Module 2

Production, Costs and Profit, and Market Structure

Introduction

In this module, we will examine the relationship between input prices and choice of technology in order to maximise efficiency. You will be introduced the definitions of economics cost and profits. We will explain implications of opportunity cost and define the relationship between marginal cost and per unit costs. For production in long run, we will explain the concepts of economies of scale and diseconomies of scale. You will also explore on break-even analysis.

In terms of market structure, you will first explore the output decision of a competitive firm, its decision to shut down, relationship between short-run market conditions and long-run market entry / exit adjustment. Then we will introduce types of imperfectly competitive markets, starting with a monopoly market. We will explain monopoly output and price determination, price discrimination of a monopoly and social costs of a monopoly. Another imperfectly competitive market to be introduced is the monopolistic market. Lastly, oligopolistic models and the concept of prisoners' dilemma and its application on oligopoly will be discussed.

Outcomes

Upon completion of this module you will be able to:

- *give* examples of the role of input prices in the choice of technology.
- *explain* the particular meaning of cost and profits in economics.
- *distinguish* between production in the short run and the long run.
- *distinguish* between historical and incremental costs.
- *explain* some implications of opportunity cost.
- *define* the relationship between marginal cost and per unit costs.
- *describe* some goods subject to (a) economies of scale and (b) diseconomies of scale.
- *find* the break-even level of output for a simple product.
- *critique* the reasoning given by managers of a competitive firm about how much to produce.

- *infer* economic principles from an in-depth business news story announcing a competitive firm's decision to shut down.
- *explain* the relationship between short-run market conditions and long-run market adjustment.
- *describe* the types of imperfectly competitive markets.
- *describe* how a monopoly determines the quantity to produce and the price to charge.
- *explain* why a monopolist charges different prices to different customers.
- *identify* the social costs of monopoly.
- *describe* monopolistically competitive market structure.
- *compare* outcome under monopolistic competition and perfect competition.
- *name* the chief market structures that occupy the spectrum between perfect competition and monopoly.
- *articulate* the concept of prisoners' dilemma and state how it applies to oligopoly.
- *explain* what an oligopolistic model is and distinguish between correct and incorrect descriptions of the way different oligopolistic models operate.

Terminology

Terminology

Break-even analysis: Given the company's fixed and variable *cost*, how many units of a particular product does a company have to sell to cover all its costs of production? It is also called *cost-volume-profit analysis*.

Economies of scale: Firm experiences a fall in the long run average total cost as a result of its expansion.

Economies of scope: Cost-saving occurs when it is possible to produce two or more products together at a lower per-unit cost than for each product separately

Marginal product: Extra output produced when an additional worker is hired. Marginal product is calculated by dividing the change in total product (ΔQ) by the change in the amount of labour employed (ΔL).

Monopoly: Monopoly consists of a single seller of a product that has no close substitutes; thus the product is highly differentiated from the products of all other

	firms
Monopolistic competition:	Monopolistic competition consists of more firms with slightly differentiated products.
Oligopoly:	Oligopoly consists of a relatively small number of firms whose products are typically differentiated from each other through some combination of product design, promotional efforts and place of sale.
Opportunity cost:	The cost of something is what you give up to get it. The opportunity cost of an item refers to the cost of all those things that must be forgone to acquire that item.
Price discrimination:	A firm selling the same product to different customers for different prices even though the costs of producing for the two customers are the same.
Production:	The process of transforming a set of resources into a good or service that has economic value.
Pure competition or perfect competition:	Pure competition consists of many firms producing identical products in an environment of full information – all firms know where to buy the cheapest inputs, and all consumers know where to buy the cheapest products.

Production, Costs and Profit

Introduction

Production is the process of transforming a set of resources into a good or service that has economic value. Resources used in production are known as inputs. Remember that natural resources, capital resources, and human resources are the three economic resources used in production. Inputs for most businesses include all three of these *factors of production*. Output is the result of this production, the quantity of a good or service that is produced.

Businesses and the industries in which they operate fall into one of three sectors depending on the type of production: primary, secondary, or service (also known as 'tertiary'). The primary sector includes industries that extract or cultivate natural resources, such as mining, forestry, fishing and agriculture. The secondary sector involves fabricating or processing goods, and includes manufacturing and construction, among other industries. Finally, the service sector includes trade industries (both

retail and wholesale) such as banking and insurance, and the new information industries. Despite the differences between these three sectors, they all follow the same production principles.

Choice of technology

In producing a certain good or service, businesses can typically choose from several processes using a different combination of inputs. A labour-intensive process employs more labour and less capital to produce a certain quantity of output. Conversely, a capital- intensive process uses more capital and less labour to produce the same quantity of output.

Suppose you have started a small company, 'Simple Diapers,' with $100,000 you have saved. You rent a building to use as a factory, and buy a supply of materials. Before hiring workers or buying sewing machines, you discover that you can make 1,000 'Soft Diapers' a day by using one of five possible production processes, each involving a different combination of workers and machines.

The combinations of labour and capital employed in each process are shown in **Table 2.1**. Five different techniques of producing 1,000 diapers are available. Technique *A* is most labour- intensive since it requires more workers and fewer machines (10 units of labour and two units of capital) to produce 1,000 diapers per day. However, inputs can also be substituted for one another. If labour becomes more expensive, firms can adopt labour-saving technologies; that is, they can substitute capital for labour. They can automate assembly lines by replacing human beings with machines and can substitute capital for land when land is scarce. Techniques *B*, *C*, and *D* are increasingly more capital- (and less labour-) intensive. Technique *E* is the most capital-intensive, requiring only two units of labour but 10 units of capital.

Technique	Units of Capital (K)	Units of Labour (L)
A	2	10
B	3	6
C	4	4
D	6	3
E	10	2

Table 2.1 Inputs required to produce 1,000 diapers by means of alternative technologies

How does a business decide which production process to use? Owners who want to earn as much profit as possible should try to maximise the business's productive efficiency, which means making a given quantity of output with the least costly mix of inputs. Selecting the most efficient

process, therefore, depends both on the quantity of each input used and on the prices of these inputs.

Study skills

Use the following information for the next two questions. Each technique produces the same amount of output.

Technique	Units of Capital	Units of Labour
A	2	15
B	5	8
C	9	3
D	14	1

1. The price of both labour and capital is $1 per unit. What is the optimal production technique: A, B, C, or D?
2. Which production technique is the most labour intensive: A, B, C, or D?

Solutions:

1. Technique C is best (least cost). The total cost is $12.
2. Technique A uses more units of labour than any of the other techniques.

What are costs?

To determine what a cost is, you must begin with the firm's objective. Let us find the seemingly obvious answer to what costs are by focusing on your diapers business. It is conceivable that you started your firm because of an altruistic desire to provide nearby families of infants with diapers. More likely, however, you started your business to make money. Economists normally assume that the goal of a firm is to maximise profit, and this assumption works well in most cases.

What is a firm's profit? The amount that the firm receives for the sale of its output (diapers) is called its total revenue. The amount that your firm pays to buy inputs (fabric, absorbent filler, workers, sewing machines, etc.) is called its total cost. You get to keep any revenue that is not needed to cover costs. We define profit as a firm's total revenue minus its total cost. That is,

$$\text{Profit} = \text{Total revenue} - \text{Total cost}.$$

Your objective is to make your firm's profit as large as possible. To see how a firm goes about maximising profit, we must consider fully how to measure its total revenue and its total cost.

Total revenue is the easy part: it equals the quantity of output the firm produces times the price at which it sells its output. If you produce 1,000

'Soft Diapers' and sell them at $1 a diaper, your total revenue is $1,000. The measurement of your firm's total cost, however, is more challenging.

In the example given above as in **Table 2.1**, your total cost would depend on the choice of the Technique (*A* to *E*), which in turn depends on the combination of the two inputs and the prices of the inputs. However, there is more to this than can be seen in the first instance.

Opportunity costs

When measuring costs, economists always use the concept of *opportunity cost*. The cost of something is what you give up to get it. The opportunity cost of an item refers to all those things that must be forgone to acquire that item. When economists speak of a firm's cost of production, they include all the opportunity costs of making its output of goods and services. When you close down your business of making diapers for a week to go on a fishing trip, the amount of income that you forgo by suspending your operation temporarily would be a real cost to you, the opportunity cost. For economists, this cost is as real as the out-of-pocket expenses associated with your fishing activities.

Firms face two types of costs: explicit costs and implicit costs. *Explicit costs* are payments made by a business to other businesses or people outside of it. Explicit costs are also referred to as *accounting costs* because they include all the costs that appear in the business accounting records. These costs include such items as payments made for workers, buildings, machinery and materials. In contrast, *implicit costs* are estimates of what owners give up by being involved with a business – the opportunity cost of pursuing this course of action over another. Implicit costs relate to the resources provided by the owners. This distinction between explicit and implicit costs highlights an important difference between how economists and accountants analyse a business. Economists study how firms make production and pricing decisions. Because the decisions are based on both explicit and implicit costs, economists include both when measuring a firm's costs, *economic costs*. By contrast, accountants keep track of the money that flows into and out of firms. As a result, they measure the explicit costs but often ignore the implicit costs.

The difference between economists and accountants is easy to see in the case of 'Soft Diapers' factory. When you give up the opportunity to earn money as a manager, your accountant will not count this as a cost of your diapers business. Because no money flows out of the business to pay for this cost, it never shows on the accountant's financial statements. An economist, however, will count the forgone income as a cost because it will affect the decisions you make in your diaper business. For example, if your wage as a manager of a T-shirt producing company rises from $100 to $200 per day, you might decide that running your diaper business is too costly and choose to shut down the factory in order to become a full-time manager.

Economists define as opportunity cost the value of any sacrificed opportunity that results from some course of action, even if no outright

monetary payment is made. Thus, the economic costs encountered by a business are all the opportunity costs involved in production and include both explicit and implicit costs. Therefore, for 'Soft Diapers,' the explicit costs of producing 1,000 diapers per day based on, let us say Technique A, are $210 – two units of labour ($5 per hour) and 10 units of capital (priced at $20 an hour of machine work).

The implicit costs consist of two components:

1. The opportunity cost of the capital investment that you have tied up in this business.
2. The opportunity cost of your own time as the owner manager of the firm that you have established.

As for the first cost, you might estimate that, rather than making diapers, you could deposit your $100,000 in a bank account and earn $30 a day. Another implicit cost would be the wage that you as the owner of the firm sacrifice by working as the manager of your company. You might estimate the value of your work as $100, which is what you would earn by working for someone else. The sum of these two costs ($30 + $100), or $130, represents the opportunity costs for 'Soft Diapers'. Therefore,

Economic costs	=	Explicit costs	+	Implicit costs
$340		$210		$130

Distinguishing between relevant and irrelevant cost

In analysing the cost of a particular question, economists recommend that only those *relevant* to the decision at hand should be considered. A cost is deemed relevant if it will be affected by the choice of alternatives being considered in a decision. Costs not affected by the outcome of a decision are considered *irrelevant*. Two commonly used ways to determine which costs are relevant are the criteria called respectively *sunk* versus *incremental* and the *fixed* versus *variable*.

A sunk cost, sometimes referred to as *historical* cost, is a prior expenditure that is not affected by any decision concerning a future course of action. Based on the definition of relevant cost, sunk cost is clearly irrelevant. The opposite of sunk cost is incremental cost. This is considered to be relevant because it is defined as a cost associated with any decision about a future course of action. Fixed cost is the cost that does not change with the level of question or output. A variable cost is one that does change with the level of question or output. Fixed cost is normally, but not always, considered irrelevant, while variable cost is considered relevant.

For example, Mother's Day falls on the weekend and the owner of the local fruits and vegetable market buys 100 rose bouquets for $5 each. The owner figures there is enough local demand to sell all 100 at $10 each to make a reasonable profit. However, the estimate turns out to be wrong.

By mid-afternoon, 40 bouquets remain unsold. What should be done? At this stage, the $5 that was paid for the flowers is irrelevant. It is a historical or sunk cost. It cannot be retrieved. A decision to sell the rest of the roses at a lower price should be independent of the price paid for the bouquets - sunk. In fact, if the owner must pay to have the unsold bouquets picked up for composting, it might be worth giving away any unsold flowers.

Economic profit

When economic costs are subtracted from total revenue, the excess is known as economic profit.

If this gives a negative figure, the business faces a negative economic profit, or a loss. The daily economic profit of 'Soft Diapers' remains when you have calculated total revenue and subtracted economic costs from it. If 1,000 diapers sold at a price of $1 each, then the total revenue gained by producing is $1,000 ($1×1,000 shirts). When the economic costs of $340 are deducted, we get an economic profit of $660 ($1,000 − $340):

Economic profit	=	Total revenue	-	Economic costs
$660		$1,000		$340

Study skills

Your brother has a plot of land that has three alternative uses: *R*, *S*, and *T*. The revenue from each use is $5, $6 and $8, respectively. The accounting cost of each use is zero.

1. The opportunity cost of using the land for use *S* is —
   A. $5, the value in use *R*.
   B. $8, the value in use *T*.
   C. $1, the difference in value between use *R* and *S*.
   D. $2, the difference in value between use *T* and *S*.

2. The economic profit of using the land for use *S* is —
   A. -$8, the value in the use *T*.
   B. $8, the value in the use *T*.
   C. -$2, the difference in value between use *T* and *S*.
   D. $2, the difference in value between use *T* and *S*.

3. The local vegetable and fruit vendor can sell as many cantaloupes as he wishes at the market price of $2 each. Total cost to him of carrying each cantaloupe is $0.50. He chooses to sell 10 cantaloupes. He is making —

    A. a total economic profit of $15.

    B. a total economic profit of $20.

    C. a normal profit of $15.

    D. a normal profit of $20.

Solutions:

1. B. Opportunity cost is the value of the highest (next-best) alternative: Use T.
2. C. Economic profit is total revenue (which for Use S is $6) minus total costs. Accounting costs are zero, but economic opportunity costs are $8 (the revenue from Use T).
3. A. Total profit is total revenue less total cost. For the vendor, total revenue is $20.00 and total cost is $5.00. Therefore, the difference is an economic profit of $15.00.

Time as a factor in the determination of relevant cost

The time period in which a firm's cost structure is being considered is very important in determining which costs are relevant to a particular business decision. In the economic analysis of cost, the time factor is handled by dividing time periods into two basic types: the *short run* and the *long run*. Remember that this distinction was also used in the analysis of supply and demand and price elasticity. In the short run, we assume there are certain resources such as land, factory space, and machinery that cannot be changed within the time period allowed. The cost of using these resources is either sunk or fixed. Thus, there will always be certain costs that are irrelevant to a short-run decision. Long-run analysis assumes there is enough time for managers to vary the costs of utilising all their resources. Consequently, all long-run costs are either incremental or variable and therefore relevant to a particular business decision.

Production in the short run

The previous section showed that short run is the period during which quantities of one or more of a business's inputs cannot be varied. In manufacturing, companies usually cannot adjust the quantity of machinery they use or the size of their factories on a short notice. In agriculture, there is typically an additional quantity that cannot be varied – the land available for farming. Inputs that cannot be adjusted in the short run are known as fixed inputs. Inputs that can be adjusted are known as variable inputs. Typically, variable inputs in the short run include the labour and materials a business uses in production. For example, as the owner of 'Soft Diapers,' you are considering adjusting

your current production of 1,000 packs (10 diapers per pack) a day. You have already bought three sewing machines and cannot acquire more without a considerable delay. Hence, the three machines represent a fixed input for your business in the short run. However, you can change the number of workers you employ, so labour represents a variable input in the short run.

Total, average and marginal product

To increase production of a certain good or service, a business must employ more of all variable inputs including workers. The result is a rise in total product, which is the overall quantity (Q) of output associated with a given workforce. The employment of labour is a convenient measure of a company's scale of production, since labour is a variable input in making virtually all products. However, businesses also use other variable inputs, such as natural resources or semi-processed goods. Once again, let us look at 'Soft Diapers'. Say you conduct a few experiments to see what happens to total product for your business when the number of workers employed is changed but the number of sewing machines - three – remains constant.

Columns 1 and 2 of **Table 2.2** show that as the number of workers increases, total product increases until the fifth worker is hired. In addition to total product, two other concepts are important when you are analysing production in the short run. Average product is the quantity of output produced per worker and is found by dividing total product (Q) by the quantity of labour (L) employed. Marginal product, in contrast, is the extra output produced when an additional worker is hired. Marginal product is calculated by dividing the change in total product (ΔQ) by the change in the amount of labour employed (ΔL). (The symbol Δ is the Greek capital letter 'delta,' which signifies a change in some variable.)

