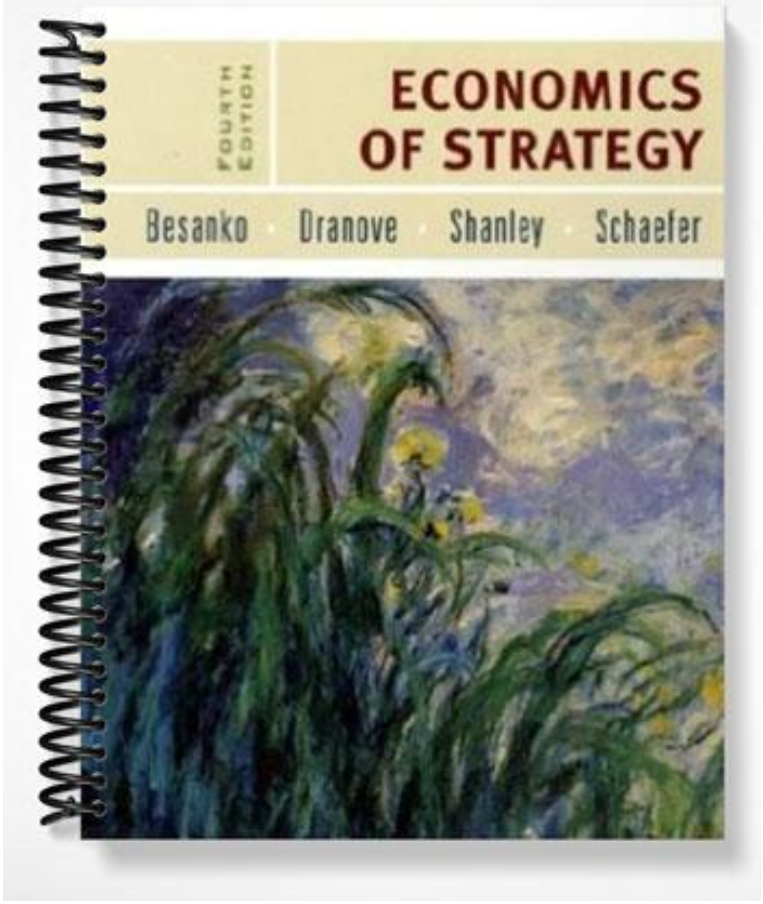
SOLUTIONS MANUAL



Chapter 2
The Horizontal Boundaries of the Firm: Economies of Scale and Scope

Chapter Contents

Chapter Summary

This chapter intends to help the student understand how to more fully answer the following questions in strategy: How do we define our firm? What activities do we do; what are our firm's boundaries? While the vertical boundaries of the firm (discussed in Chapter 3) illustrate which activities the firm would perform itself and which it would leave to the market, the horizontal boundaries of the firm refer to the size (how much of the total product market will the firm serve) and scope (what variety of products and services does the firm produce). This chapter argues that the horizontal boundaries of the firm depend critically on economies of scale and scope.

Economies of scale and scope are present whenever large-scale production, distribution, or retail processes provide a cost advantage over small processes. Economies of scale exist whenever the average cost per unit of output falls as the volume of output increases. Economies of scope exist whenever the total cost of producing two different products or services is lower when a single firm instead of two separate firms produces them. In general, capital intensive production processes are more likely to display economies of scale and scope than are labor or materials intensive processes. By offering cost advantages, economies of scale and scope not only affect the sizes of firms and the structure of markets, they also shape critical business strategy decisions, such as whether independent firms should merge and whether a firm can achieve long-term cost advantages in the market through expansion.

Approaches to Teaching this Chapter

Definitions:

Product-Level Economies of Scale: reductions in unit cost attributable to producing more of a given product in a given plant.

Short-run Economies of Scale: reductions in unit cost attributable to spreading fixed costs for a plant of a given size. These arise because of increased utilization of a plant of a given capacity.

Long-run Economies of Scale: reductions in unit costs attributable to a firm switching from a low fixed/high variable cost plant to a high fixed/low variable cost plant. These arise due to adoption of technologies or larger plants that have higher fixed costs but lower variable costs. The distinction between long and short-run scale is very important---mistaking short-run economies of scale for long-run economies could lead a firm to the false conclusion that its unit costs will continue to fall if it expands capacity once its existing capacity is full.

