates a gas-turbine generator that is housed on a barge in the Gowanus Canal in Brooklyn.

Power barges are moored on one or more barges in safe harbors and "plugged into" land-based transformers that send electricity to domestic consumers. If the purchaser defaults, the manufacturer or intermediary can tow the barge(s) away and sell the plant to another customer. Floating power plants can also be assembled off-site and then towed to the purchasing nation. This lowers labor costs because the manufacturers do not have to pay their skilled workers to go to a distant site for a long time. There is one final incentive for floating power plants: an amendment to the 1936 U.S. Merchant Marine Act provides substantial financing advantages for vessels constructed in the United States but documented under the laws of another nation. Floating barges fit this description and enjoy favorable financing.

fails to meet promised specifications and that it must be compensated for this lower quality with lower prices.

Unless you want to fight Ford in court for breach of contract (itself a potentially expensive move), you are better off accepting Ford's revised offer than not accepting it. By reneging on the original contract, Ford has "held you up" and has transferred some of your quasi-rent to itself. To illustrate this concretely, suppose $P^* = \$12$ per unit, $P_m = \$4$ per unit, $C = \$3$ per unit, and $I = \$8{,}500{,}000$.

- At the original expected price of \$12 per unit, your rent is $(12 - 3)1{,}000{,}000 - 8{,}500{,}000 = \$500{,}000$ per year.
- Your quasi-rent is $(12 - 4)1{,}000{,}000 = \$8{,}000{,}000$ per year.

- If Ford renegotiates the contract down to \$8 per unit, Ford will increase its profits by \$4 million per year and it will have transferred half of your quasi-rents to itself.

Note that after the holdup has occurred, you realize that you are getting a profit of $(8 - 3)1{,}000{,}000 - 8{,}500{,}000 = -\$3{,}500{,}000$. You are losing money on your investment in the factory! This tells us that if, instead of trusting Ford, you had anticipated the prospect of holdup, then you would not have made the investment to begin with. This situation is especially problematic because your rent was small but your quasi-rent was large. When Ford holds you up and extracts a portion of your quasi-rent, you end up with losses that dwarf the expected profits. This example shows why we talk about the holdup problem in the context of vertical integration. If you are afraid of being held up, you might be reluctant to invest in relationship-specific assets in the first place, forcing Ford either to find another supplier of cup holders *or to make them itself*.

Holdup and Ex Post Cooperation

Economist Oliver Hart, whose "property rights theory of the firm" we will encounter in the next chapter, recently offered a theory of holdup that does not require *ex ante* noncontractible investments made at the start of a trading relationship.[26] Suppose instead that a relationship between a buyer and seller is enhanced through *ex post* cooperation as the relationship unfolds. For example, they may share information about quality control, identify potential new markets, or lobby governments. As the trading relationship unfolds, conditions may change in ways that advantages one firm more than another—demand may be higher than expected or costs may drop. Most of the time the buyer and seller will continue to cooperate, but sometimes conditions are so volatile that one firm gains a huge advantage or disadvantage not necessarily at the expense of the other. In these situations, the firm that is relatively worse off may threaten to withhold cooperation unless the contract is renegotiated so as to get a share of the spoils (or pass on some of its losses). In order to force renegotiation, the firms may even withdraw cooperation. This is a form of holdup that as Hart describes, "transforms a friendly relationship into a hostile one." The end result could be the breakdown of cooperation and reduced profitability for both firms.

The Holdup Problem and Transactions Costs

The holdup problem raises the cost of transacting arm's-length market exchanges in four ways. It can lead to:

1. More difficult contract negotiations and more frequent renegotiations
2. Investments to improve *ex post* bargaining positions
3. Distrust
4. Reduced *ex ante* investment in relationship-specific investments and/or reduced *ex post* cooperation.

Contract Negotiation and Renegotiation

When trading partners anticipate the possibility of holdup, initial contract negotiations are likely to be time consuming and costly as each side seeks to put safeguards into the contract. As circumstances change in unanticipated ways, the temptation for a party to hold up its trading partner is likely to lead to frequent renegotiations and additional costs. In addition, renegotiations are likely to be associated with delays or disruptions, raising production costs and impeding delivery of products to customers.

