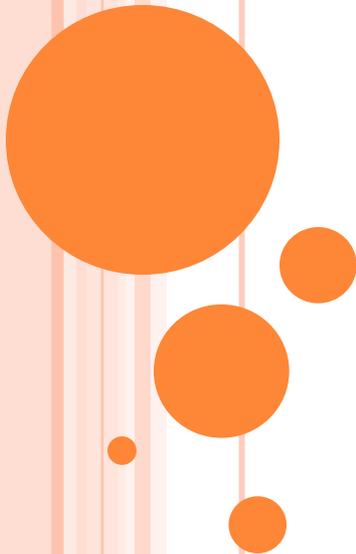


THEORY OF PRODUCTION AND COST

In economics, the theory of production and cost states that the cost of a product is determined by the sum total of the cost of all the resources that went into making it. There are multiple factors to be considered when determining the cost of a product.



- Once market forces decide demand and supply, the firm will need to make decisions about production. Theory of Production relates to the mix of the factors of production and how to utilize these factors to maximum effect.
- Factors of production- Land , Labour , capital , enterprise



PRODUCTION

- Production means transforming inputs (land , labour , machines , raw materials etc) into an output.
- An input is a good or services that is being used for the production and output is the goods and services that comes out of production process



FIXED INPUTS AND VARIABLE INPUTS

- **Fixed Inputs-** They are the **inputs** whose quantity is constant for some period of time or constant for short run production function. Typically fixed input will include land and machinery, it may also include certain type of labour.
- **Variable Inputs :-** These are inputs whose quantity can vary, even in the short run or for short period of time. Example of these input are labor energy fuel etc.
- A fixed input remains fixed up to a certain level of output whereas a variable input changes with change in output.



PRODUCTION FUNCTION

- 1. Short run Production Function
- 2. Long run production function



SHORT RUN PRODUCTION

- In the short run, the output quantity can be increased (or decreased) by increasing (or decreasing) the quantities used of only the variable inputs. This functional relationship (of dependence) between the variable input quantities and the output quantity is called the short run production function.
- Thus an increase in production during this period is possible only by increasing the variable input.



LONG RUN PRODUCTION

- In the long run, however, all the inputs used by the firm, the variable inputs and the so called fixed inputs, all are variable quantities and the firm's production is a function of all these inputs. This functional relation of dependence between all the inputs used by the firm and the quantity of its output is called the long run production function of the firm.
- Thus in long run , production of goods can be increased by employing both , variable and fixed factors.



PRODUCTION FUNCTION

- A **production function** gives the technological relation between quantities of physical inputs and quantities of output of goods.
- It can be expressed as

$$Q = f(K, L)$$



ASSUMPTIONS

- Production function is related to a specific time period.
- The state of technology is fixed during this period of time.
- The factors of production are divisible into the most viable units.
- There are only two factors of production, labour and capital.
- **Inelastic** supply of factors in the short-run period.



THE LAW OF PRODUCTION

- In the short run , input-output relations are studied with one variable input , while other inputs remains constant. The law of production under these assumptions are called **Law of variable Proportion.**
- In the long run input output relations are studied assuming all the input to be variable. The long run input output relations are studied under **law of returns to scale.**



LAW OF VARIABLE PROPORTION (LAW OF DIMINISHING RETURN)

- Law of variable proportions occupies an important place in economic theory. This law examines the production function with **one factor variable**, keeping the quantities of **other factors fixed**. In other words, it refers to the input-output relation when output is increased by **varying the quantity of one input**.