Product-Level Economies of Scope: reductions in unit cost attributable to a firm's diversification into several products produced in the same plant. Examples include any process in which there are chemical by-products from the same reaction such as crop rotation and oil refining. Another example is a product that shares a key component or set of components whose production is characterized by economies of scale, such as digital watches and electronic calculators. A final example is a firm that utilizes off peak capacity such as ski resorts, garden stores, and sporting goods stores.

Plant-Level Economies of Scope: reductions in unit cost attributable to a firm's diversification into several products produced in different plants. Examples include airline hub-and-spoke systems.

Purchasing Economies: reductions in unit cost attributable to volume discounts. Large volume buyers may be able to achieve quantity discounts that are not available to smaller-volume buyers. Examples include hospital and hardware store purchasing groups.

R&D Economies: reductions in unit cost due to spreading R&D expenses. For example, R&D labs require a minimum number of scientists and researchers whose labor is indivisible. As the output of the lab expands, R&D costs per unit may fall.

Marketing Economies: 1) economies of scale due to spreading advertising expenditures over larger markets and 2) economies of scope due to building a reputation of one product in the product line benefiting other products as well. For example, Budweiser's cost per effective message is lower than Anchor Steam's since Bud is widely available and its ads would thus have a higher impact. Also think of Coke/Diet Coke economies.

Horizontal Boundaries: related to the variety of related products or services the firm sells.

Fixed Costs: costs that do not vary with output.

Indivisibility: some inputs cannot be scaled down below a certain minimum size, even as output shrinks to zero. Examples include railroad and airline service.

Learning Curve: reductions in unit costs that result from the accumulation of know-how and experience.

Progress Ratio: the slope of the learning curve; the percentage by which AC declines as the firm doubles cumulative output.

Core Competency: the collective know-how within an organization about how to work with particular technologies or particular types of product functionality (e.g. 3M in coatings and adhesives and Canon in precision mechanics, fine optics, and microelectronics).

Horizontal Boundaries

Horizontal boundaries are those that define how much of the total product market the firm serves (size) and what variety of related products the firm offers (scope). The basic question is: "What strategic advantages are conferred on a firm by being large or by having a broad scope of products?" Size/scope can represent an advantage for three reasons. The first two reasons below will be discussed later in the text. Reason #3 below is the focus of Chapter 2.

- *Size = Market Power*. Larger/diversified firms may be able to exercise monopoly power or set the terms of competition for other firms in the industry.
- *Size = Entry Barriers*. Once a firm owns a large position in the market, it may be very difficult to dislodge it. That is, potential entrants and existing firms may be deterred from attacking this firm's core business. A good example of this is brand proliferation in breakfast cereals.
- *Size = Lower Unit Costs*. A large firm may be able to produce at a lower cost per unit than a small firm may.

Learning Curve

Make certain students can distinguish the difference between economies of scale and the learning curve which speaks to *cumulative* output, not levels of output. For example, Lockheed pursued a learning curve strategy in building its L10-11 class of aircraft. The firm anticipated that it would lose money by producing a lot of aircraft, gain experience, and finally achieve cost competitiveness in the industry. The firm initially priced below its average cost and eventually cost fell to below price. Lockheed was hard hit then with a "cheap to produce" aircraft when oil prices rose dramatically. This particular firm lost this gamble because it banked on demand remaining high; the OPEC oil embargo changed the environment significantly enough so that they couldn't benefit from their cost advantage.

Diseconomies

There are certainly limits to how big a firm can be and still produce efficiently. For example, labor costs increase as firms get bigger (unionization, employees are less satisfied with their jobs, commuting time increases as the firm gets bigger because it draws from further away). Smaller firms sometimes have an easier time motivating employees; moreover, rewards are much more closely linked to profits. The trick is for the big firm to create the right motivations for workers. Finally the source of your advantage may not be "spreadable." That is, a patent is not spreadable nor are personal services such as in restaurants.

Economies of Scale/Scope Determine Market Structure

By studying the history of an industry and examining the characteristics of successful firms, managers can assess the importance of size and other firm characteristics.

Ask students to prepare thoughts on the following questions before the lecture:

- Consider the industry you worked in before coming to school. What role, if any, did economies of scale or scope play in determining the number and size of firms in this industry? Did economies of scale or scope affect the ease with which new firms could enter the industry?