(1) Labour Total Product (L) Workers per day	**(2) Marginal Product (Q)** (Packs of diapers per day)	**(3) Average Product (ΔQ/ΔL)** (Packs of diapers per day)	**(4) (Q/L)** (Packs of diapers per day)
0	0		0
1	480	480	480
2	1,000	520	500
3	1,350	350	450
4	1,600	250	400
5	1,700	100	340
6	1,650	- 50	270

Table 2.2 Production in the short run

Columns three and four of **Table 2.2** list the marginal and average products for 'Soft Diapers'. When you employ three workers, the workforce's average product is 450 packs of diapers per day (1,350

diapers, three workers). If a fourth worker is added, the marginal product of this worker is 250 packs, which comes from subtracting the old total product (1,350 packs) from the new total product (1,600 packs), and dividing the difference by the change in the workforce from three to four:

$$\text{Average product} = \frac{\text{Total product } (Q)}{\text{Number of workers } (L)} = \frac{1{,}350}{3} = 450$$

$$\text{Marginal product} = \frac{\text{Change in total product } (\Delta Q)}{\text{Change in workforce } (\Delta L)} = \frac{(1{,}600 - 1{,}350)}{(4\text{-}3)} = 250$$

Note that marginal product peaks when the second worker is hired and becomes negative at the same point that total product begins to drop. Meanwhile, average product peaks at two workers.

Diminishing marginal returns

The marginal product values in **Table 2.2** reflect a law that applies to production in the short run. According to the law of diminishing marginal returns, at some point – as more units of a variable input are added to a fixed input – the marginal product will start to decrease since the new units of the variable input (for example, workers) are being added to an increasingly scarce fixed input (for example, land). For the law of diminishing marginal returns, consider what would happen if you used a flowerpot to grow food. If the law of diminishing marginal returns were false, then, as you used more labour, the total product of food grown in the flowerpot would rise at a faster and faster rate until the world's entire food supply could be provided from this single pot. The absurdity of this conclusion suggests that the law of diminishing marginal returns must be correct.

The three stages of production

The total product for 'Soft Diapers' is shown in the top graph of **Figure 2.1**, and its marginal product and average product are shown in the bottom graph. Both graphs can be divided into three ranges. In the bottom graph's first range, marginal product rises as more workers are added.

In the top graph's first range, total product rises at a higher and higher rate, giving the curve a positive slope that gets steeper. During the second range, marginal product begins to fall but is still positive. Total product in this second range continues to rise but at a lower rate, so that the curve becomes flatter. In the final range, marginal product falls below zero and total product decreases. Points in this last range will never be chosen by the business.

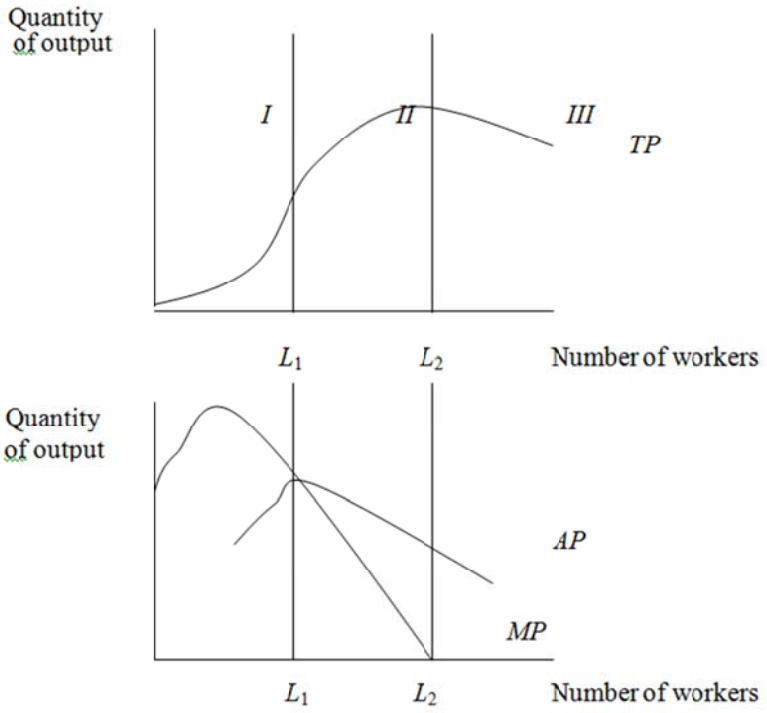


Figure 2.1

Notice that as the number of workers increases within stage *I*, the marginal product increases. The first worker has a marginal product of 480, whereas the second worker has a marginal product of 520 packs of diapers. This property is called increasing returns. As the number of workers increases beyond stage I (stages *II* and *III*), the marginal product decreases (law of diminishing or decreasing returns). The second worker has a marginal product of 520 diapers, the third worker has a marginal product of 350 packs, and the fourth worker has a marginal product of 250 packs of diapers. This property is called diminishing marginal product. As the number of workers increases, additional workers have to share equipment and work in more crowded conditions. Hence, as more and more workers are hired, each additional worker contributes less to the production of diapers. Increasing and diminishing marginal product are apparent in both figures, depicted in **Figure 2.1**.

Study skills

Use the following table to answer the next three questions.

Labour (workers)	Total Product	Marginal Product	Average Product
0	0	—	—
1	15	—	—
2	32	—	—
3	48	—	—
4	60	—	—
5	—	10	—
6	—	—	13

1. Total product, if six workers are employed, is —
   A. 70 units of output.
   B. 73 units of output.
   C. 78 units of output.
   D. 86 units of output.

2. Average product, if five workers are employed, is —
   A. 10 units of output.
   B. 12 units of output.
   C. 14 units of output.
   D. 15 units of output.

3. Diminishing returns set in with the _____worker.
   A. first
   B. second
   C. third
   D. fourth

Solutions:

1. C. Total product is average product times the number of workers (13 x 6).
2. C. With 4 workers, total product is 60 units. The fifth worker adds 10 more units to make a total of 70. Average product is total product divided by the number of workers (70/5).
3. C. The marginal products of the first, second, and third workers respectively are 15, 17, and 16. The decline begins with the third worker.

The production function to the total-cost curve

Firms incur costs when they buy inputs to produce the goods and services that they plan to sell. In this module, we will examine the link between a firm's production process and its total cost. In the short run, just as businesses use fixed and variable inputs, they face corresponding fixed and variable costs. Fixed costs, or total fixed costs, (TFC), do not change when a business changes its quantity of output since these costs relate to fixed inputs such as machinery and land. Variable costs or total variable costs, (TVC) in contrast, relate to variable inputs, which change when a business adjusts the quantity produced. The most important variable costs are wages and payments for materials used in production, whereas the typical fixed cost is the cost of machinery. Total cost (TC) is the sum of all inputs, both fixed and variable, and is found by adding fixed and variable costs at each quantity of output.

Costs and production are two sides of the same coin. A firm's total cost reflects its production function, whereas the firm's supply curve, discussed in the last chapter, is a reflection of its costs relationships. To see how these related measures are derived, consider the example in **Table 2.3**. This table presents cost data on your neighbour – the T-shirt producer. From data on a firm's total cost, we can derive several related measures of cost which will turn out to be useful when we analyse production and pricing decisions in future chapters.

Your neighbour's total cost can be divided into two types. The fixed costs, which do not vary with the quantity of output produced, are incurred even if the firm produces nothing at all. Your neighbour's fixed costs include the rent she pays because this cost is the same regardless of how many T-shirts she produces. Similarly, if she needs to hire a full-time bookkeeper to pay bills, regardless of the quantity of T-shirts produced, the bookkeeper's salary is a fixed cost. The second column in **Table 2.3** shows your neighbour's fixed cost, which in this example is $100.

Her variable costs, which change as the firm alters the quantity of output produced, include the cost of materials such as fabric, thread, ink, and labour. The more T-shirts she makes the more material she needs to buy. The third column of the table shows the variable cost. The variable cost is zero if she produces nothing, $56 if she produces one bundle (each bundle consists of 20 units) of T- shirts and $106 if she produces two (20 bundles) T-shirts and so on.

A firm's total cost is the sum of fixed and variable costs. In **Table 2.3**, the total cost in the fourth column equals fixed cost plus total variable cost. While marginal cost is based on changes in a business's total product, per-unit costs are expressed in terms of a single level of output. These costs are related to a business's fixed costs, variable costs and total costs. Hence, there are three separate types of per-unit costs: average fixed cost, average variable cost and average cost.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Quantity of Output [Q] (Tens of units)	Total Fixed Cost [TFC]	Total Variable Cost [TVC]	Total Cost [TC]	Average Fixed Cost [AFC]	Average Variable Cost [AVC]	Average Total Cost [ATC]	Marginal Cost [MC]
0	100	0	100				
1	100	56	156	100.00	56.00	156.00	56
2	100	106	206	50.00	53.00	103.00	50
3	100	154	254	33.33	51.33	84.67	48
4	100	205	305	25.00	51.25	76.25	51
5	100	263	363	20.00	52.60	72.60	58
6	100	332	432	16.67	55.33	72.00	69
7	100	416	516	14.29	59.42	73.71	84
8	100	519	619	12.50	64.87	77.37	103
9	100	646	746	11.11	71.77	82.88	127
10	100	801	901	10.00	80.10	90.10	155

Table 2.3 Measures of total and average cost

- Average fixed cost (AFC) is the fixed cost per unit of output, which you derive by dividing the business's fixed costs (TFC) by its total product (Q).
- Similarly, average variable cost (AVC) is the variable cost per unit of output, which you derive by dividing the business's variable costs (TVC) by total product (Q).
- The average fixed, average variable, and average total costs are found in columns five, six, and seven.

When three bundles are produced, the business's fixed costs of $100 are divided by the total product, giving an average fixed cost of $33.33 per bundle. Similarly, the $254 variable costs at this level of production are divided by three bundles of T-shirts, resulting in an average variable cost of $51.33. Let us observe the calculations:

$$\text{Average fixed cost (AFC)} = \frac{\text{Fixed costs (TFC) total product}}{\text{(Q)}}$$

$$\text{\$33.33 per batch (of 10 shirts)} = \frac{\text{\$154}}{\text{3 shirts}}$$

$$\text{Average variable cost (AVC)} = \frac{\text{Variable costs (TVC) total product}}{\text{(Q)}}$$

$$\text{\$51.33 per batch (of 10 shirts)} = \frac{\text{\$254}}{\text{three shirts}}$$

Average total cost (ATC) (or simply 'average cost') is the business's total cost per unit of output.

Average cost is the sum of average fixed cost and average variable cost at each quantity of output. Therefore, for example, in column seven, when the T-shirt maker produces three bundles (units) of T-shirts, the average fixed cost is $33.33 and the average variable cost is $51.33, giving an average total cost of $84.66.

Average total cost (AC)	=	Average fixed cost (AFC)	+	Average variable cost (AVC)
84.66		33.33		51.33

Although average total cost tells us the cost of the typical unit, it does not tell us how much total cost will change as the firm alters its level of production. The last column in **Table 2.3** shows the amount that total cost rises when the firm increases production by one unit of output. This number is the marginal cost. For example, if your neighbour increases production from two to three (units) of T-shirts, total cost rises from $206 to $254, so the marginal cost of the third (unit) of T-shirts is $48.

$$\text{MC} = \frac{\text{(Change in total cost)}}{\text{(Change in quantity)}} = \frac{\Delta TC}{\Delta Q} = \frac{305\text{-}254}{4 - 3} = 51$$

As will be even clearer in the next chapter, your neighbour will find the concepts of average total cost and marginal cost extremely useful when deciding how many T-shirts to produce. Keep in mind, however, that these concepts do not actually give your neighbour new information about her costs of production. Instead, the average total cost and the marginal cost express, information that is already contained in her firm's total cost. Average total cost tells us the cost of a typical unit of output if total cost is divided evenly over all the units produced. Marginal cost tells

us the increase in total cost that arises from producing an additional unit of output.

Cost curves and their shapes

Graphs of the cost data in **Table 2.3** are presented in **Figure 2.2** and enable us to see the pattern of change of the different measures of cost as output increases. They also help us to visualise the impact that marginal cost has on the average variable and average total costs. Using either the data in **Table 2.3** or the graphs in **Figure 2.2**, we can observe the following about marginal cost's impact on average variable cost:

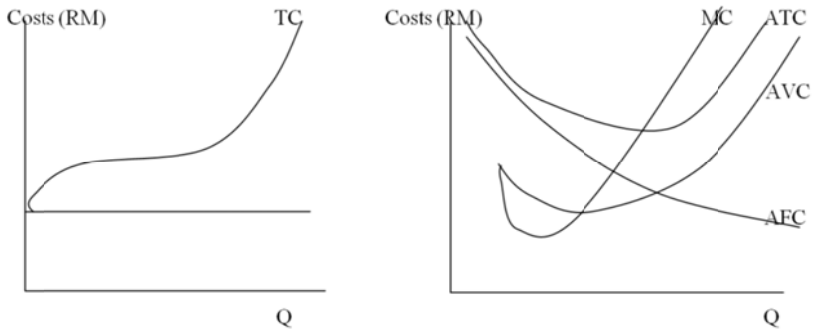


Figure 2.2

In previous study sections, graphs of supply and demand proved useful when you were analysing the behaviour of markets. Similarly, graphs of average and marginal cost help you analyse the behaviour of firms. **Figure 2.2** graphs your neighbour's costs using the data from **Table 2.3**. The horizontal axis measures the quantity the firm produces, and the vertical axis measures marginal and average costs. The graph shows four curves: average total cost (ATC), average fixed cost (AFC), average variable cost (AVC) and marginal cost (MC).

The cost curves shown here for your neighbour's T-shirt company have some features that are common to the cost curves of many firms in the economy. Let us examine three features in particular:

- The shape of marginal cost.
- The shape of average total cost.
- The relationship between marginal and average total cost.

When no shirts are produced, the denominator of the average fixed cost formula is zero, meaning that average fixed cost is an infinitely high number. Average fixed cost then falls as the business's total product increases, since the denominator in the formula rises. Therefore, the average fixed cost curve has a negative (downward) slope which becomes flatter as output rises.

Your neighbour's average total cost curve is U-shaped (saucer-shaped). To understand why this is so, remember that average total cost is the sum of average fixed cost and average variable cost. Average fixed cost always declines as output rises because the fixed cost is spreading over a larger number of units. Average variable cost typically rises as output increases because of diminishing marginal product. Average total cost reflects the shapes of both average fixed cost and average variable cost. At very low levels of output, such as one or two bundles per hour, average total cost is high because the fixed cost is spread over only a few units. Average total cost then declines as output increases until the firm's output reaches six bundles of T-shirts per hour, when average total cost falls to $72 per bundle. When the firm produces more than six bundles, average total cost starts rising again because the average variable cost rises substantially.

The bottom of the U-shape occurs at the quantity that minimises average total cost. This quantity is sometimes called the minimum efficient scale of the firm. For your neighbour's company, the efficient scale is six bundles. If she produces more or less than this amount, her average total cost rises above the minimum of $72.

Now that you have scrutinised the impact that marginal cost has on average variable and average total cost, you may wonder about the behaviour of marginal cost itself. Why does economic analysis assume that marginal cost decreases and then, at some point, starts to increase as more of a good or service is produced? To answer this question, we need to review a concept referred to in economic theory as 'the returns to a variable input'.

In the short run, a firm must work with a certain fixed quantity of resources or inputs such as land, factory or office space, machinery and equipment. As additional amounts of variable inputs such as labour hours and raw materials are combined with the fixed inputs, more output is produced. At first, additional units of the variable inputs are assumed to result in *increasing* amounts of additional output (also called marginal product). However, eventually, the additional inputs are expected to result in *decreasing* or *diminishing marginal* product. We can see this with a simple numerical example.

Suppose one person, working with a fixed amount of factory space and machinery, produces 100 units of output. Now suppose further that this person is joined by another worker. The two of them working together as a team produce 250 units of output. From the standpoint of the additional output contributed by each worker, the marginal product of the first worker is 100 and the marginal product of the second worker is 150. This is an example of increasing returns to the variable input, labour. As the two workers are joined by still more people, sustained effort to work as a team may cause the marginal product of the additional workers to continue increasing.

At some point, however, the marginal product resulting from the additional workers will start to diminish because of the limits imposed by the fixed inputs.

To explain the relationship between returns to variable input and marginal cost, we have extended the example in the previous paragraph into the schedule of numbers shown in **Table 2.3**. In this example, we assume that labour is the only variable input in this example, and the firm pays W (Wage rate) per hour to employ each worker. Thus, the wage rate is, in fact, the change in total variable cost if one work hour is hired. However, when the firm hires ΔL workers, total variable cost is (Wage rate × ΔL). Recall that the change in output resulting from the additional worker is each person's marginal product. Therefore, we can say that:

$$MC = \frac{\Delta TVC}{\Delta Q} = \frac{\text{Wage rate} \times \Delta L}{\Delta Q} = \frac{\text{Wage rate}}{\Delta Q/\Delta L} = \frac{\text{Wage rate}}{MP_L}$$

Therefore the relationship between marginal cost and return to the variable input can be presented as follows:

1. When a firm experiences increasing returns to its variable input (when its marginal product increases), its marginal cost will decrease.
2. When a firm experiences decreasing (diminishing) returns to its variable input (when a firm's marginal product decreases), its marginal cost will increase.
3. When a firm experiences constant returns to a variable input (when its marginal product neither increases nor decreases), its marginal cost will be constant over the range of output produced.