Example 3.6 A Game of Chicken? Specificity and Underinvestment in the Broiler Industry

Tomislav Vukina and Porametr Leegomonchai have recently studied investments in relationship-specific assets by broiler growers.[27] "Broilers" are chickens grown for their meat. Unlike their commercial-egg-producing cousins, broiler breeds grow fast, mature quickly, and are bred to efficiently turn chicken feed into lean flesh.

Production of broilers in the United States is highly concentrated. Large broiler companies (called processors) contract with independent farmers (growers) to produce chickens. Contracts between processors and growers usually cover one flock at a time and typically stipulate that processors are to provide baby chicks, feed, medication, and some field personnel to the grower. The grower's job is to provide broiler houses (a form of high-tech chicken coop), labor, and management. The processor delivers chicks to the grower, who then raises the chicks into adults, and ships the mature chickens back to the processor for slaughter.

Why does the processor choose to buy rather than make? For broilers, the need for biosecurity provides a strong diseconomy of scale. Placing too many chickens in close proximity increases the likelihood of a devastating outbreak of avian influenza. Processors respond to this threat by distributing their chickens to several growers (and wisely avoid putting all their eggs in one basket). Growers must, however, be close to the processor's plant, since adult chickens cannot be transported far by truck.

Growers must make substantial investments in order to raise broilers successfully. Broiler houses, which usually hold around 25,000 birds, can cost upwards of $250,000 and cannot be easily redeployed for other purposes, such as growing turkeys. Growers must also invest in specialized skills, such as knowledge of biosecurity practices and feed management. The vertical disintegration combined with locational specificity of these investments raises the possibility that processors might try to hold up growers and that growers might underinvest as a result.

Vukina and Leegomonchai test this hypothesis by looking at how growers' levels of investment vary with their degree of locational specificity. They find that the number of houses a grower has under contract is positively related to the number of processors within the grower's local area. Note that while investments in broiler houses—the variable of study here—are contractible, smaller investments in broiler houses probably mean smaller noncontractible investments (in skills and local labor-market knowledge) as well. Vukina and Leegomonchai also show that growers make fewer upgrades to their broiler houses when their assets suffer from locational specificity. Thus, locational specificity does seem to be associated with underinvestment.

Investments to Improve Ex Post *Bargaining Positions*

Parties that anticipate the possibility of holdup might make investments that improve their postcontractual bargaining positions. This can take several forms. A buyer may acquire a standby production facility for a key input as a hedge against contractual holdup by the input supplier. Alternatively, the buyer might seek a second source for an input. For example, in the early 1980s, Intel's customers (including IBM) pressured it to provide second sources for its 8088 and 80286 microprocessors. Although standby facilities and second sources can reduce the possibility of holdup, they are not without cost. A standby facility that duplicates the production facility of the input supplier may stand idle much of the time, thus representing costly excess capacity that will eventually be borne by the buyer.

Distrust

Oliver Hart emphasizes the breakdown of cooperation that can arise between parties in the relationship.[28] The resulting distrust raises the costs of contracting in two ways. First, it increases the direct costs of contract negotiation as parties insist that more formal safeguards be written into the contract. Second, distrust impedes sharing information or ideas to achieve production efficiencies or quality improvements.

Reduced Investment

Finally, and perhaps worst of all, the possibility of holdup can reduce *ex ante* incentives to invest in specific assets. Firms may reduce investments in relationship-specific assets or substitute general-purpose assets for more specific ones. For example, an alumina producer situated near an aluminum plant might build a small refinery rather than a large one. Or it might build a refinery that can produce many different grades of alumina, instead of the smelter-grade alumina that is used by the neighboring aluminum plant.

The tendency to underinvest in relationship-specific assets causes problems because relationship-specific investments usually allow firms to achieve efficiencies that they cannot achieve with general-purpose investments. An alumina refinery that is set up to produce more than one grade of alumina is generally more costly to operate than one that is designed to produce only smelter-grade. When the holdup problem leads to underinvestment in relationship-specific assets, the result is likely to be lower productivity and higher production costs for the vertical chain as a whole.