- Prahalad and Hamel talk about "core competencies" by which they mean special skills firms have in working with particular technologies. They argue that in making diversification decisions, firms should exploit their core competencies. Explain what this

means using the concept of economies of scope. Can you think of an example of where the firm you worked for leveraged its core competencies?

- Examples 2.1 and 2.4 discuss the hub-and-spoke system and make the point that it leads to economies of scope and has had an important effect on the structure of the U.S. airline industry. Yet, the most profitable firm in the industry (Southwest) does not have such a system. Explain how an industry could have a production technology characterized by economies of scale or scope, yet a small firm could be more profitable in the long run.

Suggested Harvard Case Study[1]

De Beers Consolidated Mines, HBS 9-391-076. Describes the problems facing De Beers at the start of 1983. De Beers had, since its formation in 1888, exercised a large measure of control over the world supply of diamonds. In 1983, the company itself mined over 40% of the world's natural diamonds and, through marketing arrangements with other producers, distributed over 70%. For 50 years up to 1983 the company never lowered its prices and, overall, had raised them significantly ahead of the rate of inflation. However, in 1983 the company was faced with a series of problems that threatened the structure it had so carefully built. First a large producing nation had stopped selling through De Beers. Second, new discoveries meant that the annual supply of mined diamonds would double by 1986. Finally, the industry was experiencing its worst slump since the 1930's, resulting in a significant deterioration in the company's financial position. Describes the structure and economics of the diamond industry and asks the student to decide whether or not De Beers should abandon the business strategy it had pursued for nearly a century. This case can be taught with some combination of the following chapters: 2, 7, 9, 10 and 13. You may want to ask students to think of the following questions in preparation for the case:

a) What are the characteristics of rough diamonds that create challenges in sustaining a monopoly of this trade?
b) Why does De Beers require different countries to pay different commission to participate in the syndicate?
c) Why might diamond producers agree to participate in the syndicate as opposed to selling their output on their on?
d) What forces prompt diamond producers to exit the syndicate?

House of Tata, HBS 9-792-065 (see earlier chapters)

Hudepohl Brewing Company HBS 9-381-092. Hudepohl is a private company. Presents the problem of how an established regional brewer can survive the onslaught of national breweries, some of which are being cross-subsidized by diversified parent companies. Requires detailed analysis of what operations are profitable and unprofitable for Hudepohl, in addition to industry and competitive analysis. This chapter can be taught with some combination of the following chapters: 2, 5, 11, and 12. You may want to ask students to think of the following questions in preparation for the case:

a) How well is H doing? Is Bob Pohl's optimism about H's future justified?
b) How have the fundamental economics of the beer business changed over the 20-30 years prior to the time of the case? Have these changes helped or hurt H?
c) What are the markets that H competes in? Which are H's strongest markets? Which are its most profitable markets?
d) How efficient are H's manufacturing and distribution facilities in comparison with other beer companies? Which activities need to be changed or dropped?

[1] These descriptions have been adapted from *Harvard Business School 1995-96 Catalog of Teaching Materials.*

e) What are H's strengths? What resources or assets does H have that its competitors do not have? Does Pohl's strategy exploit H's resources, capabilities, and competitive advantages?
f) What alternative strategies might Pohl adapt? More generally, how would you recommend that H position itself in the beer market, given H's resources and assets and given the strategies of its rivals in the beer industry?
g) Profit Analysis by Segment: Calculate or estimate H's production costs and profit margins for each of its four "product lines" shown in Table B: (1) draft beer sold to independent distributors, (2) draft beer distributed by H, (3) packaged beer sold to independent distributors, (4) packaged beer distributed by H.
h) Value Added: Using the above profit calculations, calculate the value added at each stage of H's vertical chain. Can you explain the differences in the profitability across these product lines?
i) Segment Analysis: To the extent possible, calculate H's market share in each of its market segments. (What are the criteria you are using to distinguish H's different market segments?)

