

11 Must the LRAC curve be U-shaped?

Whereas a firm's short-run average total cost (SRATC) curve *must* be U-shaped (providing the law of diminishing returns eventually operates), its *long-run* average cost (LRAC) curve *may* be U-shaped, but it does not have to be. Instead, the shape of the LRAC curve is determined largely by whether or not the firm experiences increasing, constant or decreasing returns to scale. A commonly occurring LRAC curve is L-shaped. This curve, illustrated in Figure 3.5, results from a situation in which increasing returns to scale give way beyond the minimum efficient scale (MES) size of firm to constant returns to scale (and to constant long-run average costs), without decreasing returns to scale (and diseconomies of scale) setting in.

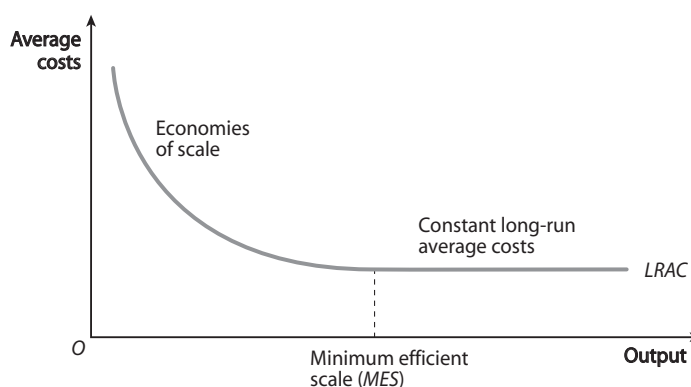


Figure 3.5 The L-shaped long-run average cost curve and minimum efficient scale (MES)

Chapter 4

Revenue theory and market structures

1 Distinguish between total revenue, average revenue and marginal revenue.

Total revenue is the total income a business receives from selling the goods and services it produces.

Average revenue is total revenue divided by the average price consumers pay for a good. Provided the price is the same whatever the quantity the firm is selling, average revenue = price. However, this is not the case when perfect price discrimination takes place. In this situation each and every customer pays a different price for the good, namely the maximum price they are prepared to pay.

Marginal revenue is the addition to total revenue when one more unit of the good is sold.

2 State the formulae for average revenue and marginal revenue.

$$\text{average revenue} = \frac{\text{total revenue}}{\text{output}} \quad \text{or} \quad AR = \frac{TR}{Q}$$

$$\text{marginal revenue} = \frac{\Delta \text{total revenue}}{\Delta \text{output}} \quad \text{or} \quad MR = \frac{\Delta TR}{\Delta Q}$$

3 Why is a perfectly competitive firm's average revenue curve horizontal?

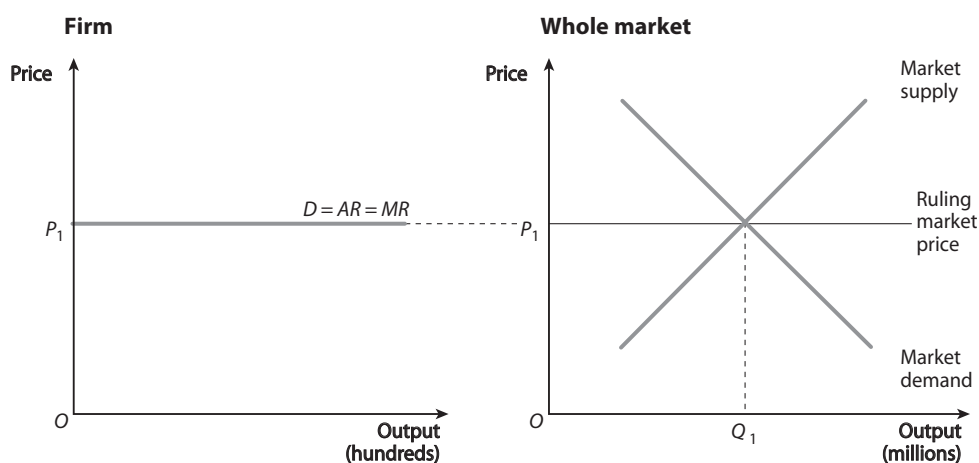


Figure 4.1 A firm and the whole market in conditions of perfect competition

In a perfectly competitive market, in which there are many firms, each firm within the market is a passive price taker at the ruling market price determined at the intersection of the market demand and supply curves shown in the right-hand panel of Figure 4.1. The ruling market price is P_1 . However much a firm (shown in the left-hand panel of the diagram) produces, the price it charges is P_1 . As I explained in my answer to Question 1, provided the price is the same whatever the quantity the firm is selling, average revenue = price. A perfectly-competitive firm's AR curve is therefore the horizontal price line facing the firm.