Recap: From Relationship-Specific Assets to Transactions Costs

Because the ideas developed in this section are complex and subtle, let's recap the main lines of argument:

- A relationship-specific asset is an asset that supports a particular transaction. Redeploying a relationship-specific asset reduces its productivity or entails extra costs.
- A relationship-specific asset gives rise to quasi-rents. The quasi-rent in a transaction with relationship-specific assets equals the *extra profit* a firm gets when it deploys its relationship-specific assets in their intended use and the transaction goes ahead as planned, as opposed to deploying those assets in their best alternative use.
- When a party has quasi-rents, it can be held up by its trading partner. When this happens, the trading partner transfers some of the quasi-rents to itself. Holdup is especially tempting when contracts are highly incomplete, so that proving breach of contract is difficult.
- The potential for holdup raises the cost of market transaction by making contract negotiations more contentious, by inducing parties to invest in "safeguards" to improve postcontractual bargaining positions, by engendering distrust, and by leading to underinvestment in relationship-specific assets.

In typical economist's fashion, this chapter has identified both costs and benefits to integration. Our analysis raises a host of new questions:

- What exactly does it mean to be integrated?
- How exactly does integration eliminate holdup and coordination problems?

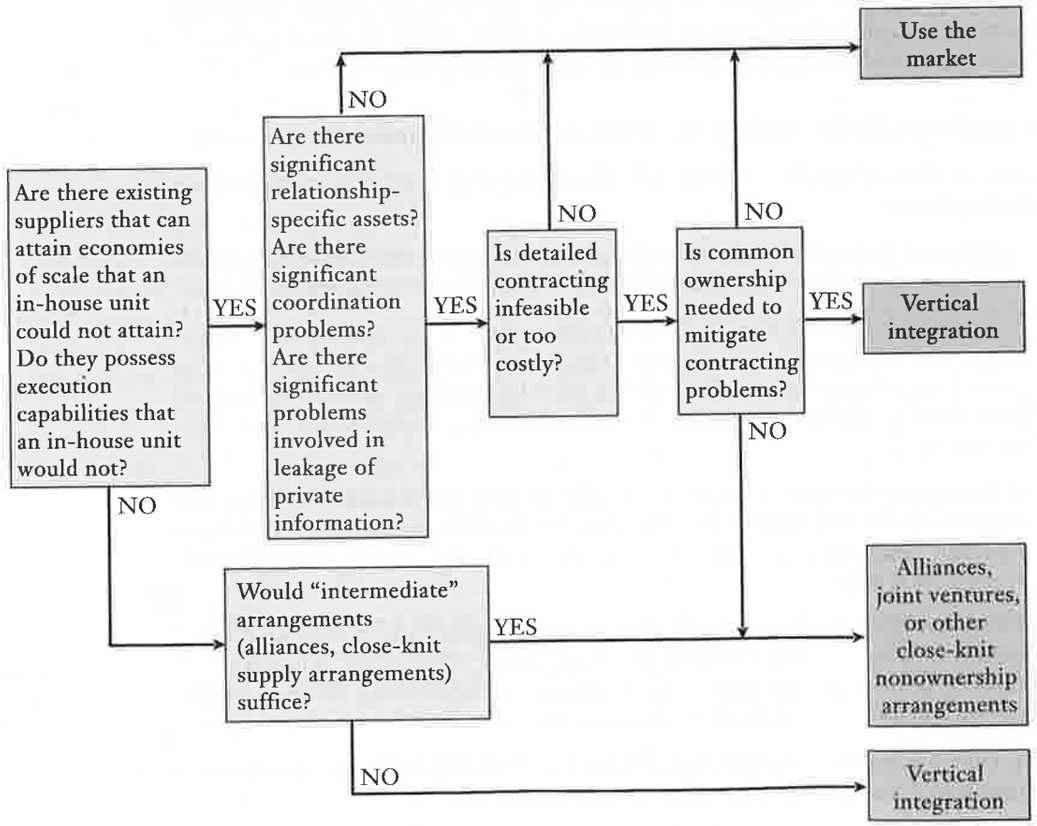
- How should one weigh the benefits and costs of "make" versus "buy?"
- Are there alternatives to the extremes of "make" or "buy?"