Shift in short-run cost curves

The cost curves shift with changes in technology or changes in resource prices. An increase in technological level that allows more output to be produced from the same inputs or resources moves the cost curves downward. If the technology requires more capital, a fixed input, then the average total cost curve moves upward at low levels of output and downward at higher levels of output.

On the other hand, a decrease in the price of the fixed factor of production moves the average fixed costs (AFC) and average total cost (ATC) curves downward but leaves the average variable cost (AVC) and marginal cost (MC) curves unchanged. A decrease in the price of a variable factor of production moves the AVC, ATC, and MC curves downward but leaves the AFC curve remain fixed or unchanged.

Study skills

Cost curves shift if —

a. technology changes

b. the prices of factors of production change

c. marginal product changes.

A. only a

B. only b

C. a and b

D. a and c

Solution:

Discuss your answer with your tutor.

Production in the long run

The long run is the period in which quantities of all resources used in an industry can be adjusted. So, even those inputs that had been fixed in the short run – such as machinery, buildings, and cultivated land – can be adjusted in the long run. Because all inputs can vary in the long run, the law of diminishing marginal returns no longer has the same importance as in the short run. In this section, we review the various ways a firm can take advantage of this flexibility to reduce its costs in the long run.

Economies and diseconomies of scale

The term 'economies of scale' is defined as the decrease in the unit cost of production as a firm increases all its inputs of production. This phenomenon is illustrated in **Figure 2.3**.

In this figure, we see that the average total cost curve, labelled 'Plant 1,' represents a certain amount of capacity. At its most efficient point, a firm with this plant capacity is able to produce Q_1 units of output at a unit cost of ATC_1. 'Plant 2' represents a greater production capacity because it is positioned to the right of Plant 1. In addition, it is located on a lower level than Plant 1, signifying that over a certain range of output, the larger plant is able to produce greater amounts of output at a lower average cost than the smaller one, i.e., the unit cost of ATC_2.

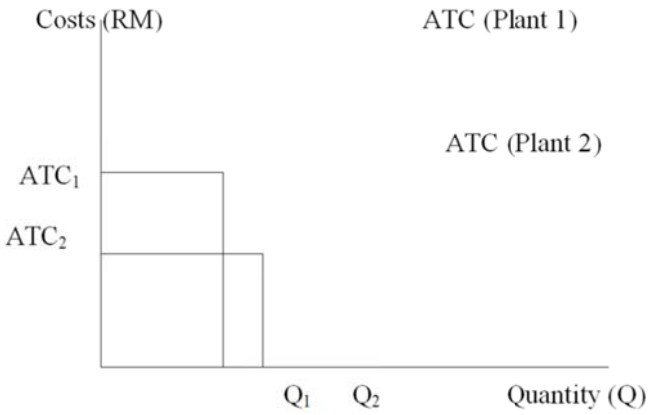


Figure 2.3

Sometimes 'economies of scale' is used interchangeably with the term *increasing returns to scale*. Increasing returns to scale is a long-term phenomenon[2] indicating that the firm's output grows at a rate that is faster than the growth rates of its inputs. For example, a 100 per cent increase in inputs results in more than 100 per cent increase in output, say 200 per cent. In this case, as the firm expands, the per-unit cost drops. The following are the main causes of economies of scale.

Division of labour and specialisation

As Adam Smith illustrated more than two centuries ago, increases in the scale of production and worker specialisation can go hand in hand. Performing fewer tasks allows workers to become more efficient at their jobs. As a result, Smith concluded that quantities of output tend to rise more quickly than the number of workers producing them. The impact of the division of labour is just as prevalent today in labour-intensive production. For example, if a very small restaurant where workers do everything expands, then workers can begin to specialise in either food preparation or service, thus making both sets of workers more efficient in the tasks they do.

Specialised capital

In most manufacturing industries, a greater scale of production is associated with the use of specialised machinery. If a car manufacturer raises the quantity of all its inputs, for example, capital equipment can have more specialised functions, so that it performs fewer tasks more efficiently than before.

Not every firm benefits from all these factors when it increases its scale of production. For example:

---

[2]Not to be confused with returns to variable input, which is a short-term phenomenon.

- Firms that have a high level of debt will usually not be able to borrow at the lowest possible interest rate.
- Size may not always offer the firm a cost advantage. Firms that are very large may become bureaucratic and inflexible, with management coordination and control problems.
- Oversized firms experience a disproportionate increase in staff and indirect labour.

The resulting increase in these types of cost may cause the average total cost to rise.

These are reasons for *diseconomies of scale*, or *decreasing returns*. Decreasing returns occur when a business expands inputs to a product's production by a certain percentage but sees output rise by a smaller percentage. For example, a 100 per cent expansion in all inputs may lead to its output rising by only 75 per cent. In terms of **Figure 2.3**, this can expect the ATC associated with bigger plants to shift up and to the right.

Figure 2.4 shows how short-run and long run costs are related. The long-run average-total-cost curve is a much flatter, saucer-shaped curve than the short-run average-total-cost curve. In addition, all the short-run curves lie on or above the long-run curve. These properties arise because of the greater flexibility firms have in the long run. In essence, in the long run, a firm gets to choose which short-run curve it wants to use. However, in the short run, it has to use whatever short-run curve it chose in the past.

Figure 2.4 also shows a long-run average cost curve reflecting both economies and diseconomies of scale as well as constant returns to scale. When long-run average total cost declines as output increases, there are said to be economies of scale. When long-run average total cost rises as output increases, there are said to be diseconomies of scale. When long-run average total cost does not vary with the level of output, there are said to be constant returns to scale.

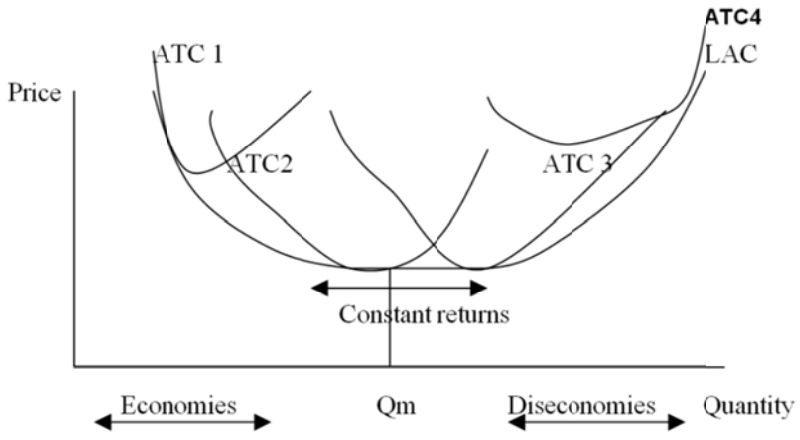


Figure 2.4

Expressing this differently, assume that our firm (say, a car-making company) expands its assembly plant three times. Each time, it faces a different short-run average cost curve for each plant size. With each expansion of the plant, the curve shifts to the right, demonstrating the effects of the increased output. When the plant is first expanded, the short-run average cost curve falls from ATC_1 to ATC_2. This shift results from economies of scale or increasing returns to scale. Remember that average cost is found by dividing total cost by the quantity of output. With economies of scale, output rises more rapidly than the total cost of inputs, so that average cost falls as the scale of production expands.

With the second plant expansion, the shift of the short-run average cost curve (from ATC_2 to ATC_3) reflects constant returns to scale. Output and the total costs of inputs rise at the same rate when the plant is expanded this second time, so the average cost curve moves horizontally as the output of cars rises. With the final plant expansion, the company's short-run average cost curve not only shifts to the right but also rises (from ATC_3 to ATC_4). This shift reflects diseconomies of scale. Since the plant's output is rising less rapidly than the total cost of input costs, the average cost curve rises as the production of cars continues to increase.

Constant returns to scale are what you might expect – the middle of the teeter-totter having at its high end, economies of scale (increasing returns to scale) and at its low end, diseconomies of scale (decreasing returns to scale). Constant returns to scale usually result when making more of an item requires repeating exactly the same tasks used to produce previous units of output. In objective terms, constant returns to scale occur in a business that expands inputs a given percentage and sees output rise by the same percentage. The flowing table, **Table 2.4** summarises the causes of economies of scale and diseconomies of scale.

Reasons for economies of scale	Reasons for diseconomies of scale
• Specialisation in the use of labour and capital.	• Disproportionate rise in transportation costs.
• Indivisible nature of many types of capital equipment.	• Input market imperfections (e.g., wage rates driven up).
• Productive capacity of capital equipment rises faster than purchase price.	• Management coordination and control problems.
• Economies in maintaining inventory of replacement parts and maintenance personnel.	• Disproportionate rise in staff and indirect labour.
• Discounts from bulk purchases.	
• Lower cost of raising capital funds.	
• Spreading of promotional and research-and-development costs.	
• Management efficiencies (line and staff).	

Table 2.4

Economies of scope

In the long run, it is also possible for managers to identify ways to take advantage of *economies of scope*. This cost-saving phenomenon occurs when it is possible to produce two or more products together at a lower per-unit cost than for each product separately. A key factor in this form of cost savings is the sharing of a company's fixed cost by multiple products. For example, certain electronic stores that normally sell TVs, VCRs, DVD players and computers are now selling CDs, videos, DVDs etc. These latter products are displayed on racks that occupy otherwise unused floor space in the stores. The use of this retail establishment's *excess capacity* in this manner reduces the average total cost of selling each product.

Another way that a company can utilise economies of scope is to produce goods or services that require similar skills and experience. For example, when Pepsico expanded into the snack and fast-food business, it was able to utilise its background in one type of fast-moving consumer item (soft drinks) to another (chips, tacos and fried chicken). The product development, channels of distribution and marketing know-how are very similar in these two product groups.

The learning curve

As pictured in **Figure 2.5**, the learning curve shows that a firm's unit cost decreases as its total cumulative output increases. Its rationale is that you improve with practice. Over the long run, as a firm produces more of a good or service, its workers are expected to get better at what they are doing. This increase in labour productivity will then decrease the unit cost of production. But other people besides the direct labour involved in the production process are also expected to improve with practice. For example, researchers may find less-costly substitutes for raw materials currently used; engineers may develop more efficient production processes or product designs.

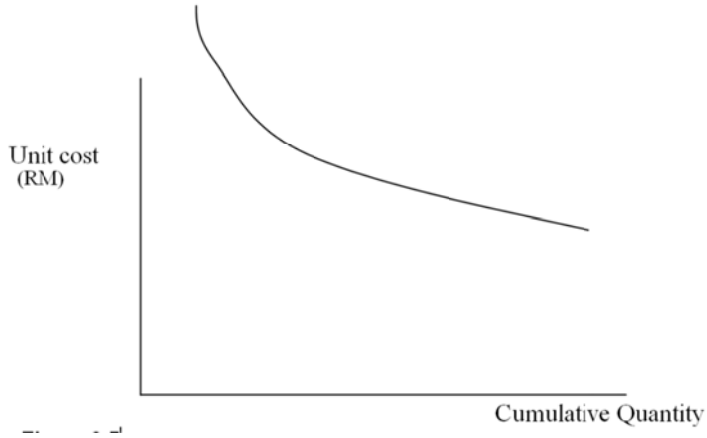


Figure 2.5

The learning curve has played an important part in the strategic approach called learning-curve pricing. This approach advocates that a firm should set its price at a relatively low level to stimulate demand, even though there is the possibility that it will earn minimal profit or even incur a loss at the outset. The greater demand will accelerate the learning effects that accompany the higher accumulated volume of production. As the company's costs are brought down the learning curve, the company will start to become profitable.

Break-even analysis

What is to be done about those costs that are not relevant to a decision? After all, even if they are ignored, they must still be paid for. However, this, in fact, is the logic of designating a cost as irrelevant. By definition, an irrelevant cost is one that must be incurred, regardless of the alternative selected by the decision maker. The question of how this cost is recovered is a separate issue altogether. To understand this aspect of the problem, we can turn to a commonly used technique called break-even analysis.

Break-even analysis is perhaps the most widely used application of the concept of relevant cost. You will find information on this subject in books on finance, accounting and marketing as well as economics. This analytical technique addresses the basic question: "How many units of a particular product does a company have to sell to cover all its costs of production: that is, to 'break even?" Another name for break-even analysis is *cost-volume-profit analysis*. This label describes the break-even problem more explicitly. That is, given the company's fixed and variable *cost*, how much *volume* does it have to sell to break even? Moreover, once it passes the break-even point and becomes profitable, how much profit will it earn as its volume increases?

Suppose your professor decides to open a seafood store. How many kilograms of seafood per month must he sell to break even? To answer this, we first divide his monthly costs into their fixed and variable components. Fixed cost is presented as a total figure, while the variable cost is shown on a per-unit basis. Variable cost per unit is also referred to as average variable cost (AVC):

Total Fixed Cost		**Variable Cost per Unit (Average Variable Cost or AVC)**	
Rent	$ 1,200	Average wholesale price per kilogram of seafood	$ 3.00
Utilities	$ 400		
Wages	$ 2,350		
Interest payment on loan	$ 1,500		
Insurance	$ 400		
Miscellaneous	$ 150		
Total	**$ 6,000**		

Table 2.5 Monthly cost of operating a seafood store

To find the break-even point, we use the following equation:

$$Q_{BE} = \frac{TFC}{P - AVC}$$

Where Q_{BE} = The break-even quantity of product sold

TFC = Total fixed cost

P = Selling price of the product

AVC = Average variable cost of the product

P – AVC = 'Contribution margin' per unit of product sold

that must be incurred, regardless of the alternative selected by the decision maker. The question of how this cost is recovered is a separate issue altogether. To understand this aspect of the problem, we turn to break-even analysis.

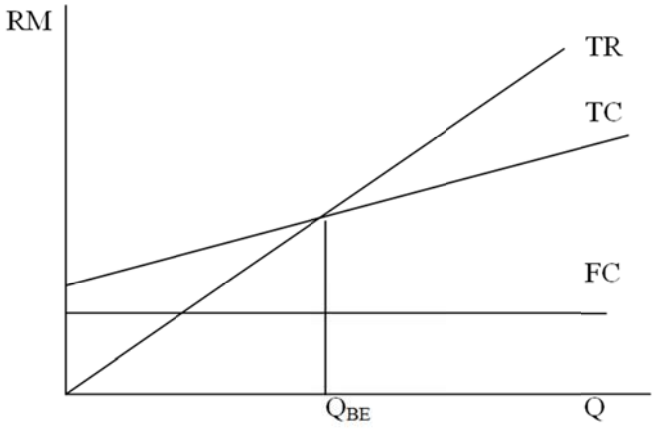


Figure 2.6

The logic of break-even analysis is very straightforward. The amount by which the selling price exceeds the average variable cost is called the 'contribution margin' per unit of product sold. When the amount of product sold reaches the point where the total contribution margin covers all the fixed costs of a product, the firm *breaks even*. The break-even concept can also be shown graphically. In **Figure 2.6**, the break-even point occurs when the firm's *total cost line crosses the total revenue line*.

Although our example is quite simple, we do not want to imply that break-even analysis applies only to small and uncomplicated business operations. To be sure, larger and more complex businesses might have a more difficult time dividing their costs into fixed and variable components, particularly when fixed and variable costs have to be determined for many different products. But no matter how complicated

the situation, there still remains the basic concept of generating enough sales so that the contribution margin covers fixed cost.

Study skills

For the total revenue TR = 32.5Q and total costs TC = 120 +12.5Q where Q represents thousands of units, determine the break-even level of output as well as the contribution margin.

Solution:

Setting TR =TC, Q = 6. Contribution margin = P- AVC = 32.5 – 12.5 = 20.

Hint: TC = TFC (= 120) + TVC (= 12.5Q).

Limitations of break-even analysis

This review of break-even analysis should give you a good idea of how the knowledge of a firm's fixed and variable costs can help in the making of certain business decisions or in the analysis of particular manufacturing or marketing strategies. However, as useful as this technique can be, it is still subject to several shortcomings. First, break-even analysis selects only one price for a particular product and then proceeds to determine how much a firm has to sell at this price to break even. In order to consider the possibility of different amounts demanded by consumers at different prices (the price elasticity of demand), a whole schedule of prices and break-even points would have to be constructed. In other words, break-even analysis determines how much a firm with a given price and cost structure needs to sell in order to break even. However, it does not provide any indication of how many units it will actually sell. Second and more important, this analysis assumes that a firm's average variable cost is constant. In certain circumstances, it is quite possible for a firm's average costs to either decrease or increase as more of a good or service is produced. To explain why, the next study section guides you through the economic analysis of short-run cost.

