

Business Costs and Production

Introduction to Economics (ECON 304K)

Do larger firms always have a cost advantage over their smaller rivals?

Walmart, the nation's largest retailer, leverages its size to get price breaks on bulk purchases from its suppliers. People commonly believe that this kind of leverage enables larger firms to operate at lower costs than smaller firms do. It is true that large firms have broader distribution networks, and they benefit from more specialization and automation compared with their smaller competitors. However, not all industries enjoy lower costs with additional sales the way retailers do. In other words, larger firms do not always have the lowest costs. Some products are especially unsuited to mass production.

We begin the chapter with an examination of costs and how they relate to production. After we understand the basics, we consider how firms can keep their costs low in the long run by choosing a scale of operation that best suits their needs. By the end of this chapter, you will appreciate the importance of cost and understand why smaller and more nimble firms are sometimes able to undercut the prices of larger franchises

Big Questions

- How are profits and losses calculated?
 - Profits and losses are determined by calculating the difference between expenses (total cost) and total revenue
 - There are two types of profit: economic profit and accounting profit. If a business has an economic profit, its revenue is larger than the combination of its explicit and implicit costs.
 - Economists break costs into two components: explicit costs, which are easy to calculate, and implicit costs, which are hard to calculate. Because economic profit account for implicit costs, the economic profit is always less than the accounting profit
- How much should a firm produce?

- A firm should produce an output that is consistent with the largest possible economic profit.
 - To maximize profit, firms must effectively combine land, labor, and capital in the right quantities
 - In any short-run production process, a point of diminishing marginal product will occur at which additional units of a variable input no longer generate as much output as before. Diminishing marginal product is a result of fixed inputs (such as capital and land) in the short run.
 - Marginal cost (MC) is the key variable in determining a firm's cost structure. The MC curve always leads the average total cost (ATC) and average variable cost (AVC) curves up or down.
- What costs do firms consider in the short-run and the long-run?
- In the short run, firms consider variable and fixed costs, as well as marginal cost. Firms also consider average variable cost (AVC), average fixed cost (AFC), and average total cost (ATC).
 - With the exception of the average fixed cost (AFC) curve, which always declines, short-run cost curves are U-shaped. All variable costs initially decline due to increased specialization. At a certain point, the advantages of continued specialization give way to diminishing marginal product, and the MC, AVC, and ATC curves begin to rise.
 - Long-run costs are a reflection of scale. Firms can experience diseconomies of scale, economies of scale, or constant returns to scale, depending on the industry.

How are profits and losses calculated?

To determine the potential profits of a business, the first step is to look at how much it will cost to run it. For a company to be profitable, it is not enough to provide products consumers want; it must simultaneously manage its costs. In this section, we discuss how profits and costs are calculated.

Calculating Profit and Loss

The simplest way to determine profit or loss is to calculate the difference between revenue and expenses (costs). The **total revenue** of a business is the amount the firm receives from the sale of goods and services. **Total cost** is the amount a firm spends to produce and/or sell goods and services. To determine total cost, the firm adds the individual costs of the resources used in producing and/or selling the goods. A **profit** occurs whenever total revenue is higher than

total cost. A **loss** occurs whenever total revenue is less than total cost. We can express this relationship as an equation:

$$\text{profit (or loss)} = \text{total revenue} - \text{total cost}.$$

To calculate revenue, we look at the dollar amount the business takes in over a specific period.

Calculating costs, however, is a little more complicated than calculating revenue; total cost has two parts — one that is visible and one that is largely invisible. In the next section, we will see that determining total costs is part art and part science.

Explicit and Implicit Costs

Economists break costs into two components: explicit costs and implicit costs.

Explicit costs are tangible out-of-pocket expenses; to calculate explicit costs, we add every expense incurred to run the business. **Implicit costs** are the costs of resources already owned, for which no out-of-pocket payment is made.

Implicit costs are also opportunity costs, because the use of owned resources means that the next-best alternative use is forgone; also, each alternative is an implicit cost (implicit costs are hard to calculate and easy to miss).

To fully account for all the costs of doing business, we must calculate the explicit costs, determine the implicit costs, and add them together:

$$\text{total cost} = \text{explicit costs} + \text{implicit costs}.$$

Table 8.1

Examples of a Firm's Explicit and Implicit Costs	
Explicit costs	Implicit costs
The electricity bill	The labor of an owner who works for the company but does not draw a salary
Advertising in the local newspaper	The opportunity costs of the capital in the business
Employee wages	The use of the owner's car, computer, or other personal equipment to conduct company business

Shows examples of a firms explicit and implicit costs

Accounting Profit vs. Economic Profit

Now that you know about explicit and implicit costs, we can refine our definition of profit. In fact, there are two types of profit — accounting profit and economic profit.