The next chapter explores these issues.

Summarizing Make-or-Buy Decisions: The Make-or-Buy Decision Tree

The make-or-buy decision involves a calculated balancing of several benefits and costs of integration. A manager can easily get lost in the complexity of this balancing act. Figure 3.3 provides a series of questions to guide the manager through the decision-making process. The manager must first assess whether the market provides any alternative to vertical integration. If the answer is no, then the firm must either take on the task itself or prop up a quasi-independent supplier through a joint venture or

Figure 3.3
Summarizing the Frameworks: An Issue Tree



Managers must answer a series of questions before making make-or-buy decisions.

strategic alliance (which are described in the next chapter). If the market does offer alternatives to vertical integration, then the manager must determine whether market relationships will be impeded by information, coordination, or holdup problems. If such problems do not exist, then the firm should use the market. But if they do exist, the manager must finally determine whether these problems can be prevented either through contract (favoring the use of the market) or through internal governance (favoring integration). Though not shown in the decision tree, managers should also consider whether special circumstances of market power are causing double marginalization (taken up in Chapter 4).

Chapter Summary

- The production of any good or service usually requires a range of activities organized in a vertical chain. Production activities flow from upstream suppliers of raw inputs to downstream manufacturers, distributors, and retailers.
- The vertical chain includes processing and handling activities associated directly with the processing and distribution of inputs and outputs, and professional support activities, such as accounting and planning.
- A fundamental question is which activities in the vertical chain a firm should perform itself and which it should leave to independent firms in the market. This is known as the "make-or-buy" problem.
- A fallacious make-or-buy argument is that firms should buy to avoid incurring the associated costs. The firm it buys from will have to incur these costs and will charge accordingly.
- A second fallacy is that firms should make, rather than buy, to keep for themselves the profits earned by independent firms. These profits usually represent the returns necessary to attract investment and would be required of the firm that "makes" just as they are required of independent firms.
- A third fallacy is that vertically integrated firms can produce an input at cost and thus have an advantage over nonintegrated firms that must buy inputs at market prices. This argument ignores a hidden opportunity cost to the vertically integrated firm: by using the input to produce its final output, it forgoes outside sales in the open market.
- The solution to the make-or-buy decision depends on which decision leads to the most efficient production. This is determined by assessing the benefits and costs of using the market.
- Market firms can often achieve economies of scale in production of an input that firms choosing to make the input themselves cannot.
- Market firms offer other advantages. While a division within a hierarchical firm may hide its inefficiencies behind complex monitoring and reward systems, independent firms must survive market competition. This encourages efficiency and innovation.
- Vertically integrated firms can try to replicate market incentives but may encounter problems associated with motivation (agency costs) and internal lobbying for resources (influence costs).
- Use of market firms is complicated by incomplete contracts. Contracts may be incomplete because of hidden actions, hidden information, and bounded rationality.

- Use of market firms often presents coordination problems. This is especially problematic for inputs with design attributes that require a careful fit between different components.
- Use of market firms may lead to the holdup problem in which one trading partner exploits contractual incompleteness to renegotiate the terms of a contract. Fearful of losing money on relationship-specific investments, the other trading partner anticipates holdup and refuses to make these valuable investments.