Activity 2.1

Activity

Why are many firms likely to experience economies of scale up to a certain size and the diseconomies of scale after some point beyond that?

Market Structure

Introduction

Terms such as 'monopoly' and, less often, 'oligopoly' appear in thoughtful discussions of business and global economics and you probably have working definitions of these words in your vocabulary. However, you may not know a great deal about the economic behaviour that distinguishes one of these market types from another, nor how these and other classic market models shed light on the types of pricing or production decisions that confront you at work. The purpose of this study section is to acquaint you more closely with these predictive models. The practice you gain in applying their principles will give you a perspective on pricing, market entry, market departure, implicit collusion and other decisions made by firms in today's business world.

Market structure

Traditional price theory delineates four basic market forms:

1. Pure competition.
2. Monopolistic competition.
3. Oligopoly.
4. Monopoly.

Pure competition consists of many firms producing identical products in an environment of full information – all firms know where to buy the cheapest inputs and all consumers know where to buy the cheapest products. Firms operating in pure competition are called *price takers* because the price of their product is determined by the market forces of demand and supply. Excess demand for the product will drive the market price up and excess supply will drive the market price down. Since all firms are selling exactly the same product and consumers have full information about all firms' prices, a firm will sell nothing if it raises its price above the market price. Conversely, the firm has no incentive to reduce its price below the market price since it is small relative to the size of the market and can sell all that it wants to at the market price.

The other three market forms are characterised by product differentiation and by an environment of incomplete information. In fact, lack of information may be one of the bases for consumers' differentiating between the products of rival suppliers.

1. ***Monopolistic competition*** consists of many firms with slightly differentiated products.
2. ***Oligopoly*** consists of a relatively small number of firms whose products are typically differentiated from each other through some combination of product design, promotional efforts and place of sale.

3. ***Monopoly*** consists of a single seller of a product that has no close substitutes; thus the product is highly differentiated from the products of all other firms.

Firms operating in monopolistic competition, oligopoly and monopoly are called ***price makers*** because they can adjust the price of their product up or down to pursue their objectives. In monopolistic competition and oligopoly, the firm's ability to set prices derives from the differentiation of its product. Each firm can raise its price to some extent without losing all its customers, since the remaining customers believe that the product is worth the extra price being asked. In a monopoly, the firm can set its own price because there are no direct competitors.

Key assumptions used in the microeconomic theory of the firm

There are two key assumptions used in the economic theory of firms that you should review before looking at pricing and output decision-making in the four types of markets.

1. The firm's primary objective is the short-run maximisation of profit. This may not, however, be the case for oligopoly, where time horizons typically extend beyond the short run. High short-run profits may induce the entry of new competitors to cause a more competitive market for the firms later in the planning period.
2. The opportunity cost of producing a particular good or service is included in the cost of doing business – economics costs.

In analysing a firm's pursuit of short-run profit, the economic theory of the firm posits that its managers must address three basic questions:

1. Should our company be in this business? In other words, should it be selling this particular product at all?
2. If so, how much should we produce?
3. And if we are able to set the price, what price should we charge?

Those firms operating in perfectly competitive markets cannot set their own price. Therefore, this question does not apply to them.

The output decision of a firm in a perfectly competitive market

In economic analysis, the type of market in which a firm is competing dictates its ability to determine its price. In the extreme case of perfect competition, the managers of a firm have no power to set price. They must sell their product at the price determined by the market forces of supply and demand and can only decide how much output to produce.

A perfectly competitive market consists of numerous sellers, and no one firm can set the price by controlling the supply of output. At the opposite extreme, a seller without competition could control the price by keeping

the supply at a level relative to demand so that it would support the desired price.

In a perfectly competitive market, there is no way sellers can exercise any product differentiation. They all sell a standardised product. Any attempt by a seller to raise the price would simply result in a complete loss of customers to other suppliers because all are selling the same product.

To calculate potential profits, firms must combine their cost analyses with information on potential revenues from sales. The goal of a firm is to maximise economic profit. As you remember, normal profit is the return that a firm's owner could obtain in the best alternative business. Economic profit is a profit that a firm earns in excess of normal profit. If a firm cannot sell its product for more than its cost to produce, it will not be able to sustain. However, if the market gives the firm a price that is significantly greater than the cost it incurs to produce one unit of its product, the firm may have an incentive to expand its output. Large profits might also attract new competitors into the market.

Figure 2.7 shows a typical firm in this industry. The price $10 is determined by the interaction of many suppliers and demanders. The firm can sell its products only at this price, no less and no more. If the firm chooses to charge a higher price, given that its rivals are selling the same product, it will lose all its customers. The firm should not sell its product at a lower price, either; this strategy would have made sense if the firm had some of the capacity and the size to meet the needs of the customers lured from other firms, but it does not. These perfectly competitive firms are small; selling for less is not practical. Therefore, a perfectly competitive firm faces a demand curve that is horizontal at the market equilibrium price. In other words, the demand is perfectly elastic.

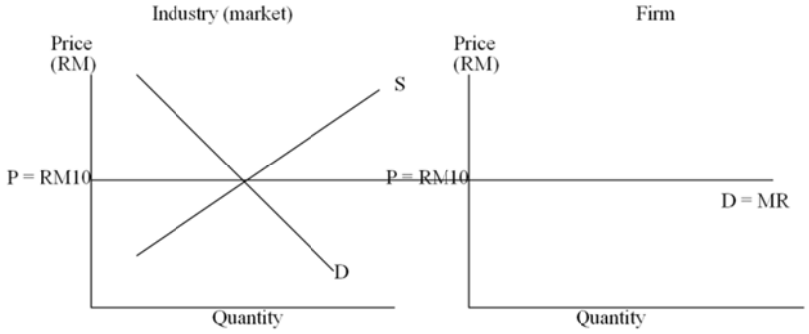


Figure 2.7

Table 2.6 supports this analysis. Suppose your 'Soft Diaper' business, discussed in section 2.1, was so successful that you decided to use your experience to expand your product line into adult clothing – men's shirts. Column 1 in the table shows different quantities of shirts sold by this new business that is named 'Men's Shirt Company'. For a price taker – a perfectly competitive firm – the quantity sold varies while the price remains constant ($10 in this example). Total revenue in column three is

obtained by multiplying price by quantity. Average revenue in column four is obtained by dividing total revenue by the quantity of output sold. The most important information here is given by marginal revenue, which is the change in total revenue caused by a one-unit change in quantity. For example, when output increases from four to five, total revenue increases from $40 to $50, so the marginal revenue is $10 ($50 – $40).

As also illustrated in the diagram, the firm's equal average and marginal products are in turn equal to the market price: MR = AR = P. Therefore, the firm demand curve is also its average revenue curve (AR). But, in this case and only in this case, the firm's demand curve is also its MR curve.

(1) Quantity Sold (Q) Shirts per day	(2) Price (P) per shirt	(3) Total Revenue (TR = P×Q)	(4) Average Revenue (AR = TR/Q)	(5) Marginal Revenue MR = ΔTR/ΔQ
4	$10	$40	$10	
5	$10	$50	$10	$10
6	$10	$60	$10	$10
7	$10	$70	$10	$10

Table 2.6 Men's shirt company

Output decisions: Short-run profit maximisation

You are now in a position to put costs and revenue together to find the output at which profit is maximised. As discussed earlier, the short run is a period of time in which each firm faces a constraint: its fixed input (capital) or its given plant. Furthermore, the number of the firms in the industry is also fixed. But many things can change in the short run, and the firm must be prepared to react to them: e.g., its price pattern over the course of the year.

Look carefully at the **Figure 2.8**. Once again we have the whole industry (market) on the left and a single representative firm on the right. Again the current market price is $10. To restate the basic questions introduced at the outset of this section – should this firm be in business and if so, how much of this product should the firm produce? To answer these questions and others, one needs to have the firm's cost functions. The two important curves are the marginal cost (MC) and average total cost (ATC) curve.

You can answer 'How much to produce?' by recalling the short-run profit maximising condition, MR = MC. As output increases, MR is constant because the price is constant (price taker) whereas, MC eventually increases. If the additional profit associated with another unit of output (MR) exceeds the additional costs associated with this unit of output (MC) – that is, MR > MC then profit increases. Contrarily, if MR < MC, then the extra revenue from selling an additional unit will fall short of the extra cost incurred to produce it and profit decreases. Therefore, if MR = MC, profit is maximised.

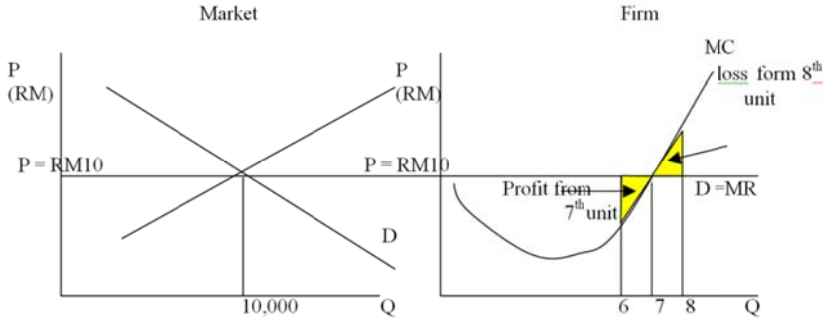


Figure 2.8

Now let us extend **Table 2.6**. In the extended table, **Table 2.7**, which retains three columns, Q, TR, and MR — there are more observations and also three new columns: Total Cost (TC), Marginal Cost (MC), and Economic Profit (TR-TC) as follows.

(1) Quantity Sold (Q) Shirts	(2) Price (P) per shirt	(3) Total Revenue (TR) (P×Q)	(4) Average Revenue (AR) (TR/Q)	(5) Marginal Revenue (MR) (ΔTR/ΔQ)	(6) Total Cost (TC)	(7) Marginal Cost (MC) (ΔTC/ΔQ)	(8) Economic Profit (TR–TC)
4	$10	$40	$4		$20		$20
				$10		$3	
5	$10	$50	$5		$23		$27
				$10		$5	
6	$10	$60	$6		$28		$32
				$10		$8	
7	$10	$70	$7		$36		$34
				$10		$13	
8	$10	$80	$8		$49		$31
				$10		$20	
9	$10	$90	$9		$69		$21

Table 2.7 Men's shirt company

Table 2.7 illustrates how as the company increases its output from four to five and to six and so on, marginal revenue remains at $10 while marginal cost increases from $3 for the fifth unit to $5 and all the way to $20 for the ninth unit. For the earlier units, because marginal revenue is greater than marginal cost, profit increases. Up to the seventh unit, (MR = P)> MC and profit increases. In fact, for the seventh unit, profit increases by $2 since MR is greater than MC by $2. At the eighth unit, however, diminishing returns push MC above MR and total profit drops (MR= P =RM10< MC = $13). Therefore, the profit maximising level of output is unit number 7. Column eight shows that profit increases from $20 to the maximum of $34 at the seventh unit, and from that point onwards, there is a descending trend.

Note that in the short run, there are three possible profit outcomes. If P (MR) > ATC, the Shirt Company makes economic profit. If P < ATC, the company makes a negative economic profit or an economic loss. If P =

ATC, then the firm makes normal profit and zero economic profit. This latter situation we referred to earlier as the break-even level of output. Two of these cases are illustrated below in **Figure 2.9**, panels (a) and (b).

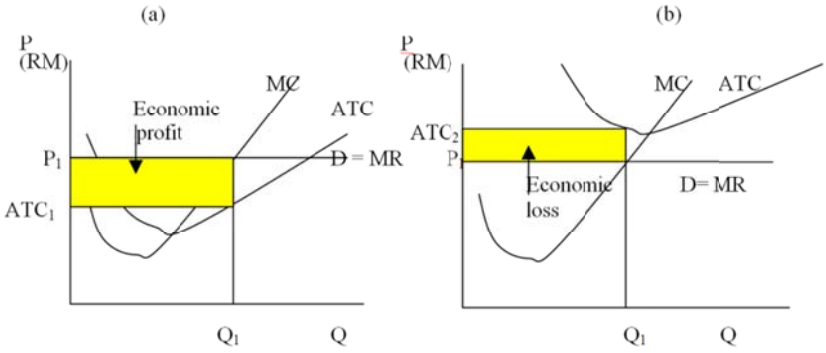


Figure 2.9

In Figure 2.9, panel (a) the firm earns economic profit whereas in panel (b) the situation is one of economic loss.

Study skills

1. Complete the following table, using the given information. The price of the product is $6 per unit.

Q	TC	TR	MC	MR
0	5	—	—	—
1	9	—	—	—
2	12	—	—	—
3	16	—	—	—
4	21	—	—	—
5	28	—	—	—

2. Referring to the table above, what is the profit-maximising output level?

   A. three units.

   B. four units.

   C. five units.

   D. two units.

3. At the profit maximising level of output in this table, the firm will make a total economic profit of —

   A. 24

   B. 30

   C. 2

   D. 3

Solution:

1. TR: 0, 6, 12, 18, 24, 30.

   MC : 0, 4, 3, 4, 5, 7.

   MR: 0, 6, 6, 6, 6, 6.

2. B. The fourth unit is the last unit for which MR exceeds MC.

3. D. At four units, the difference between total revenue ($24) and total cost ($21) is the largest. Therefore, economic profit of $3 is the highest that can be achieved.

The short-run supply curve

A perfectly competitive firm's MC curve is indeed the representative of alternative levels of output that the firm would be willing to supply at different prices: to be exact, it is the firm's supply curve. However an option exists for the firm to temporarily shut down if it is unable to cover either its fixed or its variable costs. To understand this point better, remember that when a firm shuts down, it avoids variable costs while continuing to incur its fixed costs, which are unavoidable in the short run. Production becomes pointless when a firm is unable to cover either fixed or variable costs. Therefore, if the firm's total revenue falls below its total variable costs, the firm should shut down. To state the point differently, the firm should shut down if its *price* falls below its average variable costs (P < AVC).

The shut down point for the firm is defined as a situation where the firm's total revenue is exactly equal to its total variable costs, or its price equals its AVC. The minimum point of AVC is the firm's shut down point, a point at which the firm revenue just covers its variable costs. At prices greater than the minimum AVC, of course, total revenue will be greater than total variable costs and the firm should produce, since it can cover not only its variable but also part of it fixed costs.

Thus, a firm's supply curve is the portion of its MC curve that lies above the minimum point of AVC.

Study skills

1. A firm makes an operating loss if —

   A. Price is less than average variable total cost.

   B. Price is less than average total costs but greater than average variable cost.

   C. Price is less than average variable cost.

   D. Price is less than average fixed cost.

2. If the firm shuts down in the short run, then —

   A. Total revenue will be zero, and total cost will be zero.

B. Total revenue will be zero, but total fixed costs will still have to be paid.

C. Total revenue will be zero, but total variable costs will still have to be paid.

D. Total profit will be zero, and total costs will be positive.

Solutions:

1. C. Variable costs are the ones that are actively incurred during the firm's operation.
2. B. In the short run, fixed costs have to be incurred, unrecoverably

Output decisions: Long-run optimisation

In the short run, a firm decides whether to produce or not and also if the decision is to produce, how much to produce. In the long run, the firm faces less constraint. Remember, long run is a time frame in which an existing firm can change the size of its fixed input (plant) – there are no fixed inputs – or to decide to leave the industry to avoid losses. By a similar token, in the long run, new firms can enter the industry in pursuit of profits.

As indicated earlier, in the short run, a firm might face three different possibilities: making an economic profit, taking an economic loss or breaking even. In the long run, however, a perfectly competitive firm, despite its short-run situation, cannot either run an economic profit or an economic loss. Indeed, the only outcome in the long run for a perfectly competitive firm is one in which the firm makes normal profit.

An industry in which firms are making an economic profit in the short run adjusts in two different ways. First, the number of firms in the industry increases. Second, the existing firms expand to take advantage of the profit. *Entry* by new firms is a rational decision by investors who respond to market incentives (signals) prompted by an economic profit. Meanwhile, economic profit also serves as the incentive (signal) to the existing firms to expand their existing operation.

The presence of short-run losses prompts a different set of rational responses. First, the number of firms in the industry decreases as some existing firms exit. Second, the existing firms contract the scale of their business.

Figure 2.10 illustrates the long run equilibrium for a perfectly competitive firm.