Sime Darby Berhad—1995, HBS 9-797-017**.** Sime Darby is one of South Asia's largest regional conglomerates. At the time of the case, 1995, it is contemplating entry into the fast growing financial services sector in Malaysia through acquisition of a Malaysian bank. This is in keeping with its activities mirroring those of the Malaysian economy. Presents a discussion of whether to proceed with the acquisition. Gets at the underlying sources of value creation of the conglomerate in the institutional context, which affect the costs and benefits of broad corporate scope, especially the evolving capital market and the tight interrelationship between business and politics. This chapter can be taught with some combination of the following chapters: 2, 3, 4, 10 and 16. You may want to ask students to think of the following questions in preparation for the case:

a) What are the sources of competitive advantage for a firm that is affiliated with Sime Darby?
b) Evaluate the quote in the beginning of the case: "You need to carry a fair amount of weight to make an impression in Asian markets".
c) Why is opportunistic behavior a concern? Does reputation matter more in Malaysia than in the U.S. (or in other advanced economies)? How does Sime Darby address these concerns?
d) What are some of the institutional voids filled by Sime Darby through acting as an intermediary in the financial markets? To what extent is being diversified important for filling these institutional voids?
e) Should Sime Darby have a common brand name used in all its companies?
f) Why might a talented individual prefer to work at Sime Darby rather that at an undiversified company?
g) Is Sime Darby's relationship with the government anything but an asset?
h) How is Sime Darby doing relative to other Malaysian companies?
i) Should Sime Darby acquire UMBC?

Extra Readings

The sources below provide additional resources concerning the theories and examples of the chapter.

Boston Consulting Group. *Perspectives on Experience*. Boston: Boston Consulting Group, 1970.

Chandler, A.. *Scale and Scope: The Dynamics of Industrial Capitalism*. Cambridge, MA: Belknap, 1990.

Stigler, George J. *The Organization of Industry*. Homewood, IL: Richard D. Irwin, 1968.

Teece, David J, "The Dynamics of Industrial Capitalism: Perspectives on Alfred Chandler's Scale and Scope," *Journal of Economic Literature*, 1993. 31: 199-225.

Wittman , Donald, "Nations and States: Mergers and Acquisitions; Dissolutions and Divorce," *The American Economic Review*, 1991. 81: 126-129.

Answers to End of Chapter Questions

1. **A firm produces two products, X and Y. The production technology displays the following costs, where C(i,j) represents the cost of producing i units of X and j units of Y:**

   C(0,50) = 100 C(5,0) = 150

   C(0,100) = 210 C(10,0) = 320

   C(5,50) = 240 C(10,100) = 500

   Does this production technology display economies of scale? Of scope?

   This technology does not display economies of scale. The cost per unit of making 50 units of Y is $2, and the cost of making 100 units of Y is $2.10. Since the cost per unit does not decrease as the quantity of Y increases, this technology does not display economies of scale in the production of Y. The result is analogous in looking at the costs of making X, as well as looking at the costs of making X and Y together in greater quantities.

   This technology does display economies of scope in the production of X and Y. The cost of making 5 units of X is $150 and the cost of making 50 units of Y is $100. Made separately, the total cost of making 5 units of X and 50 units of Y is $250. The cost of making 5 units of X and 50 units of Y together is $240.

2. **Economies of scale are usually associated with the spreading of fixed costs, such as when a manufacturer builds a factory. But the spreading of fixed costs is also important for economies of scale associated with marketing, R&D, and purchasing. Explain.**

   Fixed costs are those costs that do not vary directly with output. Fixed costs must be expended in order to initiate production, but also for activities such as selling the output or developing improvements to the output. As the firms scale of operation increases in terms of volume of output and number of products produced, functions related to marketing, R&D and purchasing are spread over more units—hence reducing the cost of each of these activities per unit sold. For example, once a firm invests in developing a new product, those R&D costs are fixed regardless of the scale of that product.

3. **What is the difference between economies of scale and learning economies? If a larger firm has lower average costs, can you conclude that it benefits from economies of scale? Would a small firm necessarily enjoy the same cost position if it were to duplicate the size of its larger rival?**

   Economies of scale are said to exist if average costs decrease as output increases. Learning economies, a source of economies of scale, refer to a reduction in average costs due the accumulation of experience and know-how.

   Lower costs may be due to the fact that the firm is farther down the learning curve or that the firm enjoys economies of scale. A small firm, if it becomes large, can replicate the cost position if the lower costs are due to economies of scale. However if the lower costs are due to learning curve effects the firm has wait until the cumulative output results in lower costs.

