Background to Supply: Production and Costs

Production

Production refers to the output of goods and services produced by businesses. To simplify the idea of the **production function**, economists create a number of **time periods** for analysis.

1. **Short run production**

The **short run** is a time period when there is **at least one fixed factor input**. This is usually capital such as machinery and technology. In the short run, the output of a business expands when more variable factors such as raw materials and extra workers are brought into use

2. **Long run production**

In the long run, **all of the factors of production can change** allowing a business to change the **scale of its operations.**

The long run for a retail business such as Pret a Manger will be different from the long run for the power generation industry. The long run is when all factors of production are variable – there are no fixed factors!

The length of time between the short and the long run will vary from industry to industry. For example, how long would it take a newly created business delivering sandwiches around a local

town to move from the short to the long run? Let us assume that the business starts off with leased premises to make the sandwiches; two leased vehicles for deliveries and five full-time and part-time staff. In the short run, they can increase production by using more raw materials and by bringing in extra staff as required. But if demand grows, it wont take the business long to perhaps **lease** another larger building, buy in some more capital equipment and also lease some extra delivery vans – by the time it has done this, it has already moved into the long run!

The point is that for some businesses the long run can be a matter of weeks! Whereas for industries that requires expensive capital equipment which may take months or perhaps years to become available, then the long run can be a sizeable period of time.

Productivity and the law of diminishing returns

Productivity is a measure of the efficiency of a factor input. The basic measure of productivity is output per person employed. There is a difference though between marginal and average productivity:

Marginal product (MP) = Change in total output from adding one extra unit of labour

Average product (AP) = Total output divided by the total units of labour employed

In the example below, a business hires extra units of labour to produce a higher quantity of wheat. The table below tracks the output that results from each level of employment.

Units of Labour Employed	Total Physical Product (tonnes of wheat)	Marginal Product (tonnes of wheat)	Average Product (tonnes of wheat)
0	0	n/a	n/a
1	3	3	3
2	10	7	5
3	24	14	8
4	36	12	9
5	40	4	8
6	42	2	7
7	42	0	6

Diminishing returns occurs when the **marginal product of labour starts to fall**. In the example above, extra labour is added to a fixed supply of land when a farming business is harvesting wheat. The marginal product is maximized when the 4th worker is employed. Thereafter the output from new workers is falling although output continues to rise until the seventh worker is employed.

Explaining the law of diminishing returns

The **law of diminishing returns** occurs because factors of production such as labour and capital inputs are **not perfect substitutes** for each other. This means that resources used in producing one type of product are not as efficient when switched to the production of another good. For example, workers employed in producing glass for use in the construction industry may not be as efficient if they have to be re-employed in producing cement or kitchen units. We say that factors of production such as labour and capital can be "**occupationally immobile"** i.e. they can be switched from one use to another, but with a loss of productivity.

There is normally an **inverse relationship** between the productivity of the factors of production and the **unit costs** of production for a business. When productivity is low, the unit costs will be higher. It follows that if a business can achieve higher levels of efficiency, there may well be a benefit from lower costs and higher profits.

Costs of production

Costs are **expenses faced by a business** when producing a good or service. Every business faces costs and these must be recouped if a business is to make a profit. In the short run a firm will have **fixed** and **variable costs** of production.

(1) Fixed Costs

These costs do not vary directly with the level of output. Examples of fixed costs include:

1. Rent paid on buildings and business insurance premiums
2. The depreciation in the value of capital equipment due to age
3. The costs of staff salaries
4. Interest charges on borrowed money
5. The costs of purchasing new capital equipment

(2) Variable Costs

Variable costs **vary directly with output**. Examples of variable costs for a business include the costs of raw materials, labour costs and other components used directly in the production process. The greater the total volume of units produced, the lower will be the fixed cost per unit as the fixed costs are spread over a higher number of units. This is one reason why **mass-production** can bring down significantly the unit costs for consumers – because the fixed costs are being reduced continuously as output expands. In our example below, a business is assumed to have fixed costs of £30,000 per month regardless of the level of output produced. The table shows total fixed costs and average fixed costs (calculated by dividing total fixed costs by output).

Output (000s)	Total Fixed Costs (£000s)	Average Fixed Cost (AFC)
0	30	
1	30	30
2	30	15
3	30	10
4	30	7.5
5	30	6
6	30	5

When we add variable costs into the equation we can see the **total costs** of a business. The table below gives an example of the short run costs of a firm

Output Units	Total Fixed Cost TFC (£s)	Total Variable Cost TVC (£s)	Total Cost TC (£s)	Average Total Cost ATC (£ per unit)	Marginal Cost MC (£)
0	100	0	100		
20	100	40	140	7.0	2.0
40	100	60	160	4.0	1.0
60	100	74	174	2.9	0.7
80	100	84	184	2.3	0.5
100	100	90	190	1.9	0.3
120	100	104	204	1.7	0.7
140	100	138	238	1.7	1.7
160	100	188	288	1.8	2.5

180	100	260	360	2.0	3.6

Average Total Cost (ATC) is the **cost per unit of output produced**. ATC = TC divided by output

Marginal cost (MC) is the change in total costs from the production of one extra unit of output.