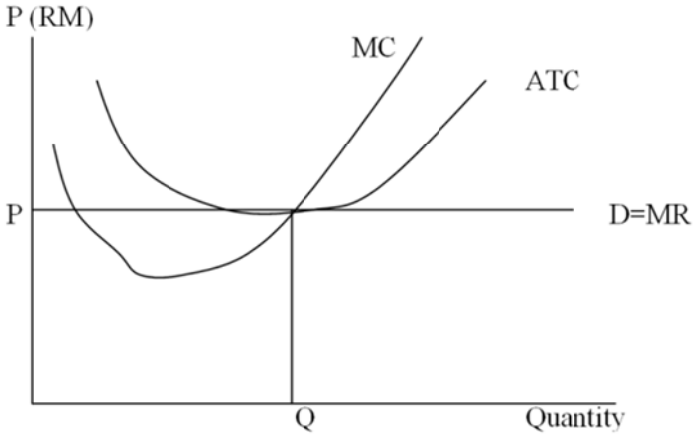


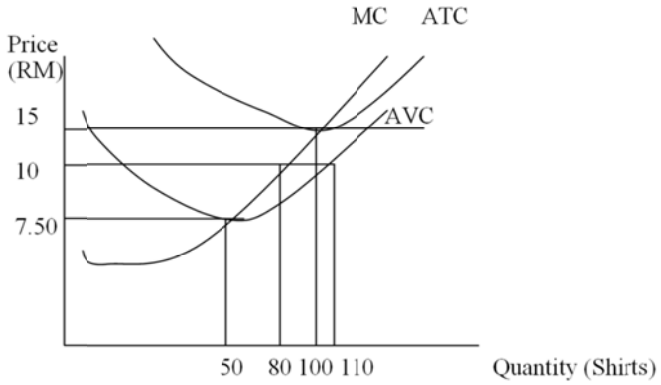
Figure 2.10

Study skills

1. A competitive profit maximising firm will enter a market if:
   A. Price exceeds minimum average cost.
   B. Revenue exceeds variable costs.
   C. Revenue exceeds fixed costs.
   D. Price exceeds minimum marginal cost.

2. All the following statements, except one, are true of long-run equilibrium in a competitive industry. Which is odd one out?
   A. The marginal firm is making zero profit.
   B. The marginal firm's price is equal to average cost.
   C. All firms determine output by equating price and marginal cost.
   D. Industry demand is not perfectly elastic.

Use the following figure to answer the following questions.



3. If the market price for shirts is $10, this firm should produce _____ shirts and can earn _____.

A. 70, and $1,500.

B. 80, and $1,500

C. 110, and $1,100.

D. 80, and $800.

4. If the market price is $15, this firm produces _____shirts and can earn _____economic profit.

A. 100, and $1,500.

B. 100, and $1,100.

C. 50, and zero.

D. 100 and zero.

Solutions:

1. A, because only in this case is the economic profit positive.
2. D. Industry demand is not perfectly elastic or horizontal. This is the kind of firm (price taker) whose demand is perfectly elastic).
3. D. Tracing the price $10.00 to the intersection with MC., you find the quantity to be 100 and total revenue $800.
4. D. Total cost is equal to total revenue at this price level. Again first find where P crosses MC.

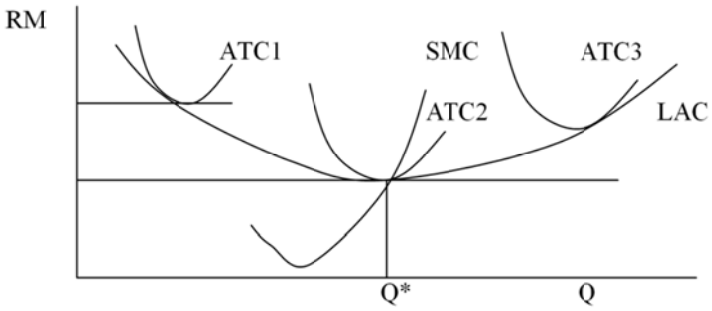


Figure 2.11

The short-and long-run dynamics of perfect competitiveness provide us with three key lessons for managers in a highly competitive market environment.

1. The reason the market price is high enough for firms to earn an economic profit is that the demand is high, the supply is low, or some combination of both. By now, smart managers have their firms established in such markets. This, however, requires the *entrepreneurial* skill of taking a risk before the competition enters the market.
2. When firms within the industry make economic profit, other firms will enter in order to invest and reap the benefits of the

opportunities. This movement, as we have seen, increases the supply and drives the price down. Economic profits will gradually disappear. Therefore, no firm can remain complacent.

3. Since perfectly competitive firms within an industry sell homogenous (identical) products, there is no strategy in competing on the basis of product differentiation. Therefore, advertising is not an option. The only way a firm under perfect competition can maintain profit is through keeping its costs as low as possible.

Price makers (imperfect competition)

All firms seek to obtain and expand market power, and many firms have some degree of such power. A minority of firms have significant market power and account for a large portion of the market, if not the entire market. To understand the market system, you need to know how the system functions when individual firms possess significant market power. Let us proceed by looking at monopoly. Next in the logical sequence is monopolistic competition, and you will conclude this study section by finishing the sequence and analysing oligopoly.

Monopoly

At the extreme opposite of a perfectly competitive market is one in which there is one seller of a particular product or service. When a firm is identified as a monopoly, it has considerable power to determine its price and output level. Such monopolies as public utilities are sanctioned by governments. Government and laws also provide companies with a monopoly for the duration of the patent on a particular product. Sometimes, circumstances allow a firm to enjoy temporary monopoly. For example, there may be only one store in a shopping mall that sells gourmet coffee. Whenever a firm has a monopoly in a particular market or markets, the economic theory states that it still must adhere to the MR = MC rule to maximise its short-run profit. Because it is a *price maker* rather than a *price taker*, we can no longer say that its price is equal to its marginal revenue. In a nutshell, a monopoly is an industry that produces a good or service for which no close substitute exists. There is only one supplier that is protected from competition, one way or another.

You can best understand the relationship between a monopolist's price and its marginal revenue by using the analysis of price elasticity presented earlier. Recall the graphs representing the difference between a perfectly competitive firm and industry. While the demand faced by the industry was downward sloping, the firm faced a perfectly elastic (horizontal demand curve). In this case, however, the monopolist is the industry itself — one seller. Therefore, with a demand curve that is downward sloping, the firm's marginal revenue line lies below its demand line.

We can show how a monopoly (a hairdresser, for example) would proceed to price her product by combining its cost structure with the type of demand and marginal revenue curve shown in **Table 2.8**.

(1) Quantity Sold (Q) Hairstyles per day	(2) Price (P)	(3) Total Revenue TR (P×Q)	(4) Average Revenue AR (TR/Q)	(5) Marginal Revenue MR (ΔTR/ΔQ)
1	$10	$10	—	—
2	$9	$18	$9	$8
3	$8	$24	$8	$6
4	$7	$28	$7	$4
5	$6	$30	$6	$2
6	$5	$30	$5	$0
7	$4	$28	$4	-$2
8	$3	$24	$3	-$4
9	$2	$18	$2	-$6
10	$1	$10	$1	-$8

Table 2.8 Hairdressing business

Table 2.8 shows that total revenue, column three, reaches a peak between units five and six. Marginal revenue, column five, is initially positive, up to the sixth unit, and subsequently becomes negative.

Note that average revenue, column four, is equal to price. **Figure 2.12** illustrates these relationships.

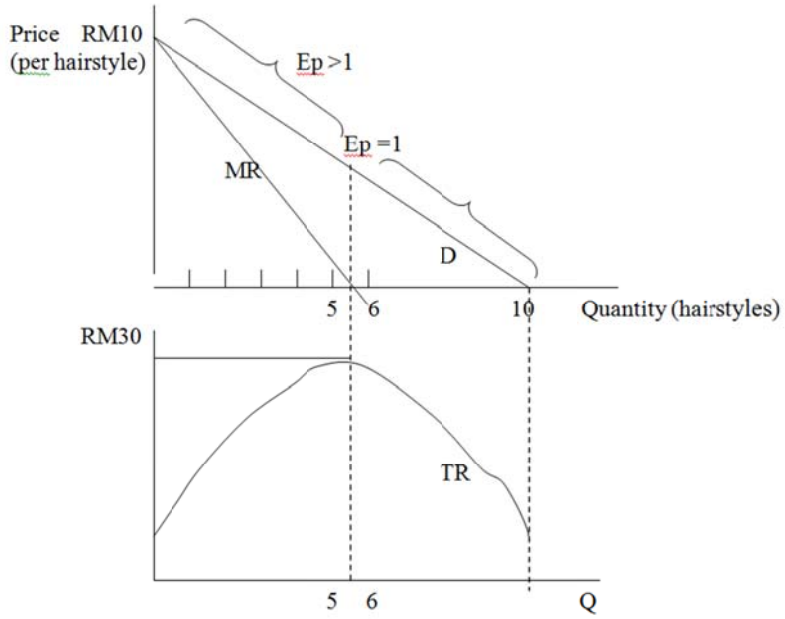


Figure 2.12

Table 2.8 also shows an important difference between perfect competition and monopoly. A monopolist's marginal revenue is always less than its price. The reason is that in order for the monopolist to sell an extra unit of output, the firm must cut its price, and the price cut applies to all units sold – the additional unit as well as all previous units. However, the addition to revenue from selling the extra unit is less than the price charged. In order to see this point, consider the following diagram, **Figure 2.13**. This figure shows the demand curve represented in **Table 2.8**.

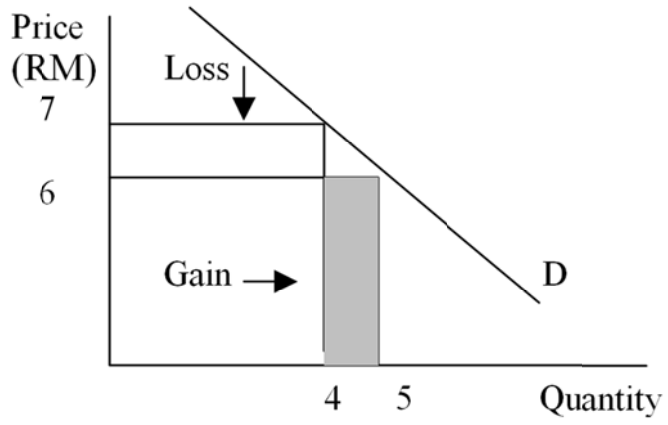


Figure 2.13

As you can see, when the prices are $7 and $6 respectively, total revenue is $28 and $30 respectively. Marginal revenue is, however, $2. In order to increase its sale by one unit from four to five, the monopolist must lower

its price from $7 to $6. However, the revenue generated is less than the price charged. The gain from selling the unit is the difference between the two shaded rectangles. The seller gains the checked area and loses the hatched area. The loss is equal to 6 × (5 − 4) = $6, while the gain is 4 × (7 − 6) = $4. Therefore, the net (extra or marginal) gain is 6 − 4 = $2, which is lower than the price charged $6.

Study skills

In a monopoly,

A. The market demand curve is above and steeper than the marginal revenue curve.

B. The market demand curve is the same as the marginal revenue curve.

C. The market demand curve is above and parallel to the marginal revenue curve

D. The market demand curve is above and flatter than the marginal revenue curve.

Solution:

D. The marginal revenue curve has the same intercept as demand but its slope is twice as much.

Short-run profit maximisation

Now that you have considered the revenue side of a monopoly firm, we can find out how a monopolist maximises its profit. **Figure 2.14** shows the same revenue conditions as in **Figure 2.13**. The profit-maximising monopolist will wish to expand output until marginal costs rise to equal marginal revenues. You noticed in the last section that the marginal revenue curve associated with a negative sloping linear demand curve has the same vertical intercept on the graph and *twice* the slope of the demand curve. **Figure 2.14** presents the market demand curve (D) faced by the monopolist and the corresponding marginal revenue (MR) curve. Superimposed on these are the cost curves of the monopolist – the short-run average cost (ATC) and marginal cost (MC) curves. The profit-maximising monopolist produces up to the point where marginal cost per unit rises to meet the falling marginal revenues. This point occurs at output level Q_m. Notice that every unit to the right of Q_m has a marginal cost greater than its marginal revenue; therefore it *will not* be produced. Conversely, every unit to the left of Q_m costs less than it earns (marginally or incrementally); it therefore *will* be produced and sold. The firm's profits can be visualised as the rectangle P_mABC.

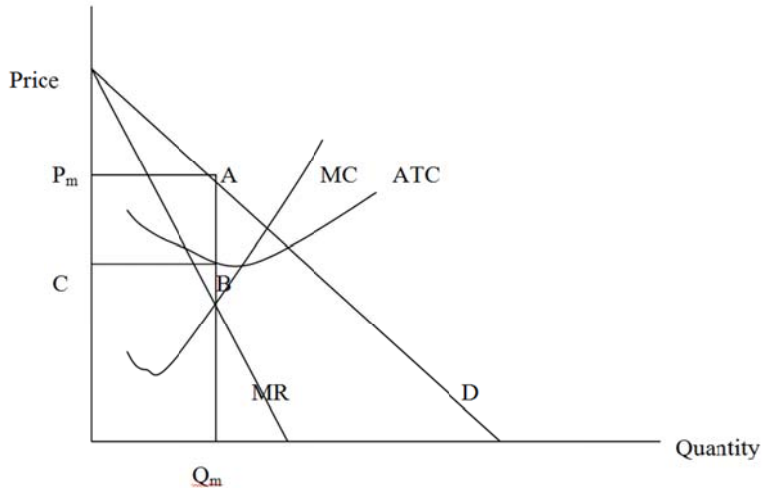


Figure 2.14

From a management viewpoint, the important implication of the monopoly model is that a firm in a position of monopoly in selling a good or service *should not* charge the highest price. Furthermore, we know that the right price is the one that helps equate the firm's marginal revenue with its marginal cost. In doing so, the firm will earn the maximum profit.

Monopoly in the long run

In a monopolised industry, as in a perfectly competitive one, losses and profits provide incentives for exit and entry. If the monopoly is suffering losses in the short run, it will continue to operate as long as it can cover its variable costs. In the long run, however, it will leave the industry unless it can find a scale of operations at which its full opportunity costs can be covered.

If the monopoly is making profits, others will wish to enter the industry in order to earn more than the opportunity cost of their capital. If such entry occurs, the monopoly's position shown in **Figure 2.14** will change, and the firm will cease to be a monopoly.

In order for positive monopoly profits to lead to the entry of new firms into the industry, these new firms must be able to enter the industry. This leads us to a discussion of *entry barriers*: impediments that prevent entry by other firms to the industry. These may be either natural or created. If monopoly profits are to persist in the long run, effective entry barriers must prevent the entry of new firms into the industry. Natural entry barriers typically arise as a result of economies of scale. When the long-run average cost curve is downward sloping over a large range of output, big firms have significantly lower cost per unit than small firms.

Natural barriers give rise to *natural monopoly*. Natural monopoly occurs when one firm can supply the entire market at lower average total cost than two or more firms can. This situation arises when the demand limits sales to a quantity at which economies of scale exist. Electrical power

transmission is a natural monopoly – a single set of power lines serving a given region will always be cheaper than two. **Figure 2.15** shows such a situation. Here the demand curve for electricity is D and average total cost is ATC.

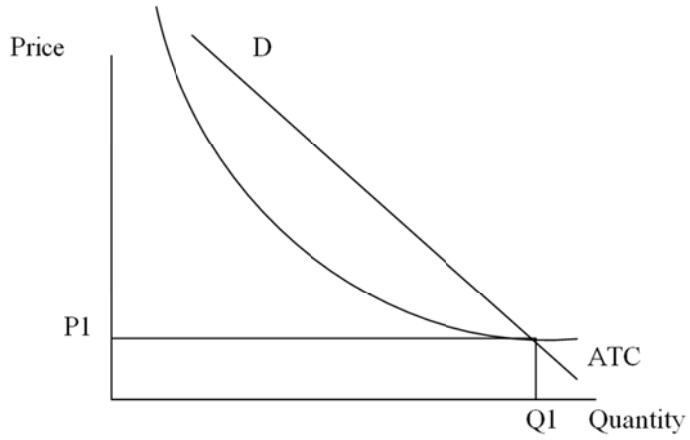


Figure 2.15

Another type of natural barrier is *setup cost*. If the firm could overcome its costs of entering the market, developing its products and establishing such things as its brand image and its dealer network – which is typically huge – then its entry into the market could prove successful and profitable. However, this is usually not the case and normally the incumbent firm will be free of this threat.

As discussed earlier, many entry barriers are created by conscious government action and are therefore condoned by it. Patent laws, for instance, may prevent entry by conferring on the patent holder the sole legal right to produce a certain product for a specific period. The best example is the case of pharmaceutical companies.

Monopoly versus perfect competition

In terms of welfare and efficiency, monopoly does poorly relative to perfect competition. A monopoly makes economic profit by charging a high price. Therefore, consumers and monopolists tend to have diametrically opposed standpoints on the desirability of a monopoly.

This section discusses the fact that there is more to this issue than just simply a redistribution of income. In the process of this transfer of income from consumers to the firm, there will be a net loss.