4. **A firm contemplating entering the market would need to invest $100 million to build a minimum efficient scale production plant (or about $10 million annually on an amortized basis). Such a plant could produce about 100 million pounds of cereal per**

year. What would be the average fixed costs of this plant if it ran at capacity? Each year, U.S. breakfast cereal makers sell about 3 billion pounds of cereal. What would be the average fixed costs if the cereal maker captured a 2 percent market share? What would be the disadvantage if it achieved only a 1 percent share? If prior to entering the market, the firm contemplates achieving only a 1 percent share, is it doomed to such a large cost disparity?

The averaged fixed cost is $10million/100 million pounds or $0.10 per pound if the plant ran at capacity.

A 2 percent market share would be .02* 3 billion pounds or 60 million pounds per year. The average fixed cost would be $10 million/60 million pounds or $0.167 per pound. If the firm captured only 1 percent share, average fixed cost would be $10 million/30 million pounds or $0.333 per pound. The firm would be disadvantaged by $.23 per pound relative to a plant that ran at capacity unless the size of the market increases over time.

5. **The European Union has banned virtually all tariffs for trade among member nations. How is this likely to affect specialization by firms located in EU countries?**

Just as the reduction in transportation costs increases the size of the market for a firm's output so does the elimination of tariffs. Larger markets will lead to specialization by firms.

High cost production of goods that enjoyed some protection from tariffs will be replaced by imports (either firms moving their production abroad or imports from foreign firms) leading to horizontal specialization

Low tariffs (along with low transportation costs) will also encourage vertical specialization with various stages of production occurring in various countries.

6. **Historically, product markets were dominated by large firms and service markets by small firms. This seems to have reversed itself somewhat in recent years. What factors might be at work?**

Product markets have traditionally been capital intensive businesses, with a large portion of total costs tied up in fixed and semi-fixed costs. Applying the cube-square rule to product markets, we know that the physical properties of production traditionally allowed firms to expand capacity without comparable increases in cost. Increased utilization of production facilities allowed firms to spread fixed costs over additional units and lower average costs. Further, the divisibility of labor allowed for task specialization and energy costs tended to decline as capacity increased. Firms doing higher volume business usually need to carry proportionately less stock in inventory and therefore reduced average cost. Other factors contributing to economies of scale in product markets include umbrella branding and advertising. Consequently, these significant economies of scale allowed larger firms to dominate.

Over time, shifting environmental factors have altered the environment of product markets. The observation that firms in product markets are shrinking indicates the aforementioned economies of scale may no longer be the most pervasive contributor to firm success. Some explanations would include the development of cost saving technologies such as computers and communications developments that reduce coordination costs. Large firms' advantage with respect to inventory may have diminished due to the development of stronger vendor/customer relationships via JIT arrangements or joint ventures, as well as advanced production planning techniques/software. Further, consumer elasticities may have relaxed

such that brand loyalty has declined for certain products. As traditional economies of scale diminish in importance the barrier to entry is lowered and new entrants of smaller size, more equipped to adapt to change, may enter the market.

The shift from small to larger firm dominance in service markets is primarily due the reliance of these firms on labor as the principal factor of production. Traditional theory posits that labor does not exhibit properties of indivisibility. As such, smaller firms were unable to dedicate employees to clients within a specific industry, or with similar needs. Doing so allows employees to scale the learning curve more rapidly and improves productive efficiency. Larger firms are more capable of supporting such focused activities, allowing them to spread overhead costs over increased volume. Further, service firms rely heavily on reputation to attract new business. Therefore, economies of scale may be achieved due to reputation and branding effects.

7.. Best Buy stores have recently redesigned their stores that customers waiting to make purchases must stand in a single queue and wait for the next available cashier, rather than queue up at separate cashiers. How does this relate to inventory economies of scale? (Hint: What is inventoried?)

When there are multiple queues, each queue can be viewed as a "firm" with a single cashier. When the queues are merged, it will be a horizontal merger of these firms with the "inventory" of cashiers being merged leading to inventory economies of scale.

In practice, if the cashiers are close to each other (as in a grocery store) customers can switch from slow moving queues to faster queues ensuring that there will not be idle cashiers while customers are waiting. On the other hand if cashiers are dispersed around the store (as in a department store) it is possible for some cashiers to be idle while customers are queuing up elsewhere in the store.