A firm's **accounting profit** is calculated by subtracting only the explicit costs from total revenue. Accounting figures permeate company reports, quarterly and annual statements, and the media.

$$\text{accounting profit} = \text{total revenues} - \text{explicit costs}$$

As you can see, accounting profit does not take into account the implicit costs of doing business. To calculate the full cost of doing business, we need to consider both implicit and explicit costs; doing so yields a firm's economic profit. **Economic profit** is calculated by subtracting both the explicit and the implicit costs from total revenue. Economic profit gives more complete assessment of how a firm is doing.

$$\text{economic profit} = \text{total revenues} - (\text{explicit costs} + \text{implicit costs}) \text{ or } \text{economic profit} = \text{accounting profit} - \text{implicit costs}$$

The difference in accounting profits among various types of firms can be misleading.

Economic profit can be negative, since the negative dollar amount is a loss. If a business has an economic profit, its revenues are larger than the combination of its explicit costs and implicit costs. Likewise, a business has an economic profit, its revenues are larger than the combination of its explicit costs and implicit costs. Likewise, a business has an economic loss when its revenues are smaller than the combination of its explicit and implicit costs. The difficulty in determining economic profit lies in calculating the tangible value of implicit costs

How much should a firm produce?

Every business must decide how much to produce. In this section, we describe the factors that determine output, and we explain how firms use inputs to maximize their production. Because it is possible for a firm to produce too little or too much, we must also consider when a firm should stop production.

The production function

For a firm to earn economic profit, it must produce a product that consumers want. This product is the firm's **output**. A firm should produce an output that is consistent with the largest possible economic profit.

The firm must also control its costs. To do so, the firm must use resources efficiently; there are three primary **factors of production**: labor, land, and capital. Each factor of production is an **input**, or a resource used in the production process to generate the firm's output. **Labor** consists of workers, **land** consists of the geographical location used in production, and **capital** consist of all the resources the workers use to create the final product.

To keep costs down in the production process, a firm needs the right mix of inputs. The **production function** describes the relationship between the inputs a firm uses and the output it creates.

The **marginal product**, which is the change in output associated with one additional unit of an input.

$$\text{marginal product} = (\text{output from } n \text{ inputs}) - (\text{output from } n - 1 \text{ input units})$$

Conversely, for any given number of workers, the total output is the sum of the individual workers' marginal products.

Diminishing Marginal Product

The point at which successive increases in inputs are associated with a slower rise in output is known as the point of **diminishing marginal product**. A common mistake when considering marginal product is to assume that a firm should stop production as soon as marginal product starts to fall. This is not necessarily true; "diminishing" does not mean "negative". There are many times when marginal product is declining but still relatively high.

What costs do firms consider in the short run and the long run?

Production is one part of a firm's decision-making process: the other major component of production is cost.

Every firm, whether just starting out or already well established and profitable, can benefit by assessing how much to produce and how to produce it efficiently. In addition, production and cost considerations are different in the short run and in the long run. We begin with the short run because the majority of firms are most concerned with making the best short-run decisions, and then we extend our analysis to the long run, where planning ahead plays a central role.

Costs in the short run

All firms experience some costs that are unavoidable in the short run. These unavoidable costs are a large part of short-run costs. In the short run, costs can be variable or fixed.

Variable costs change with the rate of output; in **Chapter 9**, we add demand to our analysis to determine how much the firm should produce. For now, we stay focus on the cost side.

Fixed costs are unavoidable; they do not vary with output in the short run. These fixed costs — also know as **overhead**— include rent, insurance, and property taxes.

Interpreting tabular data

Every business must be able to determine how much it costs to provide the products and services it sells. **Table 8.3** lists many different ways to measure the costs associated with business decisions.

When we add fixed cost and variable cost together, we get total cost (TC), $TC = TVC + TFC$. **Average variable cost (AVC)** is the total variable cost divided by the output produced, $AVC = TVC \div Q$.

Average fixed cost (AFC) is calculated by dividing total fixed cost by the output: $AFC = TFC \div Q$. Because total fixed cost is constant, dividing these costs by the output means that as the output rises, the average fixed cost declines. In other words, higher output levels spread out the total fixed cost across more units.