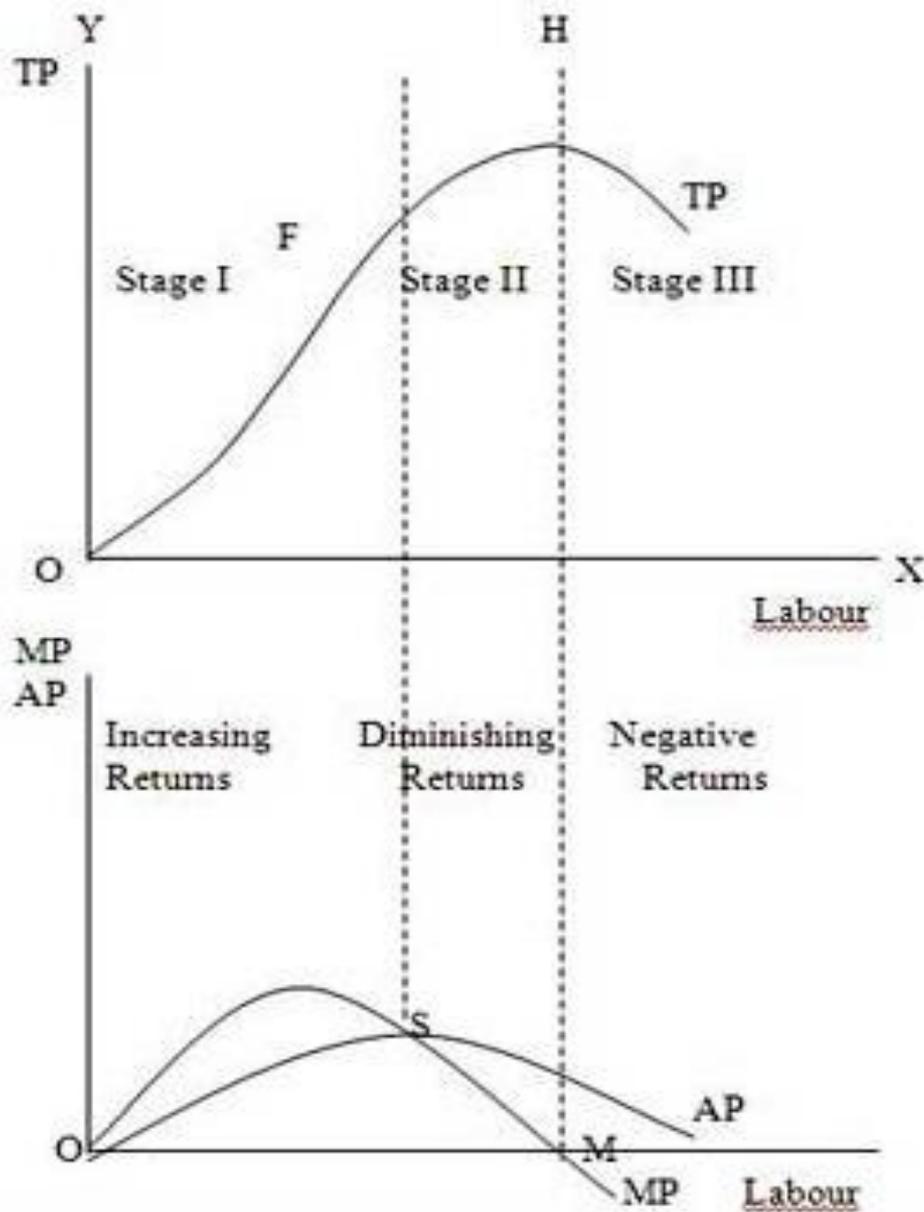


- The law of diminishing returns state that any attempt to increase output by increasing only one factor faces diminishing returns.
- The law states that when some **factors remains constant** , more and more units of a variable factors are introduced the production may increase initially at an increasing rate but after a point it increases at a diminishing rate.
- **Land and capital** remains fixed in the short run labour is variable in nature.



<i>Units of Labour</i>	<i>Total Product (Quintals)</i>	<i>Marginal Product (Quintals)</i>	<i>Average Product (Quintals)</i>
L	Q	$\frac{\Delta Q}{\Delta L}$	$\frac{Q}{L}$
1	80	80	80
2	170	90	85
3	270	100	90
4	368	98	92
5	430	62	86
6	480	50	80
7	504	24	72
8	504	0	63
9	495	-9	55
10	480	-15	48

TP increases at the increasing rate till the employment of 3rd labour . Afterwards it is facing law of diminishing return



3 Stages of Law of Variable Proportion

1st Stage- TP , MP ,AP is increasing at increasing rate. This stage continues up to the point where AP is equal to MP.