4 Explain the three parts of the mathematical relationship between the average and marginal values of an economic variable.

Consider a premiership football team that has played four games so far in the football season. The team has scored two goals in each game (and eight goals in total). The team's average score per game is obviously two, as is its marginal score (the number of goals scored in the last game played). But in its next game, the fifth game, the team scores seven goals, which now becomes the marginal score. The marginal score pulls up the average score to three (15 divided by five).

These figures are an example of the following relationship below:

When the marginal value of a variable $>$ the average value of the variable, the average must rise.

Returning to the football team, in its sixth game no goals at all are scored. The marginal score is thus zero and this pulls down the average score to 2.5 (15 divided by six). This is explained by the relationship below:

When the marginal value of a variable $<$ the average value of the variable, the average must fall.

From the two relationships above, I can now deduce the following:

When the marginal value of a variable = the average value of the variable, the average is constant, or remains the same.

It is vital for students to learn and understand the three examples of the relationship between the average and marginal values of a variable. The four most common applications of the relationship in the context of the theory of the firm are shown in Figure 4.2.

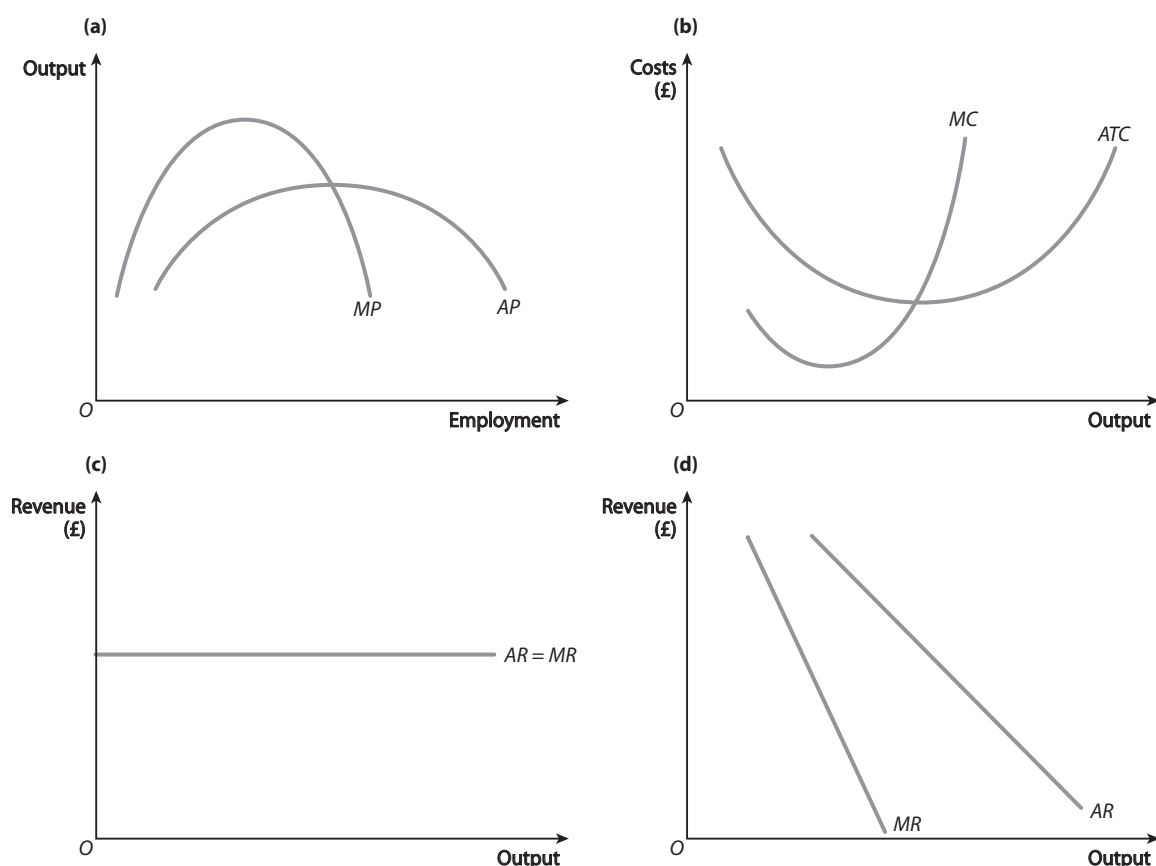


Figure 4.2 Averages and marginals and the theory of the firm

Panel (a) of Figure 4.2 shows the marginal product of labour curve cutting through the average product of labour curve at its highest point. Panel (b), which is the obverse of panel (a), illustrates a firm's marginal cost curve cutting through from below the firm's average total cost curve, with the result that the latter is U-shaped. Panels (c) and (d) both show the relationship between average and marginal revenue curves – in perfect competition in panel (c), and in monopoly in panel (d).

5 Explain the relationship between average revenue and marginal revenue in monopoly.

The relationship between the average and marginal revenue curves in monopoly is shown in panel (d) of Figure 4.2 above. Because a monopolist's demand curve slopes downward to the right (being the market demand curve), an extra unit of output can only be sold by reducing the price at which *all* units of output are sold. Total sales revenue *increases* by the area *k* in Figure 4.3, but *decreases* by the area *h*. Areas *k* and *h* respectively show the revenue gain (namely the