You are well prepared now to see the impact on price and quantity of a monopoly by comparing them with price and quantity in a perfectly competitive market. To do this, consider what would happen if a perfectly competitive market were transformed into a monopoly. The market demand and supply curves for the bottled-water industry are shown in **Figure 2.16**. Remember that the supply curve is the same as the MC cost curve under perfect competition. In this case, we are assuming a

horizontal MC curve. Equilibrium for a competitive market occurs at the intersection of these curves, point A. If the industry becomes one large company, the market demand curve remains the same despite the change in the market structure.

With the transformation to a monopoly, the demand curve for the entire market becomes the business's demand curve. There is a significant change, however. Now that the business is a monopolist, its price (given by the demand curve) and its marginal revenue are no longer equal. Instead, the marginal revenue curve falls below the demand curve, as was the case before.

Next, consider supply. Recall that a perfect competitor's supply curve shows the quantity of output supplied by the business at each possible price and is represented by a portion of the marginal cost curve. In turn, the market supply curve is the sum of all supply curves of businesses in the market. After the change to a monopoly, production facilities remain the same as before: inputs originally owned by the perfectly competitive producers are now in the hands of one business. When the monopolist combines the cost figures for these various facilities, it finds a marginal cost curve that is merely an extension of the perfectly competitive supply curve shown in **Figure 2.16**.

The bottled-water monopoly's profit-maximising output occurs where the new marginal revenue and marginal cost curves intersect, point B. At this output level, the price is found at point C on the demand curve. Thus, with the transformation from perfect competition to monopoly, bottled water becomes more expensive, (P_m versus P_{pc}), and fewer bottles, (Q_m versus Q_{pc}) are produced.

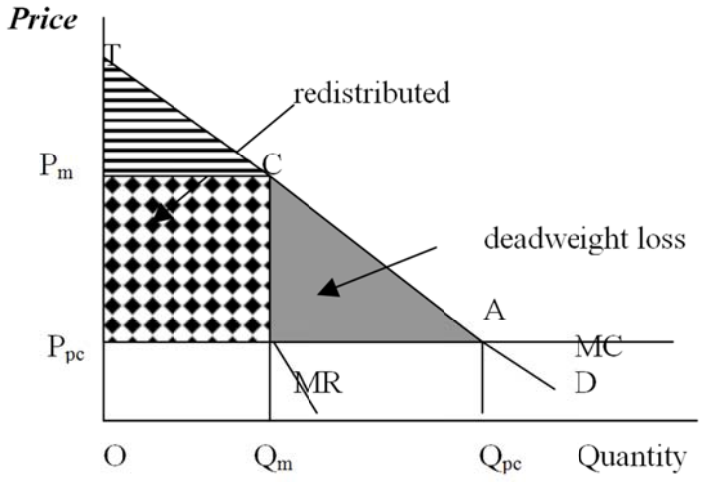


Figure 2.16

Allocative efficiency

As you see, monopoly status restricts output and sets a higher price than perfect competition, so it moves wealth from the consumers to the seller.

Therefore, from the perspective of fairness and equity, the society is better off with perfectly competitive industries than monopolies. However, whether monopoly is inferior to perfect competition from the perspective of efficiency is a different matter.

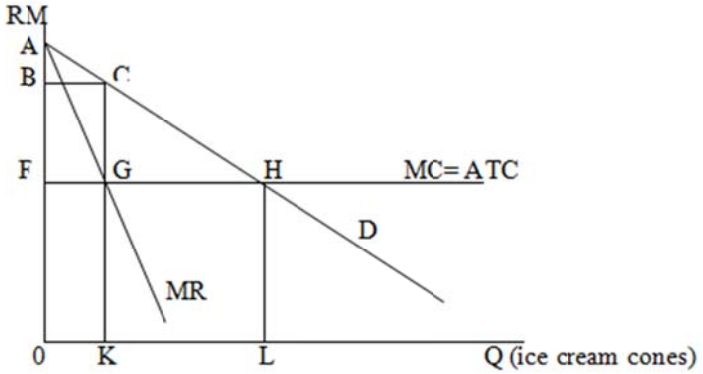
Figure 2.16 can be employed again to illustrate this point. Under perfect competition, consumers pay P_{pc} for each unit bought. The maximum price that consumers are willing to pay for each unit is derived differently. It is shown by (the height of) the demand curve (D), which measures the value of the good to the consumers. The value minus its price is *consumer surplus*. In terms of **Figure 2.16**, consumer's surplus is represented by the triangular area TAP_{pc} – the area between the price line and the demand curve.

When the monopoly replaces perfect competition charging a higher price, P_m, consumer surplus is reduced to the shaded patterned with diamond shapes. The monopoly gains in the form of higher profit – shown with stripes. But is the monopolist's gain equal to the consumer's loss? Again, if the gain by the seller had been equal to the loss to the buyers, you could view the monopoly practice of charging a higher price and restricting quantity as merely redistributive. But there is more to this. A closer look at **Figure 2.16** shows that the loss to the consumers is greater than the gain to the monopolist. Some of the losses to the buyers are accrued to the seller as depicted by the square pattern. While this represents a loss to the consumers, it is not a loss to the society as whole since the loss to one group is offset by the gain of the other. The net gain (or loss) equals zero.

However, the rest of the loss in consumer's surplus, caused by the monopoly's restriction of output, is *lost*. The total loss resulting from the lower monopoly output is the shown by the grey triangle. This area is also referred to as the *deadweight loss* to the society, which measures the allocative inefficiency associated with the monopolistic practice.

Study skills

Use the following diagram (market for ice cream) to answer the following questions. Initially this industry is perfectly competitive and fixed cost is equal to zero.



1. If the ice cream becomes a monopoly, the monopolist will charge a price of _____ per ice cream and produce ____ cones of ice cream.

A. B dollars and L cones

B. B dollars and K cones

C. F dollars and K cones

D. F dollars and L cones

2. If the ice cream becomes a monopoly, the monopolist's profit is equal to —

A. ABC

B. BFGC

C. CGH

D. GHKL minus BFGC

3. If the ice cream becomes a monopoly, the loss in social welfare is equal to —

A. ABC

B. BFGC

C. CGH

D. GHKL minus BFGC

Solutions:

1. B. A perfectly competitive industry would produce L and charge F dollars. The monopolist will reduce output to K and will raise the price to B.
2. B. The monopolist will reduce output to K, will charge B and will face an average cost of F. Its profit is price minus average cost times quantity, or BFGC.
3. C. The area CGH is the loss in consumer's surplus not gained by the monopolist.

Price discrimination

As you have analysed the behaviour of monopolies so far, there has been an assumption that the monopoly charges the same price to all customers. In some circumstance, however, a firm may be able to sell the same product to different customers for different prices even though the costs of producing for the two customers are the same. This practice is called *price discrimination*. Before looking at such behaviour, note that price discrimination is not possible when a good is sold in a competitive market. In a competitive market, there are many firms selling the same good at the market price. No firm is willing to charge a lower price to any customer because the firm can sell all it wants at the market price. And if any firm tried to charge a higher price to a customer, that customer would buy from another firm. For a firm to discriminate in its pricing, it must have some market power.

There are numerous examples of price discrimination. Movie theatres charge different prices for different customers: lower price for students and senior citizens or to those who attend in the afternoon and on certain weeknights versus weekends, etc. Another form of price discrimination sets different prices for different quantities (volumes). Examples of this type would include bulk buying: the larger the order, the larger the discount. Another form of price discrimination occurs when a firm charges a different price for each unit sold and charges each consumer the maximum price that he or she is willing to pay for that unit.

The first and most obvious lesson is that price discrimination is a strategy for a profit-maximising monopolist. In other words, by charging prices to different customers, a monopoly can increase its profit. In essence, a price-discriminating monopolist charges each customer a price closer to willingness to pay than is possible with a single price. The second lesson is that price discrimination requires the ability to separate customers – geographically or sometimes by age or income – according to their willingness to pay.

Study skills

1. The following is an example of price discrimination: True/ False?

   A monopolist charges a higher price for its daytime customers than its night-time customers because the cost of production is greater during the day'.

2. The following is an example of successful price discrimination: True/False?

   A monopolist is selling its product to two different groups of customers who can easily buy the product in a lower-price market for a quick resale in the higher-price market'.

Solutions:

1. False. Price discrimination is the practice of charging different prices for reasons not associated with costs.

2. The discrimination monopolist must be able to separate its markets to be able to successfully practice price discrimination. This is especially critical for goods. Services do not usually pose a serious problem since by nature they are not easily transferable.

Social benefits of monopoly

Monopoly yields neither allocative nor productive efficiency as compared to competitive firms. However, in certain cases, a monopolist may incur either higher or lower unit cost than that incurred by competitive firms. There are two reasons why costs may differ, namely (1) economies of scale, and (2) technological advance in the long-un.

Economies of scale

When economies of scale are extensive, a large number of competitive firms, producing at the minimum efficient level, may not be able to meet the market demand. In this situation, an industry of one or two firms would have a lower average total cost than would the same industry made up of several competitive firms. At the extreme, a single firm or a natural monopoly might be able to attain the lowest long-run average total cost. For example, extensive economies of scales always display in some firms relating to new information technologies such as computers, notebooks, computer software and Internet services. As these firms have grown, their long-run average total costs have decreased because of greater use of specialised inputs, the spreading of product development costs and learning by doing. This has substantially reduced the average total costs of the firms.

Invention and innovation

Monopolists can lower their costs through the discovery and implementation of new technology in the long run. If monopolists are more likely than competitive firms to develop more efficient production techniques over time, then inefficiency of monopoly might be overstated. Moreover, monopolists may seek technological advance to restrict new firms enter into the market. In this situation, technological advance is important to the maintenance of monopoly.

Government policy toward monopoly

Collusion is an agreement made by few firms or producers to charge the same price or otherwise not compete among each other. In the United States, for example, government policies with respect to monopoly and collusion are embodied in the **antitrust laws**. Antitrust laws are laws and/or regulations aimed at eliminating collusion and promoting competition among firms. A number of laws have been implemented to regulate the behaviour of monopolies.

1. **Antitrust laws and antitrust enforcement**

   The first law regulating monopolies in the United States was the Sherman Act (1890), which was designed to encourage competition and avoid the formation of monopolies. The Sherman Act is aimed to regulate firms that had combined to form trusts. Trusts enabled firms to collude. After the Sherman Act was passed, trusts disappeared, but the term '**antitrust laws**' continues to be used to refer to laws aimed to eliminate collusion among firms. To address loopholes in the Sherman Act, Congress passed the Clayton Act (1914) and the Federal Trade Commission Act. Under the Clayton Act, a merger is prohibited or defined as illegal if its effect tends to cause "substantially to lessen competition, or to tend to create a monopoly." The Federal Trade Act established the Federal Trade Commission (FTC), which was given rights to monitor and regulate unfair business practices.

3. **Mergers: The trade-off between market power and efficiency**

   The U.S. federal government regulates mergers because if firms gain market power by merging they may incur inefficiency of the market by raising prices and reducing output. In particular, the government is most concerned with **horizontal mergers**, which are mergers between firms in the same industry. **Vertical mergers** are between firms at different stages of production of a good.

4. **The Department of Justice and Federal Trade Commission merger guidelines**

   The Economics Section of the Antitrust Division of the Department of Justice was established in 1973 to evaluate the economic consequences of proposed mergers. Subsequently, merger guidelines were developed by the Department of Justice and the FTC in 1982. The guidelines made it easier for firms proposing a merger to understand whether the government would allow the merger. These guidelines focus on three main issues, namely market definition, the measure of market concentration, and merger standards.

5. **Regulating natural monopolies**

   If a firm is a natural monopoly, competition will not play its role of forcing prices down to the level where the firm earns zero economic profit. Policy makers usually set prices for natural monopolies. To achieve economic efficiency, regulators may require that the monopoly charge a price equal to its marginal cost. However, this strategy has a weakness when the firm's average total cost curve is still falling when it crosses the demand curve. If the firm charges a price equal to marginal cost, price will be less than average total cost and the firm will suffer a loss. Hence, the policy makers will set the price equal to the level of average total cost so that the natural monopoly will break even.

Monopolistic competition

Monopolistic competition is a cross between perfect competition and monopoly. It has most of the characteristics of a perfectly competitive firm: a large number of sellers, fairly easy entry and exit into and out of markets, and knowledge of market participants about the prices being offered by the sellers. A key characteristic that makes it monopolistic is the ability of sellers to differentiate their product. For example, brand names, packaging, advertising, location, etc. all help a product appear to be different from the competition. This differentiation enables a firm to charge a higher price than its competitors, if it so desires.

In monopolistic competition markets, the firm must choose a price knowing that the consumer has many close substitutes to choose from. If the price is too high, in view of the consumer's perception of the value of the differentiating features of the firm's product, the consumer will purchase a competing firm's product instead. Thus the monopolistic competitor must expect a relatively elastic demand response to changes in

its price level. Yet at the same time, it expects to be able to change price without causing any other firm to retaliate and consequently, without causing a change in the general price level in the market. This is possible because the firm is one of many firms, and it expects the impact of its actions to be spread imperceptibly over all the other firms, giving no one firm any sufficient reason to react to the initial firm's price change.

In other words, monopolistic competition can change price up and down without experiencing the extreme response of pure competition. For price increases it will suffer loss of sales, but this loss is not total as it would be for the pure competitor. Like a monopoly, the monopolistic competitor can adjust the price upward or downward to the level that maximises its profits. However, similar to the pure competitor, the monopolistic competitor has many rivals in the short run, compounded by the free entry of new firms in the long run.

Monopolistically competitive markets are found where a large number of vendors gather to sell similar products to a gathering of potential buyers. The weekly fruit and vegetable market in some communities may be characterised as monopolistic competition. Similarly, the gatherings of artisans selling souvenirs and other goods in tourist resorts act like monopolistic competitors. Other examples of monopolistic competition are small retail businesses such as florists, pharmacies, restaurants and dry cleaners. For instance, some Chinese restaurants try to offer food from different regions of China. The neighbourhood pharmacist tries to get to know all his or her customers by name.

Short-run profit maximisation

Figure 2.17 shows the case of a profit-maximising monopolistically competitive firm within the industry. The demand and marginal revenue curve are similar to those in monopoly, represented by d and mr respectively. The industry demand curve is given by D. The firm's demand curve is obviously flatter than the industry's demand curve since, for instance, a drop in the price charged by a firm increases the quantity demanded by as much as the firm, with its elastic demand curve, is able to lure away some of the customers of other firms. However, for the industry as a whole, the response of the quantity to the same price cut cannot be as much (there is lower price elasticity) since the industry includes all sellers (firms), including all those who lost customers and the one that gained mostly at the expense of others.

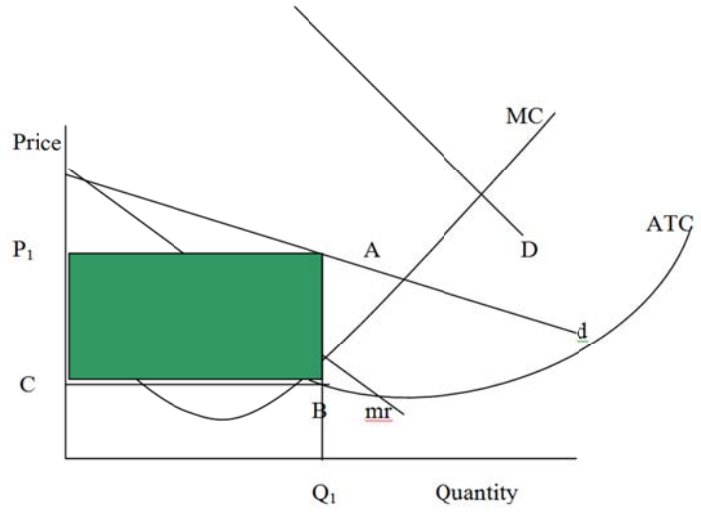


Figure 2.17

The situation of a representative firm in monopolistic competition is depicted in **Figure 2.17**. Since the demand curve has a negative slope, the marginal revenue curve must lie below the demand curve, having twice the slope and the same intercept point. The monopolistically competitive firm maximises its profits at the price and output level where marginal revenue equals marginal costs. Thus, price will be set at P_1 and quantity at Q_1; *profits* are shown as the area P_1ABC.

Nothing, however, guarantees that a firm in a monopolistically competitive industry will earn economic profits in the short run. **Figure 2.18** shows what happens when a firm with the same cost curves faces a weaker market demand. Even though the firm follows the rule of profit maximisation by setting marginal revenue to marginal costs, it might face an *economic loss*. The loss is shown by the rectangle P_2DEF – the striped area.