QUESTIONS

1. Describe the vertical chain for the production of motion pictures. Describe the extent of vertical integration of the steps in this chain.
2. A manufacturer of pencils contemplates backward integration into the production of rapeseed oil, a key ingredient in manufacturing the rubberlike material (called factice) that forms the eraser. Rapeseed oil is traded in world commodity markets, and its price fluctuates as supply and demand conditions change. The argument that has been made in favor of vertical integration is this: "Pencil production is very utilization-sensitive (i.e., a plant that operates at full capacity can produce pencils at much lower cost per unit than a plant that operates at less than full capacity). Owning our own source of supply of rapeseed oil insulates us from short-run supply–demand imbalances and therefore will give us a competitive advantage over rival producers." Explain why this argument is wrong.
3. Matilda Bottlers bottles and distributes wines and spirits in Australia. Big Gator is a conglomerate that manufactures, among other things, a popular lager beer. By virtue of a lifetime contract, Matilda has exclusive rights to bottle and distribute Big Gator Beer in New South Wales, the largest state in Australia. Matilda uses its monopsony power to pay a lower price for Big Gator Beer than do bottlers in other states. Is this sufficient justification for Big Gator to buy out Matilda Bottlers?
4. What is the "Chicago School" argument against concerns that vertical integration is anticompetitive? Under what conditions might this argument be wrong?
5. Canon has manufactured high-quality cameras since it was founded in 1933. SLR-cameras (i.e., not point and shoot cameras) are purchased in two parts: the body and the lenses. Photographers who want a Canon product must make the upfront investment in the expensive camera body. Canon earns significant profit from the sale of camera bodies and then earns a stream of profits from camera lenses. An owner of a Canon camera body can also purchase lenses from other companies that produce Canon-compatible products. Would Canon be better off if there were no other firms that made Canon-compatible lenses?
6. In each of the following situations why are firms likely to benefit from vertical integration?
   (a) A *grain elevator* is located at the terminus of a *rail line*.
   (b) A *manufacturer* of a product with a national brand-name reputation uses *distributors* that arrange for advertising and promotional activities in local markets.
   (c) A *biotech firm* develops a new product that will be produced, tested, and distributed by an established *pharmaceutical company*.
7. Consider the following pairs of situations. In each pair, which situation is more likely to be susceptible to *coordination* problems?
   (a) Maintenance of *corporate landscaping* by a gardening company versus maintenance of a *football or soccer stadium's grass turf* by a gardening company.
   (b) Design of a *toolbox* to hold *tools* versus design of a *wafer* to hold the wires of a microscopic *silicon chip*.
8. Universities tend to be highly integrated—many departments all belong to the same organization. There is no technical reason why a university could not consist of freestanding departments linked together by contracts or other market arrangements. Why do you suppose that universities are not organized in this way?
9. "Influence activities happen in everyday life, in households, schools, and even among close friends." Can you give examples to support this statement?
10. Explain why the make-or-buy decision is moot when contracts are complete.
11. Some contracts, such as those between municipalities and highway construction firms, are extremely long with terms spelled out in minute detail. Others, such as between consulting firms and their clients, are short and fairly vague about the division of responsibilities. What factors might determine such differences in contract length and detail?
12. Production requires coordination of many activities. Why does the make-or-buy decision depend critically on coordination of *design attributes*? What is the connection between your answer and incomplete contracts?
13. Suppose that Arnold Schwarzenegger (AS) pays Besanko, Dranove, Shanley, and Schaefer (BDS^2) an advance of $5 million to write the script to *Incomplete Contract*, a movie version of their immensely popular text on business strategy. The movie contract includes certain script requirements, including one that AS gets to play a strong, silent, business strategist with superhuman analytic powers. BDS^2 spend $100,000 worth of their time to write a script that is tailor-made for the ex-Terminator (AS, that is). When they turn in the script to AS, he claims that it fails to live up to the contractual requirement that he has several passionate love scenes, and so he attempts to renegotiate. Given the ambiguity over what constitutes passion, BDS^2 are forced to agree.
    (a) What was BDS^2's rent?
    (b) What is their quasi-rent? What assumptions do you have to make to compute this?
    (c) Could BDS^2 have held up AS? Explain.
14. In many modern U.S. industries the following patterns seem to hold:
    (a) Small firms are more likely to outsource production of inputs than are large firms;
    (b) "Standard" inputs (such as a simple transistor that could be used by several electronics manufacturers) are more likely to be outsourced than "tailor-made" inputs (such as a circuit board designed for a single manufacturer's specific needs).

    What factors might explain these patterns?
15. Chapter 1 discussed the history of the vertically integrated corporate giants of the early twentieth century. Use the concepts in this chapter to explain why firms facing the following conditions are more likely to vertically integrate: (1) The firm is in a developing economy; (2) the firm uses a capital-intensive production process. Be sure to discuss both reasons to make and reasons to buy.

ENDNOTES

[1]The information is taken from Orwall, B., and M. Peers, "The Message of Media Mergers: So Far, They Haven't Been Hits," *The Wall Street Journal*, May 10, 2002, p. A1.