extra unit sold multiplied by its price) and the revenue loss resulting from the sale of an extra unit of output. The revenue loss results from the fact that in order to sell one more unit of output, the price has to be reduced for *all* units of output, not just the extra unit sold. Marginal revenue, which is the revenue gain *minus* the revenue loss ($k - h$), *must* be less than price or average revenue (area *k*).

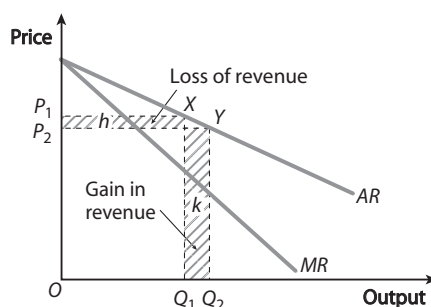


Figure 4.3 How a monopolist's MR curve is derived from its AR curve

Now in the top half (elastic section) of the AR curve, the area *k* is *always* larger than the area *h*, as Figure 4.3 illustrates. This means that *MR* is always *positive* under the top half of the AR curve. However, the reverse is true under the bottom half of the demand curve. In this situation, demand is inelastic, with the result that the equivalent area *k* is *always* smaller than the equivalent area *h*. Marginal revenue is now negative. The final point to note is that provided the monopolist's *MR* curve is linear (i.e. a straight line), the curve is twice as steep as the monopolist's *AR* curve. Marginal revenue falls to zero at the point where the *MR* curve cuts through the horizontal (output) axis of the diagram.

6 How does price elasticity of demand change when moving along a firm's average revenue curve in perfect competition and monopoly?

Price elasticity of demand measures the proportionate change in quantity demanded following an initial change in the good's price. At AS, students learnt that price elasticity of demand is measured by using the following formula:

$$\text{price elasticity of demand} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in the good's price}}$$

In perfect competition, each and every firm in the market faces a perfectly elastic demand curve for its output, shown by the horizontal ruling market price determined where market demand equals market supply in the market as a whole. This means that price elasticity of demand does *not* change (it equals negative infinity) as a firm changes its output and moves along the horizontal *AR* (and *MR*) curve.

In monopoly, by contrast, price elasticity of demand falls from point to point, moving down the monopolist's *AR* curve – providing the curve is linear (a straight line). Demand is price elastic at all points on the top half of the *AR* curve, inelastic at all points on the bottom half of the demand curve, and unit elastic (neither elastic or inelastic) at the point exactly half way down the demand curve shown in Figure 4.4 below:

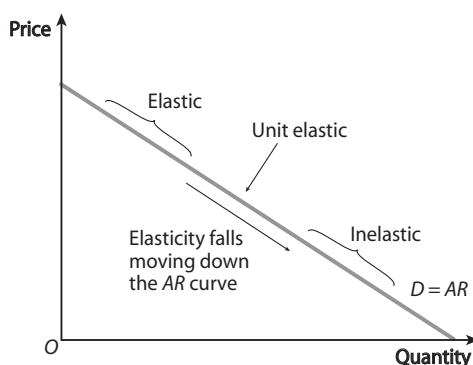


Figure 4.4 Price elasticity of demand falling as a monopolist increases its output