2nd Stage- TP continues to increase but at a diminishing rate. As the MP at this stage starts falling , the AP also declines. This stage ends where TP become maximum and MP becomes zero.

3rd stage- The MP becomes negative in this stage . TP also declines



LAW OF RETURNS TO SCALE

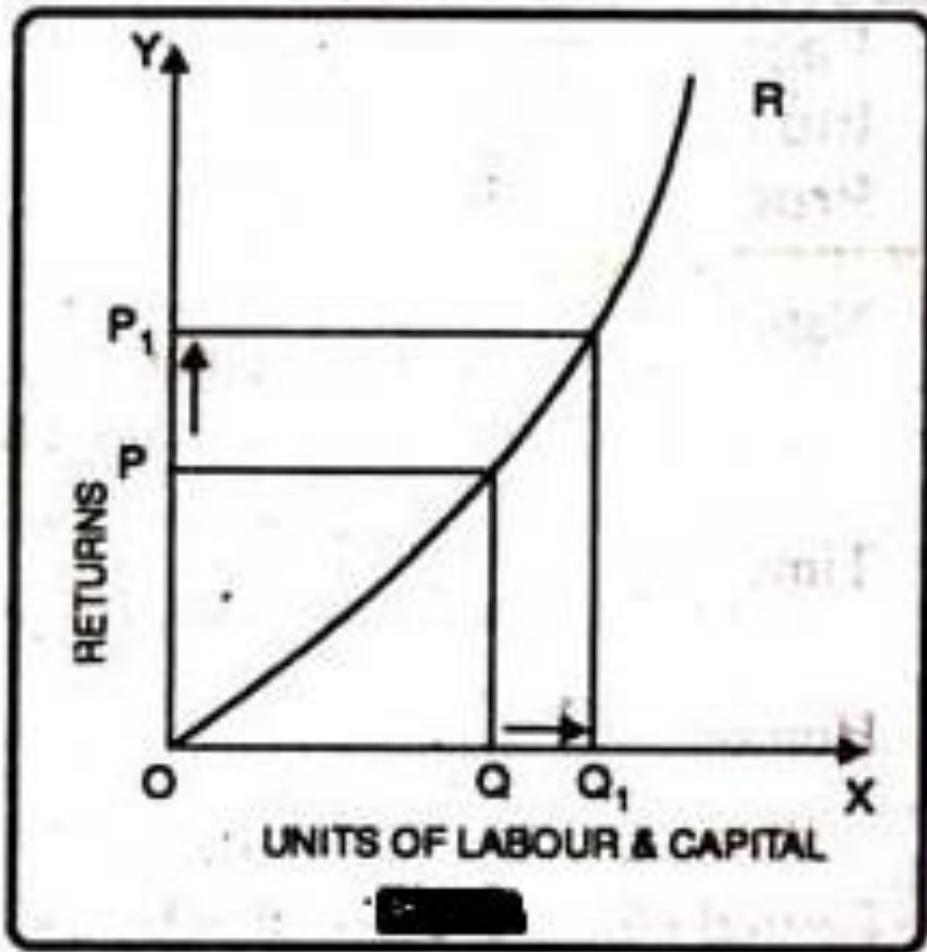
- Returns to scale is the rate at which output increases in response to proportional increase in all inputs.
- The increase in output may be proportionate , more than proportionate or less than proportionate.



INCREASING RETURN TO SCALE

- Increasing returns to scale or diminishing cost refers to a situation **when all factors of production are increased**, output increases at a higher rate. It means if all inputs are doubled, output will also increase at the faster rate than double. Hence, it is said to be increasing returns to scale. This increase is due to many reasons like division external **economies of scale**.