Average total cost (ATC) is calculated by adding the AVC and AFC. It can also be calculated by dividing total cost by quantity $ATC = TC \div Q$

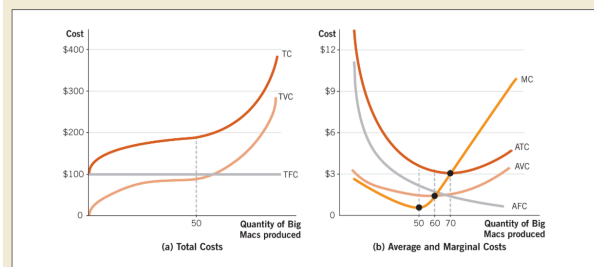
Interpreting data graphically

The **marginal cost (MC)** is the increase in cost that occurs from producing one additional unit of output. (This relationship is shown as the change in TVC divided by the change in quantity produced, where change is indicated by Δ . [Equation is

FIGURE 8.2

The Cost Curves

(a) The total variable cost (TVC) dictates the shape of the total cost (TC) curve. After 50 Big Macs, diminishing marginal product causes the total cost curve to rise at an increasing rate. Notice that the total fixed cost curve (TFC) stays constant, or flat. (b) The marginal cost curve (MC) reaches its minimum before average variable cost (AVC) and average total cost (ATC). Marginals always lead the average variable and average total costs either up or down. Average fixed cost (AFC), which has no variable component, continues to fall with increased quantity, because total fixed costs are spread across more units.



$$\text{marginal cost} = (\text{cost of producing } n \text{ units}) - (\text{cost of producing } n - 1 \text{ units})$$

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Costs in the Long Run

We have seen that in the short run, businesses have fixed costs and fixed capacities; in the long run, all costs are variable and can be renegotiated. Thus, firms have more control over their costs in the long run, which enables them to reach their desired level of production. One way firms can adjust in the long run is by changing the **scale**, or size, of the production process. If the business is expected to grow, the firm can ramp up production. If the business is faltering, it can scale back its operations. This flexibility enables firms to avoid a situation of negative marginal product. Economists refer to the quantity of output that minimizes the average total cost in the long run as the **efficient scale**.

A long-run time horizon allows a business to choose a scale of operation that best suits its needs. The absence of fixed factors in the long-run production process means that we cannot explain total costs in the long run in the same way we explained short-run costs. Short-run costs are a reflection of diminishing marginal product, whereas long-run costs are a reflection of scale and the cost of providing additional output; because diminishing marginal product is no longer relevant in the long run, one might assume that costs would fall as output expands. However, this is not necessarily the case; depending on the industry and the prevailing economic conditions, long-run costs can rise, fall, or stay approximately the same.

Three types of scale

In this section, we describe three different scenarios for a firm in the long run. A firm may experience **economies of scale**, **diseconomies of scale**, or **constant returns to scale**. Let's consider each of these in turn.

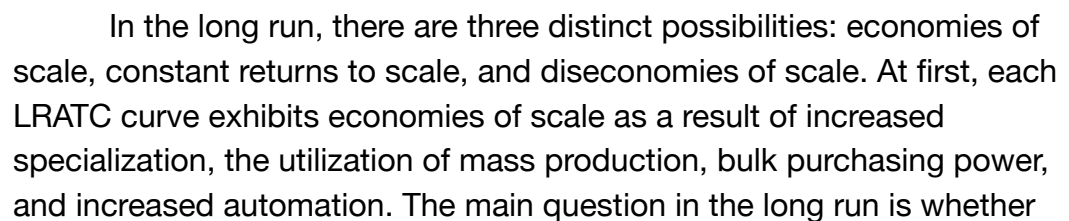
If output expands and long-run average total costs decline in the long run, a business experiences **economies of scale**; but bigger isn't always better! Sometimes a company grows so large that coordination problems make costs rise. A larger firm can become less effective at holding down long-run average total costs and experience **diseconomies of scale**, or higher costs as output expands in the long run.

The problem of diseconomies of scale is especially relevant in the service sector of the economy.

Long-run cost curves

FIGURE 8.3

In the long run, there are three distinct possibilities: the long-run average total cost curve (LRATC) can exhibit economies of scale (the purple curve), constant returns to scale (the red curve), or diseconomies of scale (the orange curve).



the cost curve will continue to decline, level off, or rise. In an industry with economies of scale at high output levels; the cost curve continues to decline, and the most efficient output level is always the largest output: the purple curve in Figure 8.3. In this situation, we would expect only one large firm to dominate the industry because large firms have significant cost advantages. However, in an industry with constant returns to scale; the cost curve flattens out: the red line. Once the curve becomes constant, firms of varying sizes can compete equally with one another because they have the same costs. Finally, in the case of diseconomies of scale — bigger firms have higher costs: the orange curve.

Conclusion

Do larger firms have lower costs? Not always; when diseconomies of scale occur, average total costs will rise with output. This result contradicts the common misconception that bigger firms have lower costs than their smaller competitors. Simply put, sometimes a leaner firm with less overhead can beat its larger rivals on cost.