

## Quadrant II - Notes

**Paper Code: ECC 101**

**Module Name: Law of Variable Proportion**

**Module No: 39**

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### **What is Theory of Production?**

In the words of Ferguson, “The theory of production consists of how the producer, given the state of technology combines various inputs to produce a definite amount of output in an economically efficient manner.” Theory of production also seeks to explain the relationship between input and output

Theory of production is mainly concerned with two things :- 1) Production Function 2) Laws of Production or Laws of Return

**Production Function** Production function refers to the functional relationship between the quantity of good produced (output) and the factors of production (inputs) necessary to produce it. According to Watson, “The relation between a firm’s physical production (output) and the material factors of production (inputs) referred to as production function.”

**Fixed and Variable Factors of Production** A fixed factor of production is one whose quantity cannot readily be changed. Examples include major pieces of equipment, suitable factory space, and key managerial personnel. A variable factor of production is one whose usage rate can be changed easily. Examples include electrical power consumption, transportation services, and most raw material inputs.

**Law of variable proportion** The law of variable proportions states that as the quantity of one factor is increased, keeping the other factors fixed, the marginal product of that factor will eventually decline. This means that up to the use of a certain amount of variable factor, marginal product of the factor may increase and after a certain stage it starts diminishing.

When the variable factor becomes relatively abundant, the marginal product may become negative.

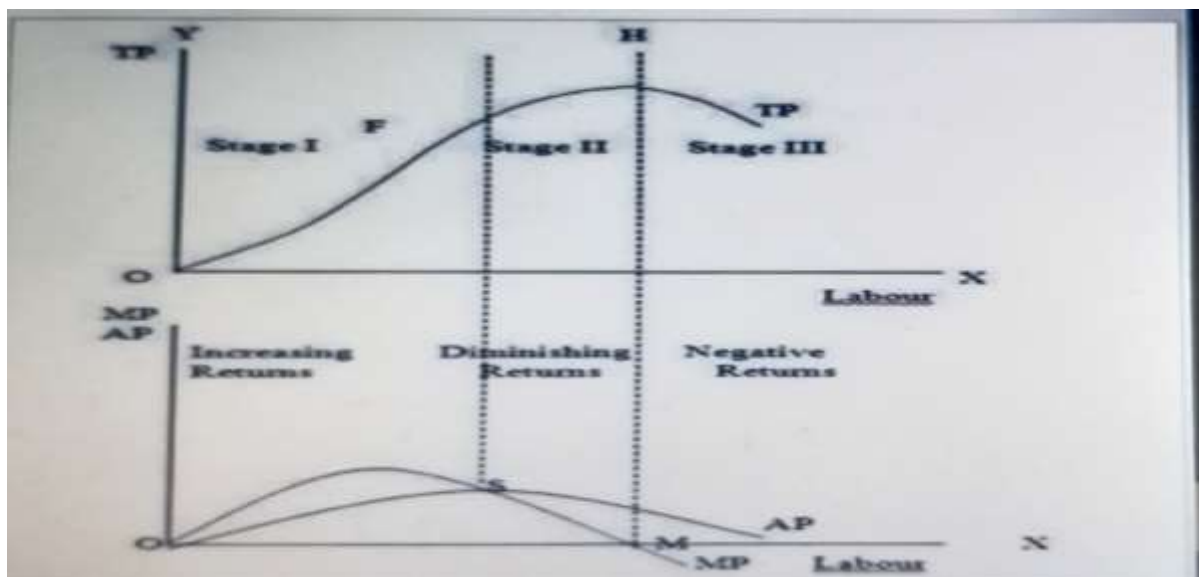
Assumptions: The law of variable proportions holds good under the following conditions:

Constant State of Technology: First, the state of technology is assumed to be given and unchanged. If there is improvement in the technology, then the marginal product may rise instead of diminishing. Fixed Amount of Other Factors: Secondly, there must be some inputs whose quantity is kept fixed. It is only in this way that we can alter the factor proportions and know its effects on output. The law does not apply if all factors are proportionately varied.

Possibility of Varying the Factor proportions: Thirdly, the law is based upon the possibility of varying the proportions in which the various factors can be combined to produce a product. The law does not apply if the factors must be used in fixed proportions to yield a product.

Illustration of the Law: The law of variable proportion is illustrated in the following table and figure. Suppose there is a given amount of land in which more and more labour (variable factor) is used to produce wheat.

Unit of Labour	Total Product	Average Product	Marginal Product
1	2	2	2
2	6	4	3
3	12	6	4
4	16	4	4
5	18	2	3.6



Three Stages of the Law of Variable Proportions: These stages are illustrated in the following figure where labour is measured on the X-axis and output on the Y-axis. Stage 1. Stage of Increasing Returns: In this stage, total product increases at an increasing rate up to a point. This is because the efficiency of the fixed factors increases as additional units of the variable factors are added to it. In the figure, from the origin to the point F, slope of the total product curve TP is increasing i.e. the curve TP is concave upwards up to the point F, which means that the marginal product MP of labour rises. The point F where the total product stops increasing at an increasing rate and starts increasing at a diminishing rate is called the point of inflection. Corresponding vertically to this point of inflection marginal product of labour is maximum, after which it diminishes. This stage is called the stage of increasing returns because the average product of the variable factor increases throughout this stage. This stage ends at the point where the average product curve reaches its highest point.

Stage 2. Stage of Diminishing Returns: In this stage, total product continues to increase but at a diminishing rate until it reaches its maximum point H where the second stage ends. In this stage both the marginal product and average product of labour are diminishing but are positive. This is because the fixed factor becomes inadequate relative to the quantity of the variable factor. At the end of the second stage, i.e., at point M marginal product of labour is zero which corresponds to the maximum point H of the total product curve TP. This stage is important because the firm will seek to produce in this range.

Stage 3. Stage of Negative Returns: In stage 3, total product declines and therefore the TP curve slopes downward. As a result, marginal product of labour is negative and the MP curve falls below the X-axis. In this stage the variable factor (labour) is too much relative to the fixed factor.

#### Causes of Applicability

Causes of increasing returns to a factor :

- 1. Fuller utilization of the fixed factor : In the initial Stages fixed factor remains under utilized. Its fuller utilization cause for greater application of the variable factor. Hence initially additional units of the variable factor add more & more to total output .
- 2. Increased efficiency of the variable factor : Additional application of the variable factor causes process based division of labour that raises efficiency of the factor. Accordingly MP of the factor tends to Rise.

Causes of decreasing return to a factor :

- 1. Fixity of the factor: as more & more units the variable factor continue to be combined with the fixed factor , the latter gets over utilized. Hence the diminishing returns
- . 2. Imperfect factor substitutability: factors of production are imperfect substitutes of each other. more & more of labour cannot be continuously used in place of additional capital.

#### Applicability of the law of Variable Proportion

Law of variable proportions applies to all fields of production, like agriculture, industry, etc. This law applies to any field of production where some factors are fixed and other are variable. That is the reason, why it is called law of universal application. ∞Application to Agriculture ∞Application to Industry