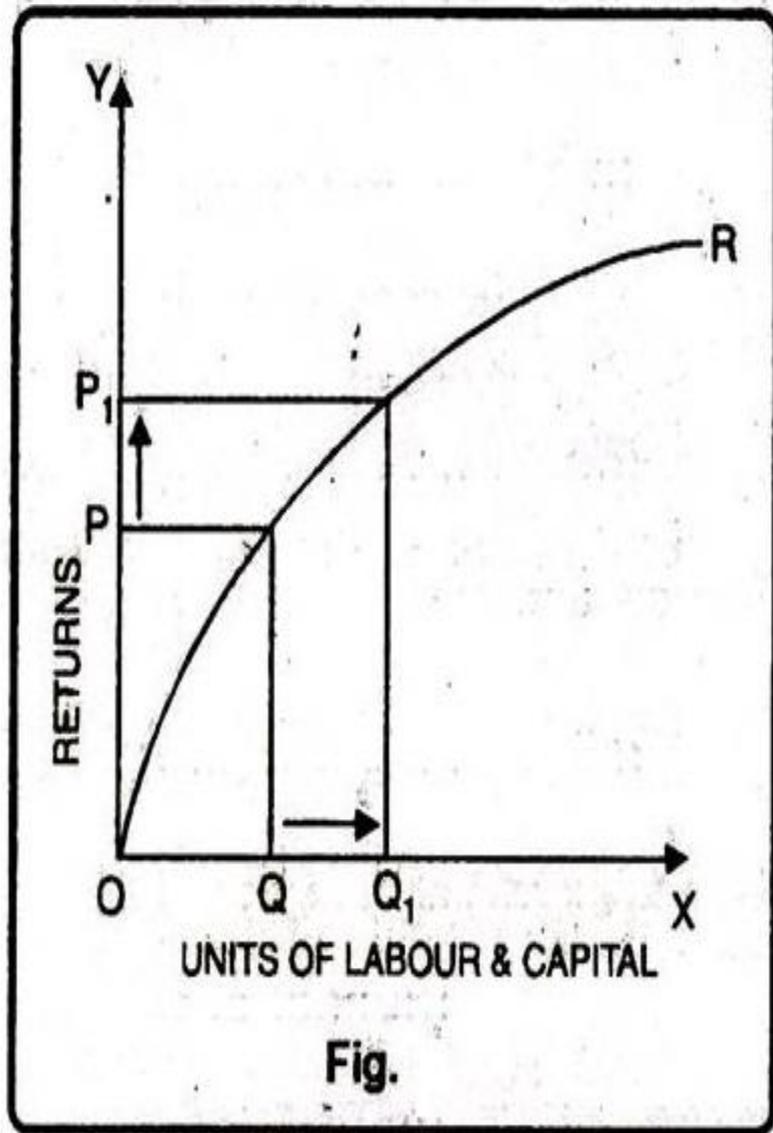
When labour and capital increases from Q to Q_1 , output also increases from P to P_1 which is higher than the factors of production i.e. labour and capital.



DIMINISHING RETURN TO SCALE

- Diminishing returns or increasing costs refer to that production situation, where if all the factors of production are increased in a given proportion, output increases in a smaller proportion. It means, if inputs are doubled, output will be less than doubled. If 20 percent increase in labour and capital is followed by 10 percent increase in output, then it is an instance of diminishing returns to scale.
- The main cause of the operation of diminishing returns to scale is that internal and external economies are less than internal and external diseconomies





Diminishing returns to scale has been shown. On OX axis, labour and capital are given while on OY axis, output. When factors of production increase from Q to Q_1 (more quantity) but as a result increase in output, i.e. P to P_1 is less. We see that increase in factors of production is more and increase in production is comparatively less, thus diminishing returns to scale apply.

CONSTANT RETURN TO SCALE

- Constant returns to scale or constant cost refers to the production situation in which output increases exactly in the same proportion in which factors of production are increased. In simple terms, if factors of production are doubled output will also be doubled.