[2]From *Chicago Tribune*, February 21, 1993, section 1, p. 15.

[3]Hagel, John, and Marc Singer, "Unbundling the Corporation," *The McKinsey Quarterly*, 3, 2000.

[4]Levine, A. (2009), "Licensing and Scale Economies in the Biotechnology Pharmaceutical Industry" Harvard University. Unpublished working paper.

[5]Expected value is found by multiplying the probability of an event by the payoff associated with that event. In this case, the expected value is

$$(1/3) \times (-100{,}000) + (1/3) \times 100{,}000 \times (1/3) \times 300{,}000 = 100{,}000$$

[6]Rey, P., and J. Tirole, "A Primer on Foreclosure," in Armstrong, M. and R. Porter (eds.), *Handbook of Industrial Organization III*, 2006.

[7]The argument is *about* half right because vertical integration can sometimes lead to more profits in the vertical chain even without foreclosure. One example is when vertical integration eliminates double marginalization, which we discuss in Chapter 4.

[8]"Best Firms to Work For: McKinsey and Company," *Consulting Magazine*, September 28, 2007.

[9]Becker, G., *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, University of Chicago Press, 1964.

[10]Von Hayek, F., "The Use of Knowledge in Society," *American Economic Review*, 35, September 1945, pp. 519–530.

[11]Milgrom, P., and J. Roberts, "Bargaining Costs, Influence Costs, and the Organization of Economic Activity," in Alt, J., and K. Shepsle (eds.), *Perspectives on Positive Political Economy*, Cambridge, Cambridge University Press, 1990.

[12]Much of the information for this example is taken from Dvorak, P., "Out of Tune: At Sony, Rivalries Were Encouraged; Then Came iPod," *The Wall Street Journal*, June 29, 2005, p. A1.

[13]Hayek, F., "The Use of Knowledge in Society," *American Economic Review*, 35, 1945, pp. 519–530.

[14]Williamson, O., *The Economic Institutions of Capitalism*, New York, Free Press, 1985.

[15]Macauley, S., "Non-Contractual Relations in Business: A Preliminary Study," *American Sociological Review*, 28, 1963, pp. 55–67.

[16]*Cook v. Deltona Corp.*, 753 F2d 1552 (1985), United States Court of Appeals, Eleventh Circuit.

[17]Macauley, "Non-Contractual Relations in Business."

[18]Milgrom, P., and J. Roberts, *Economics, Organization and Management*, Englewood Cliffs, NJ, Prentice-Hall, 1992.

[19]Qian, Y., Roland, G., and C. Xu, "Coordinating Tasks in – Form and U-Form Organisations" LSE STICERD Research Paper No. TE458, 2003.

[20]Koener, B., ' "Made in America' Small Businesses Buck the Offshoring Trend" *Wired*, March 2011, http://www.wired.com/magazine/2011/02/ff_madeinamerica. Searched March 7, 2011.

[21]Coase, R., "The Nature of the Firm," *Economica*, 4, 1937, pp. 386–405.

[22] Williamson, O., *The Economic Institutions of Capitalism*, New York, Free Press, 1985.

[23]We assume that default or declaring "bankruptcy" is not an option. Once you build the factory, you have to make your mortgage payment no matter what. To justify this assumption, imagine that your company has many other profitable business activities that generate enough cash to cover your mortgage payment on this factory under all circumstances. You would thus be legally obligated to pay your mortgage no matter how unprofitable the factory proves to be.

[24]Rent is synonymous with economic profit. To relate this to an important concept from corporate finance, when an investment has a positive rent, it will have a positive net present value. See the Economics Primer for net present value.

[25]The expression "holdup problem" was coined by Victor Goldberg in his article, "Regulation and Administered Contracts," *Bell Journal of Economics*, 7, Autumn 1976, pp. 426–448.

[26]Hart, O. "Hold-Up, Asset Ownership, and Reference Points" *Quarterly Journal of Economics*, February 2009.

[27]Vukina, T., and P. Leegomonchai, "Oligopsony Power, Asset Specificity, and Hold-Up: Evidence from the Broiler Industry," *American Journal of Agricultural Economics*, 88, 2006, pp. 589–605.

[28]Hart, O. *ibid.*