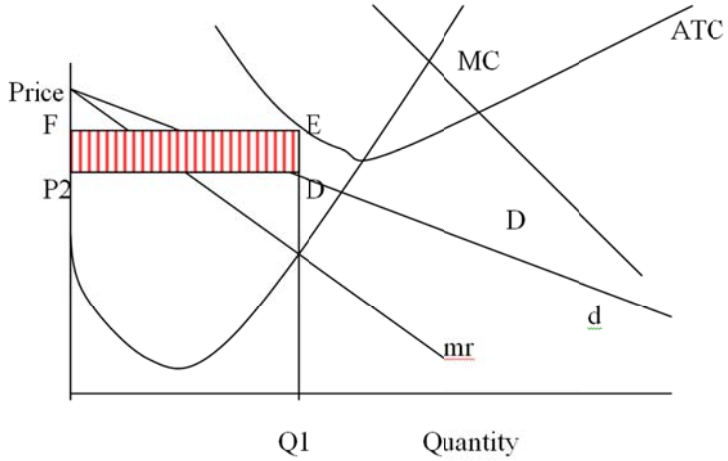


Figure 2.18

Study skills

1. Unlike a monopolist, a monopolistically competitive firm —
   A. can earn positive economic profit in the short run but not in the long run.
   B. has a downward sloping marginal revenue curve.
   C. can never cover its minimum average cost in the long run.
   D. may sell to many buyers.

2. In monopolistic competition, when profits are being maximised, the price —
   A. equals marginal revenue.
   B. exceeds marginal cost.
   C. is less than marginal revenue.
   D. equals marginal cost.

3. The monopolistically competitive firm's demand curve will be _____ elastic than that of the perfectly competitive firm. The monopolistically competitive firm's demand curve will be downward sloping,_____the market demand curve in perfect competition.
   A. more, like.
   B. more, unlike.
   C. less, like.
   D. less, unlike.

Solutions:

1. A. Easy entry into the market will compete away any short-run economic profits.
2. B. To maximise profits, MR = MC. Because price exceeds MR, P exceeds MC.
3. C. Given product differentiation, the degree of substitutability will be less than it is in perfect competition. The market demand curve is downward sloping in this market structure, whereas the firm's demand curve is horizontal in perfect competition.

Long-run optimisation

In analysing monopolistic competition, our key assumption is that entry and exit are free in the long run. Firms can enter the industry when there are profits to be made and depart when they face economic losses. Therefore, the difference between this situation and the one faced by a pure monopoly is that the *monopolistic competitor cannot expect to earn an economic profit indefinitely*. As soon as other firms notice that it is possible to earn an economic profit in a particular market, they will quickly try to move in. Their entry will cause the demand curve facing our representative firm to decrease (shift to the left) because the

newcomers will be taking a certain amount of its business away. This shift continues until profits are eliminated, when the demand curve slips to the average total cost curve. Graphically, this is the point at which the demand curve and the average total cost are tangent (that is, the point at which they just touch and have the same slope). **Figure 2.19** shows a monopolistically competitive industry in long-run equilibrium. At Q* and P*, price and average total cost are equal and there are *no economic profits or losses*. Note that tangency occurs at the profit-maximising level of output, where marginal revenue is equal to marginal cost.

A different sequence occurs if a monopolistically competitive firm starts with losses, but the market will arrive at the same long-run equilibrium. Suppose that there are too many video stores in a small town and none of them is able to make a profit. Eventually, there will be a shakeout: some firms will be forced to leave. Therefore, for the remaining firms, the market share (demand) increases and their demand curves will shift to the right. These shifts will continue until the losses for the surviving firms are eliminated. Graphically, it means a tangency between demand and average cost curve and the same long-run equilibrium as develops when a firm starts in a profit-earning position.

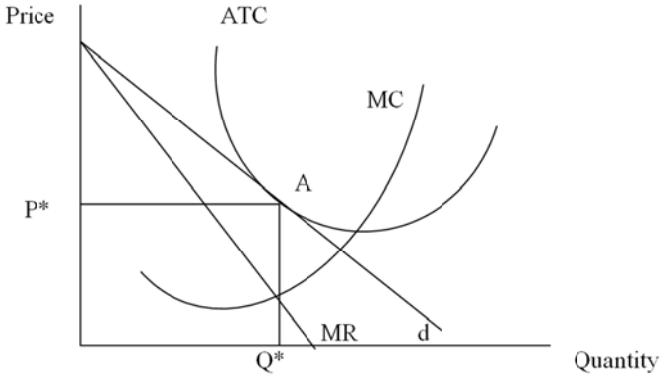
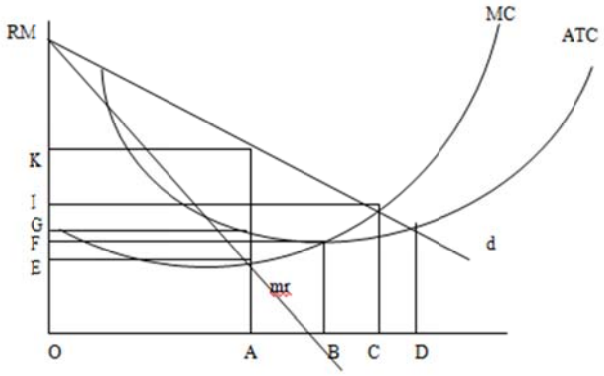


Figure 2.19

Study skills

Use the diagram to answer the following questions. This diagram depicts a monopolistically competitive firm.



1. In the short run, the profit-maximising output level is —
   A. OA.
   B. OB.
   C. OC.
   D. OD.
2. In the short run, the profit-maximising price is —
   A. OE.
   B. OF.
   C. OG.
   D. OK.
3. In the short run, this firm will earn a total economic profit of —
   A. OA×OG.
   B. OA×OK.
   C. OA×GK.
   D. OA×EK.
4. In the long run, this firm's demand curve will shift to the ____ and become more _____
   A. right, inelastic.
   B. right, elastic.
   C. left, inelastic.
   D. left, elastic.
5. In the long run, this firm's marginal revenue curve will shift to the _____ and become more ____
   A. right, inelastic.
   B. right, elastic.
   C. left, inelastic.
   D. left, elastic.

Solutions:

1. A. This is the output level where MR = MC.
2. D. Use the demand curve to determine price.
3. C. Total economic profit equals (P -ATC) x Q.
4. D. Each firm will lose some of its market share as firms enter the industry. Demand will become more elastic because of the larger number of substitutes.
5. D. The reason is that as more firms enter the industry, each firm's market share drops (there is a reduction in the

demand faced by each individual firm). Therefore, the firm's demand and marginal revenue curves will fall (shift to the left). Also, with a larger number of firms now operating in the industry, the demand curve faced by each firm is more elastic. Each has less control and hence its marginal revenue curve will also become flatter or more elastic.

The firm in an oligopoly

The determination of price, output and profit is not as simple in an oligopolistic market as in the three other types of market. Firms in an oligopoly might sell a standardised product: steel, a microchip processor, aluminium, chemicals such as hydrochloric acid; paper products and so on. They might also sell a differentiated product such as soft drinks or cars. The key characteristic distinguishing this market and the other three is the relatively small number of competing firms. There is no rule in economic theory for the minimum number of firms that qualify a market as an oligopoly.

Regardless of how few firms there are in a market and what percentage of market share is held by the top firms, the most important implication for firms in an oligopoly is that the pricing practices in this type of market are named by a condition known as *mutual interdependence*. This means that each firm must set its price on the basis of its costs, demand elasticity and of the anticipated reaction by its competitors. In other words, just following the MR = MC rule may not be enough to maximise profit.

Another crucial feature of oligopoly is the existence of barriers to entry. Unlike monopolistic competition, oligopoly involves various barriers to the entry of new firms, with variation from industry to industry.

Oligopolists are typically pulled in two different directions:

1. The interdependence of firms may make them wish to collude with each other. Unless the law prohibits it (as is usually the case), they tend to get together and act as a single seller or monopoly to maximise their joint profits. At least explicitly, most of the time firms do not collude, partly from fear of criminal charges and partly because of the lack of trust discussed below.
2. Alternatively, they will be tempted to compete with their rivals to gain a bigger share of industry profits for themselves. The two policies, however, are incompatible. The more fiercely firms compete to gain a bigger share of profits, the smaller these shares will be. Competition drives down the price and hence will drive down the potential profits.

Pricing under oligopoly

When firms under oligopoly engage in collusion, they are agreeing on prices, market share, advertising expenditure, etc., to reduce the

uncertainty they face and to banish the spectre of competitive price-cutting or retaliatory advertising, both of which could reduce total industry profits.

Cooperative or collusive mechanisms

A formal (explicit) collusive agreement is called a cartel. The cartel will maximise profits if it acts like a monopoly: if the members behave as if they were a single firm. **Figure 2.20** illustrates a cartel.

The total market demand curve is shown with the corresponding market MR curve. The cartel's MC curve is the horizontal sum of the MC curves of its members. Profits are maximised at Q1 where MC = MR. The cartel must therefore set a price of P1 (at which Q1 will be demanded).

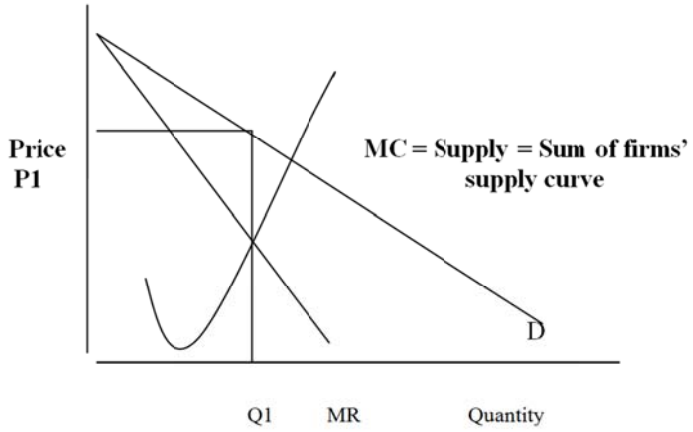


Figure 2.20

Having agreed on the cartel price, the members will then divide the market among themselves.

Each member would be given a quota. The sum of all the quotas must add up to Q1. If the quotas exceeded Q1, either there would be output unsold if price remained fixed at P1 or the price would fall.

In many countries, cartels are illegal, as they are depicted by the government as a means of driving up prices and profits and thereby as being against the public interest.

Where explicit collusion is illegal, firms may simply break the law, or get round it. Alternatively, firms may stay within the law but still implicitly collude by watching each other's prices and keeping theirs similar. Firms may *implicitly* agree to avoid price wars or aggressive advertising campaigns.

Another form of *implicit* collusion occurs when firms set the same price as an established leader. The leader may be the largest firm: the firm that dominates the industry. This is known as *dominant firm price leadership*. Alternatively, the price leader may simply be the firm with the lowest

cost, known as *low-cost price leadership* or, one that has emerged over time as the most reliable one to follow: the one that is the best barometer of market conditions. This is known as *barometric firm price leadership*. In these scenarios, regardless of the type of leadership, one firm leads the way and will be followed within a relatively short time by all or most of the other firms. The price leader is the firm that is willing to take the risk of being the first to adjust prices, but this firm has usually a good reason to expect that other firms will follow suit.

Non-cooperative (Competitive) mechanism

Collusion (implicit or explicit) is not the only reason for every competitor charging the same price. In fact, one important model of competition in oligopolies is the model that explains why mutual interdependence leads to the same price being charged among competitors: *the kinked demand curve*. The kinked demand curve model shows that if firms expect rivals to match a price cut but not price increases, then they are unlikely to change price or quantity.

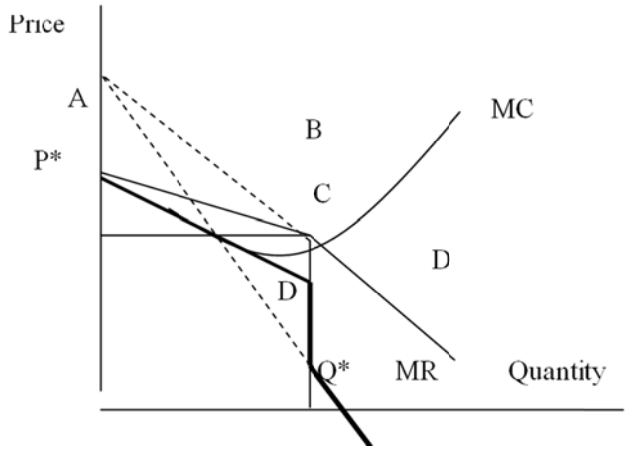


Figure 2.21

Figure 2.21 illustrates the essential aspects of this theory. Notice that at the given price P*, the demand curve is kinked in the sense that its slope is not continuous. The portion of the demand curve above the price is much more elastic than the portion below the price. This is because each competitor anticipates that if it increased its price, none of the other competing firms would follow. If this is indeed the case, the firm that has raised its price stands to lose a considerable amount of market share (there being an elastic demand curve). The lower portion of the kinked demand curve is rather inelastic because each competitor is assumed to anticipate that the lowering of its price would bring about retaliatory price reductions from the other competitors.

The main intent of lowering prices in an oligopoly is to gain market share at the expense of the other competitors. If every firm lowers its price, none would gain very much market share. In fact they may all end up selling about the same amount as before but at lower price unless their

price cuts help to stimulate total market demand. This would depend on the price elasticity of the industry demand.

The upshot is that the kinked demand curve helps to explain why firms in an oligopolistic market tend to charge the same price. However, the *kinked demand curve model* does not explain how the market price around which the kinked curve lies is actually determined.

The price stability can be shown by drawing in the firms' marginal revenue curves. The marginal revenue curve appropriate to this demand curve has two different segments. The upper segment relates to the elastic portion of the demand curve, while the lower segment relates to the inelastic portion of the demand curve. At quantities below Q*, the MR curve corresponds to the flat (elastic) part of the demand curve, starting from the same point where the demand curve intercepts the vertical axis: A. At quantities greater than Q*, however, the MR curve corresponds to the steep (inelastic) portion of the demand curve and starts at C. To see how this is constructed, imagine a extending the steep part of the demand curve back to the vertical axis.

This and the corresponding MR are shown by the dotted lines in **Figure 2.20**. Therefore, you will note that there is a vertical discontinuity in the marginal revenue curve, shown as the gap CD.

Other important models of competition, discussed below, explain instances when oligopolists cannot cooperate (collude), implicitly or explicitly. The nature of competition, however, varies from industry to industry.

- When firms produce homogenous products and/or are committed to producing a given amount of output, as in the case of industries where fixed costs are high and changing capacity is very expensive, there is quantity or *Cournot* competition. An example of this situation is the steel industry.
- When they produce differentiated products and/or the cost of increasing capacity is low, competition takes the form of price competition or *Bertrand* competition. Airlines belong in this category.

Oligopoly and the prisoner's dilemma

Strategic situations form the subject matter of game theory. Formal game theoretic modelling is beyond the scope of this course. However, there is one very simple game theoretic structure that captures the basic oligopoly incentive problem very well: the prisoner's dilemma. Consider a two-firm industry (a duopoly) in which firms may charge either a high (collusive) price or a low price. Note that this setting is different from the Cournot model in two aspects. First, firms are choosing price rather than quantity. Second, their choice is discrete in that they have only two prices to choose from. In the Cournot models, firms can choose any one of a large number of possible quantities. Despite these differences, however; the incentive structure of this game is similar to the Cournot model.

Let us assume that oligopolists can engage in two different strategies: high prices, which we will refer to as a cooperative strategy, and low prices (a non-cooperative strategy). If both firms cooperate or charge high prices, both firms do well, essentially sharing in monopoly profits. If one firm charges a high price and the other does not, the defector takes most of the sales in the market and does very well but the other firm does very poorly. If both firms charge lower prices, both make modest profits. This payoff structure is illustrated in the following box or matrix, known as a pay-off matrix.

As indicated in **Table 2.9**, the first element in each cell is Firm l's profit (or payoff); the second element is Firm 2's profit. Combined profits are highest under the strategy of mutual cooperation (collusion). In this case, each will earn a profit of 50. However, if, Firm 1 believes that Firm 2 intends to charge the collusive price, then Firm 1 has an incentive to defect, for by charging a lower price, it can raise its profit from 50 to 100. Furthermore, even if Firm 1 believed that Firm 2 was likely to defect, then the best strategy would be to defect also, because by doing so Firm 1 gets 30, while if it remains true to the agreement, it will get nothing. Similar reasoning applies to Firm 2. Thus, for each firm, no matter what the other does, its best strategy is to defect – charge low prices. A strategy that is best no matter what the rival does is referred to as a *dominant* strategy. It is likely, that mutual defection will be the outcome even though the firms could earn significantly more by colluding. The outcome of the mutual defection strategy is called *Nash equilibrium*; given the strategy chosen by the rival, each firm is doing the best it can.