Economies is greater than diseconomies – increasing return

Economies is less than diseconomies – diminishing return

Economies is equal to diseconomies – constant return to scale



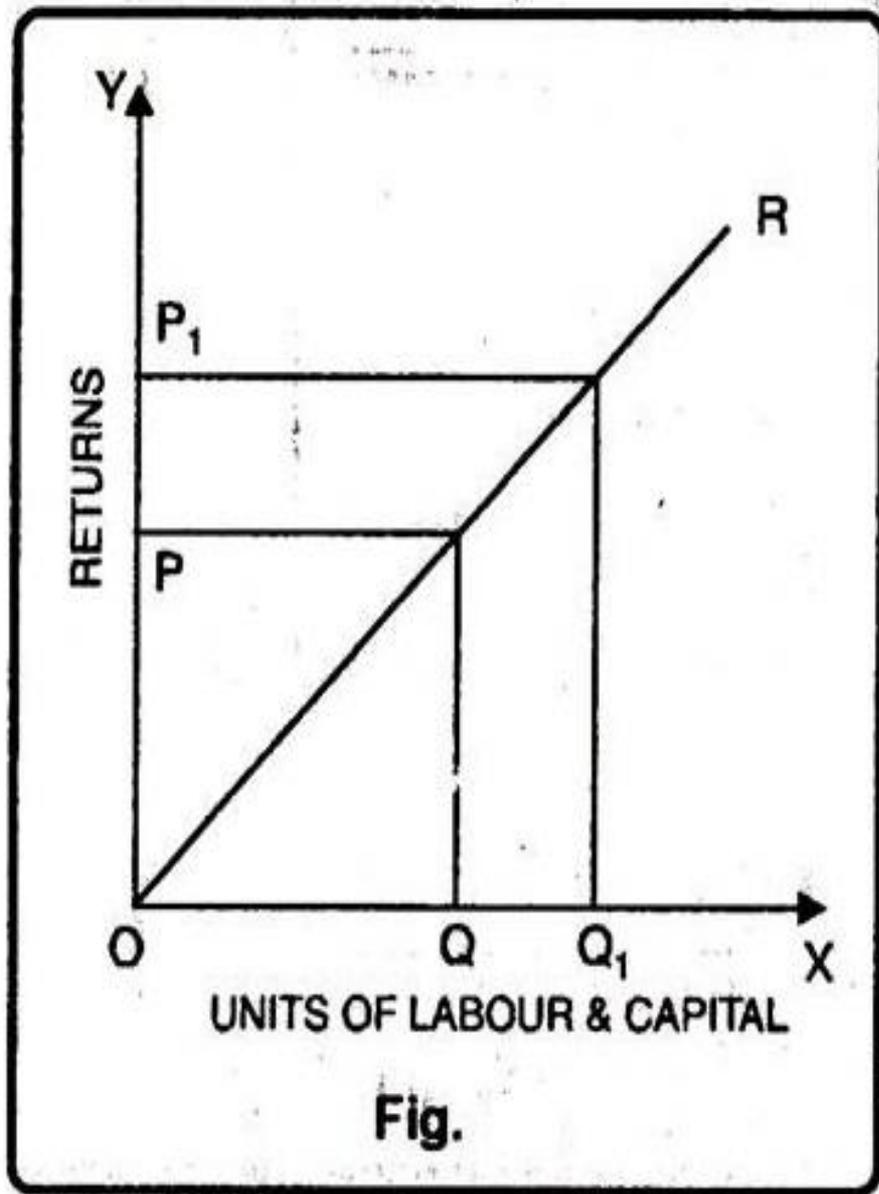


Fig.

In this case internal and external economies are exactly equal to internal and external diseconomies. This situation arises when after reaching a certain level of production, economies of scale are balanced by diseconomies of scale. This is known as homogeneous production function. Cobb-Douglas linear homogenous production function is a good example of this kind.