8. In the past few years, several American and European firms opened "hypermarts", enormous stores that sold groceries, household goods, hardware, and other products under one roof. What are the possible economies of scale that might be enjoyed by hypermarts? What are the potential diseconomies of scale?

"Hypermarts" could conceivably achieve several economies of scale by offering a wide array of consumer products in one store. First, if the firm has already purchased expensive real estate and could build a slightly larger building, it can enjoy economies of scale by effectively spreading these high fixed costs across a wider array of products. Second, a firm that already has a strong reputation with consumers could enjoy marketing economies of scale using their existing branding umbrella. Third, the firm could achieve greater economies of scale by using its current distribution systems to deliver more products to fewer large stores. Finally, a "hypermart" may realize purchasing economies because it turns over products quickly, buys in bulk, and becomes a desirable channel in the eyes of product manufacturers.

Despite these potential benefits, there are some limits to economies of scale. For instance, a "hypermart" could spread specialized labor such as talented store managers so thinly that they have a difficult time managing and monitoring the entire store. Because the store has lost its niche focus, both the store's old and new services may be adversely impacted. Additionally, the firm may damage its reputation with core consumers by expanding its products well beyond the range for which it is known.

9.. Some state governors have proposed purchasing prescription drugs on behalf of state residents, on the grounds that by pooling purchasing power, they can obtain deep discounts. What advice would you give to governors to improve their chances of obtaining low prices?

The pooling of the purhasing activity per se may not lead to lower prices. The fear of disruption may induce the firms to offer lower prices. However we need to consider two countervailing reasons. Since the state government may *have* to buy the particular drug (unlike a small drug store which can choose not to stock a given drug) its may find its bargaining power compromised. Further, if the state negotiates the price and the actual sale and delivery take place in a decentralized manner, there may not be any cost savings (selling costs) due to the *bulk purchase*. If the state takes delivery of the drugs and then redistributes it the extra cost incurred may not be less than the savings due to bulk purchase.

Since the drug companies may not want to acquire the reputation of being weak (considering the forty nine other governors who will be watching the outcome) they will be tough to negotiate with.

10. Suppose you wanted to quantify a firm's learning experience. One possible measure is the firm's lifetime cumulative output. What are the advantages and disadvantages of this measure? Can you offer a superior alternative measure?

The magnitude of learning benefits is often expressed in terms of a slope. The slope for a given production process is calculated by examining how far average costs decline as cumulative production output doubles. It is important to use cumulative output rather than output during a given time period to distinguish between learning effects and other scale effects.

11. During the 1980s, firms in the Silicon Valley of Northern California experienced high rates of turnover as top employees moved from one firm to another. What effect do you think this turnover had on learning-by-doing at individual firms? What effect do you think it had on learning by the industry as a whole?

Employees may be viewed as assets of the firm. However, unlike other firm assets (e.g. capital equipment, buildings, etc.) human assets walk out the door on a daily basis and may take with them the knowledge that they acquired while at the firm. Both employer and employee are exposed to risks within their relationship. While firms must invest both time and dollars to provide employees with formal and experiential training in order to maximize productive efficiency, firms are exposed to the risk of their assets going elsewhere. Conversely, employees must invest time in learning firm-specific skills and forgo alternate employment opportunities to remain at the firm.

As turnover increases, firms are less inclined to invest in extensive training, as they cannot retain the benefit of learning over time. This is compounded by the adverse consequences of sharing valuable information with employees that can be passed on to competitors. Productive efficiency is further hampered as there are fewer experienced employees available to provide on-the-job training for new employees. Additionally, firms have little incentive to incur the substantial cost of training more individuals. Finally, high turnover can serve as an indicator to employees that the firm is a short-term career option. Consequently, employees may be less inclined to make a relationship-specific investment in developing skills applicable to the firm, and the industry as a whole. Overall, internal

learning is reduced.

Conversely, high turnover contributes greatly to learning by the industry as a whole as it allows industry participants to free-ride off the skills and knowledge workers acquired at a given firm since employees take their expertise with them. Industry learning is enhanced further if the knowledge and skills acquired are transferable rather than firm specific. Additionally, as employees move between firms, their network of professionals with whom to share ideas expands, therefore promoting the flow of information between firms.