		Firm 2	
		High price	Low price
Firm 1	High price	50,50	100, 0
	Low price	0, 100	30,30

Table 2.9

The original version of the prisoner's dilemma dealt with two suspects in a crime rather than two firms. In the original version, each prisoner was induced to confess (defect) in the hope of getting a lighter sentence even though both suspects would do best if neither confessed. If firms (or prisoners) had to make single, once-and-for-all choices, it is hard to believe they would do anything other than defect. If, however, the interaction between the firms is repeated, the chance is much better of maintaining cooperation. In a repeated game, there is an incentive to cooperate if the firms believe that cooperation in this period will bring forth cooperation from the rival in the next period, while defection today will induce defection by the rival next period. Thus, cooperation may be maintained in a repeated game, although if one firm believes it may not be around next period, or if the one-period gains from defection are very high, then defection will result.

It is fortunate for consumers that oligopoly situations include the aspect of prisoner's dilemma as this maintains reasonably vigorous levels of competition even when only a few firms are involved. We cannot say in general how much competition is enough, but, as indicated above, even industries with only a few firms can be highly competitive. There are many alternative theories of how oligopolies behave.

Pricing strategies in imperfectly competitive markets

Limit pricing

Market theory reveals that monopolists set profit-maximising prices where MR = MC. At this optimal price level, the monopolists will maximise their profit level. In practice, markets are dynamic and monopolists must remain sensitive to the possibility of entry by new competitors. In some circumstances, it make sense for monopolists to forego higher short-run profits if pricing moderation will forestall competitors' entry and boost long-run profitability. In this situation, monopolists may implement a pricing strategy called limit pricing to retard the entry of new competitors. Limit pricing is a competitive strategy to set a less-than-optimal price (where MC = MR) in an effort to deter market entry by new competitors.

Network externalities

Affinity programmes for restaurant dining and flyer programmes for the airlines reflect the fact that many firms are always able to create a customer lock-in effect that produce long-run benefits. Customer lock-in effects are close-linked with network externalities that yield to significant first-mover advantages. Network externalities refer to the advantages of production tied to widespread adoption of a physical or economic standard. In the railroad industry, for example, customers are linked using railroad rights of way with a consistent gauge of track. The benefits of a consistent physical network are so important that trains could not run if different railroad companies required different gauges of track.

Market penetration pricing

Market penetration pricing is a strategy of setting very low initial prices to create a new market or enlarge market share in a well-developed market. The main purpose of this pricing strategy is to benefit a critical mass of customers, create good network effects and establish a viable market or business. For example, in the computer software market, Microsoft is well-known to have sold initial versions of PC-based software programs at promotional prices in order to attract a large base of enthusiastic customers. Once a large customer base is created, Microsoft increases prices to gain higher profit margins as switching computer software becomes more difficult or costly once use has become widespread throughout a firm or organisation.

Advertising

A firm in a monopolistic market with a differentiated good is required to ensure that its customers know how its good is different from its

competitors, even when the difference is marginal. One of the strategies is to use advertising and packaging. Firms in monopolistic competition spend huge amounts in advertising to ensure that customers appreciate and value the differences between their own goods and those of their competitors. Advertising in magazines, newspapers, television, radio and the Internet are the main channels for promoting their goods or products.

One of the main objectives of advertising is to provide a signal to consumers of a high-quality product or create a brand name for their product. In general, a brand name gives information to customers about the quality of a product, and is an incentive to the producer to achieve a high and consistent quality standard. Advertising and brand name benefit the customers in terms of product differences and quality and enable a better product choice to be made.

Activity 2.2

Activity

Think of three different products or services and estimate roughly how many firms are there in the market. Identify whether 'the market' is local, national or international. In what ways do the firms compete in each of the cases you have identified?

Module summary

Summary

You have reviewed the production function which is governed by the law of diminishing marginal returns in the short run that results in the marginal product curve that is hill-shaped. The total and average product curves are also hill-shaped because of their connections with changes in marginal product. Marginal cost is inversely related to marginal product. The marginal cost curve is shaped like the letter 'J'. Average fixed cost has a negative slope and is flatter at higher output levels. Average variable cost has a saucer-shaped curve that reaches its minimum where it crosses the marginal cost curve. The curve for average cost is saucer-shaped and reaches a minimum where it intersects the marginal cost curve. Economic cost includes the opportunity cost of all the factors of production and a normal rate of return for the owners of the firm. A business could have increasing, constant, and decreasing returns to scale. The long-run average cost curve is saucer-shaped reflecting ranges first of increasing, then constant and finally decreasing returns to scale.

You have also seen that a perfectly competitive individual firm has no control over its price. In the short run, a perfectly competitive firm should produce if its product price exceeds its average variable costs. In perfect competition, free entry and exit ensure that an individual firm in a long-run equilibrium situation makes neither economic profit nor loss. A natural monopolist is a monopolist whose ATC is declining over the entire relevant range of market demand for which economies of scale exist. A monopolist can make an economic profit that will not be competed away in the long run. Production of a monopoly is undesirable from the point of view of the society because the monopolist causes a deadweight loss to the society. Price discrimination is the practice by a monopolist for reasons not associated with the cost conditions. Market structure of monopolistic competitive industry is a cross between a monopoly and perfect competition. To understand oligopoly industry, it is important to relate to concepts of cartel, collusion, Prisoner's Dilemma and Cournot competition.

In the following study units, you will be looking at economy in aggregate of national income, inflation, unemployment, business cycle, aggregate demand, aggregate supply and their equilibrium.

Assignment

Assignment

1. What is the relationship among a firm's total revenue, profit, and total cost? How are they related?
2. Give an example of an opportunity cost that an accountant might not count as a cost. Why would the accountant ignore this cost?
3. How and why does a firm's average-total-cost curve differ in the short run and in the long run?
4. Define economies and diseconomies of scale and explain why they might arise.
5. Production processes may be labour-intensive or capital-intensive. To achieve productive efficiency, what criterion must a firm apply in choosing the production process to produce a certain quantity of output?
6. Which costs—economic costs or accounting costs—include both explicit costs (payments to those outside the business) and implicit costs (opportunity costs owners sustain by running the business)?
7. How do economists measure profitability?
8. What is the name of the market structure when one firm supplies the entire market?
9. What does the demand curve facing the firm in perfect competition look like?
10. What does the demand curve facing the firm in imperfect competition look like?
11. How is the marginal curve drawn in relation to the demand curve in imperfect competition?
12. What is the relationship between the demand facing a monopolist and the industry demand within which the monopolist operates?
13. Is it true that compared to perfect competition, monopolies produce more output and charge higher prices?
14. How can firms continue to earn pure profits in the long run?
15. What is the relationship between the elasticity of the monopolist's demand and how much its price exceeds marginal cost?

Assessment

Assessment

Use the following information for the next two questions. You are making plans to establish a car wash business. Your research has isolated four distinct methods of production, each of which will produce the same number of clean cars.

Technique	Units of Capital	Units of Labour
A	2	20
B	4	15
C	6	11
D	8	8

1. If the hourly price of a unit of capital is $60 and the hourly wage is $6, which production technique should you choose in order to minimise costs; A, B, C, or D?

2. Which is the most labour-intensive method of production: A, B, C, or D?

3. Use the following **table** for this question.

Number of Workers	Marginal Product	Total Product	Average Product
1	12		
2	16		
3	14		
4	13		
5	10		

   A. Complete the total product and average product columns.

   B. With which worker do diminishing returns occur?

   C. Graph the marginal and average product curves.

4. 'When marginal product is decreasing, average product is constant.' Is this statement true or false? Why?

5. Your friend operates a variety store that provides an annual revenue of $480,000. Each year he pays $25,000 in rent for the store, $15,000 in business taxes, and $350,000 on products to sell. He estimates he could put the $80,000 he has invested in the store into his friend's restaurant business instead and earn an annual 20 per cent profit on his funds. He also estimates that he and his family could earn a total annual wage of $90,000 if they worked somewhere other than the store.

   A. Calculate the total explicit costs and total implicit costs of running the variety store.

B. What is the accounting profit of the variety store?

C. What is the economic profit?

D. In what way is economic profit superior to accounting profit as an indicator of the overall performance of this business? Given the advantages of economic profit as a performance indicator, explain why the concept of economic profit is not often used in accounting.

E. Should your friend consider closing down this business? Why?

6. Identify each of the following short-run costs as either variable or fixed:

   A. Depreciation charges for a construction firm.

   B. Lumber costs for a pulp-and-paper producer.

   C. Property insurance for a restaurant.

7. How does the law of variable proportions (decreasing returns to scale) differ from the law of diminishing returns to labour?

8. Distinguish between economies of scale and scope.

9. Daily production for Pot-Works, a flowerpot maker, varies with the number of workers employed, as shown in the table below.

Short-run Production for Pot-Works			
(1) Labour	(2) Total Product (pots/day)	(3) Marginal Product (pots/day)	(4) Average Product (pots/day)
0	0		
1	100		
2	280		
3	510		
4	560		
5	540		

   A. On one graph, draw the total product curve. On another graph, draw the marginal product and average product curves. Explain the relationships between these curves.

   B. On your graphs, identify the ranges where marginal product rises, where marginal product falls and is positive, and where marginal product is negative.

10. Suppose Honda's total cost of producing four cars is $225,000 and its total cost of producing five cars is $250,000. What is the average total cost of producing five cars? What is the marginal cost of the fifth car?

11. How do returns to scale influence the size of businesses in certain industries?

12. All of the following, except one, are true of the competitive model. Which is the odd one out?

    A. Marginal revenue equals market price.

    B. The firm cannot raise the market price without losing all its customers.

    C. The firm can sell as much as it wants at the market price.

    D. The firm is a price taker.

    E. The firm faces a downward-sloping demand curve.

13. When the demand curve facing the firm is downward sloping, marginal revenue is less than price because:

    A. the firm can sell more units without lowering its price.

    B. the firm can only sell more units by lowering its price.

    C. a very large number of firms are producing essentially the same product.

    D. if the firm raises its price, it loses all its customers.

    E. the firm is behaving as a price taker.

14. A pure monopoly is best defined as a firm—

    A. selling a product for which there are no close substitutes.

    B. making short-run economic profits.

    C. with a degree of market power.

    D. with a downward-sloping demand curve.

    E. all of the above.

15. Which of the following is not a barrier to entry?

    A. patent rights.

    B. ownership of private property.

    C. the possession of a government franchise.

    D. substantial economies of scale.

16. A monopolist who is producing where MR is less than MC should—

    A. increase production.

    B. reduce price.

    C. reduce production.

    D. produce where price is equal to marginal cost.

17. The profit-maximising monopolist must decide all of the following

except—

A. output level.

B. price level.

C. the wage level.

D. the combination of inputs.

18. A monopoly is currently maximizing profits. We can conclude that—

A. it is maximising total revenue and minimising total cost.

B. it has reduced the difference between marginal revenue and marginal cost to zero.

C. it is maximising total revenue and marginal revenue.

D. D. it is producing at a point in output where marginal revenue equals average cost.

19. A natural monopoly is usually regulated to produce an output level such that—

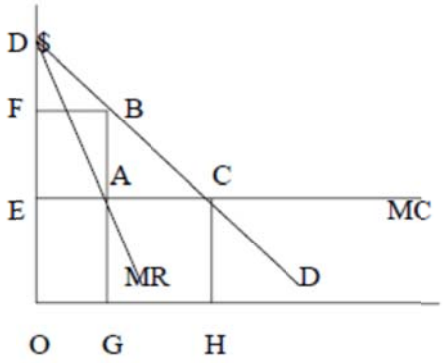
A. P=MC.

B. MR=MC.

C. P=ATC.

D. MR = ATC.

Use the diagram below to answer the next six questions.



20. When perfectly competitive industry becomes a monopoly, price will _____ and quantity will _____

A. fall to E, fall to G.

B. fall to E, rise to H.

C. rise to F, rise to H.

D. rise to F, fall to G.

21. With a profit-maximising monopolist, the net loss of social welfare is shown by area—

A. BDF.

B. BAC.

C. EABF

D. DCE.

22. To preserve the monopoly, this firm would be willing to spend up to—

A. FBCE.

B. BAC.

C. FBAE

D. ABDC.

23. If this industry was initially perfectly competitive and then became a monopoly, the amount of consumer surplus transferred to the monopoly is shown by the area—

A. DBC.

B. ABC.

C. FBCE.

D. BAE.

24. If this industry were perfectly competitive, consumer surplus would be shown by the area—

A. ABC.

B. DCE.

C. FBAE.

D. FBCE.

Assessment answers

1. Technique — Total Cost

   A — 2 x $60 + 20 x $6 = $240

   B — 4 x $60 + 15 x $6 = $330

   C — 6 x $60 + 11 x $6 = $426

   D — 8 x $60 + 8 x $6 = $528

   Therefore, A is the least expensive technique and hence it is to be chosen. A is the least costly because labour is much cheaper than capital.

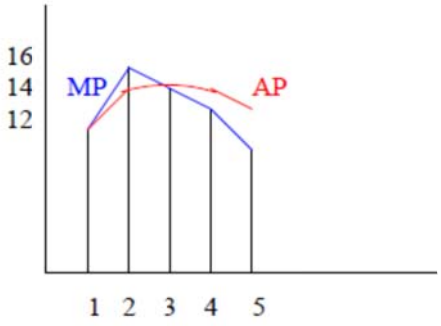
2. Clearly A is the answer. This is compatible with the answer to the previous question.

3. A.

Number of Workers	Marginal Product	Total Product	Average Product
1	12	12	12
2	16	28	14
3	14	42	14
4	13	55	13.75
5	10	65	13

   B. With the third worker MP_L begins to diminish.

   C. Diagram



4. False. When MP is decreasing, AP could be rising or falling.

5. A. Explicit costs = $25,000 + $15,000 + $350,000 = $390,000

   Implicit costs = ($80,000 x 0.2) + $90,000 = $106,000

   B. Accounting Profit = TR – Explicit costs = $480,000 - $390,000 = $90,000

   C. Economic Profit = TR – Total costs (explicits + implicits) = $480,000 − ($390,000 + $106,000) = −$16,000

D. Economic profit is superior in that it is obtained after all costs, including opportunity costs of time and capital, are accounted for. Any business decision should be based on this notion. Economic profit is hard to measure because the forgone alternatives (opportunity costs) are normally difficult to pinpoint with accuracy, as they are market-driven and tend to fluctuate. It is true that sometimes an effort to determine opportunity costs could be subjective.

E. Yes. My friend will be better off working for someone else and depositing the capital investment in a financial institution instead.

6. A. fixed

   B. fixed

   C. variable

   D. fixed

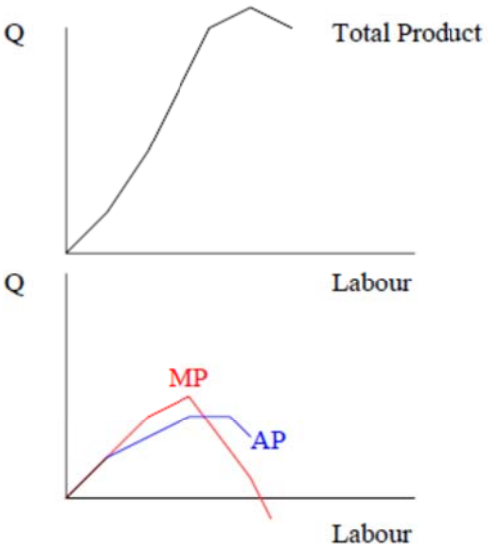
7. The law of decreasing returns is a long-term phenomenon; the law of diminishing returns to labour is short-term. The former occurs when all inputs are flexible and changed at the same time, whereas the latter is caused by keeping capital fixed while changing labour.

8. Economies of scale arise when average cost of production decreases as the level of production increases. Economies of scope arise when the cost of producing two products jointly is less than the cost of producing them separately.

9. A.

Short-run Production for Pot-Works			
(1) Labour	(2) Total Product (pots/day)	(3) Marginal Product (pots/day)	(4) Average Product (pots/day)
0	0	0	0
1	100	100	100
2	280	180	140
3	510	230	170
4	560	50	140
5	540	-20	108

Diagrams:



B. MP rises between 0 and the third unit of labour. It falls with unit 4 and becomes negative with unit 5.

10. Average total cost = $\frac{Total\ cost}{5} = \frac{\$250{,}000}{5} = \$50{,}000$

Marginal cost of 5th unit = 250,000 −225,000 = $25,000.

11. When firms face increasing or constant returns to scale they can expand while taking advantage of falling or constant costs. In the former, decreasing average costs enable the firm to drive competitors out of the market and capture a bigger share of the market. This way the firm grows in size to become one of the small number of remaining firms(if not the only one). Industries such as auto, chemical, and pharmaceutical fall into this category.

12. E is the answer. A perfectly competitive firm faces a flat demand curve.

13. B

14. E

15. B

16. C

17. C

18. D

19. C

20. D

21. B
22. C
23. D
24. B