Production

Production refers to creation of something tangible which can be used to satisfy human want.

However, matter already exists, we cannot create it. Hence

The process of addition of utilities to the existing matter by changing form, place and keeping it over time is referred to as Production in Economics.
Production Function, ISO-quants and Economies of scale

Production

The process of addition of utilities to the existing matter by changing form, place and keeping it over time is referred to as Production in Economics.

We add

- Form Utility
- Time Utility
- Place Utility
- Personnel Utility.
Production Function, ISO-quants and Economies of scale

Production

The process of addition of utilities to the existing matter by changing form, place and keeping it over time is referred to as Production in Economics.

Technologically, however, production is referred to as a process of transforming inputs into outputs. This is accomplished by use of factors of production such as Land, Labour, Capital and Organization. These factors are inputs and finished products are outputs.
Agents of Production

Land, Labour, Capital and Organization.

Land – has a wider meaning and includes all the natural resources found on, above and under the surface of earth and which are essentially free gifts of Nature.
Production Function, ISO-quants and Economies of scale

Agents of Production
Land, Labour, Capital and Organization.

Labour – in Economics is defined as human efforts, mental or manual, undertaken in order to add utilities and create values.
Agents of Production
Land, Labour, Capital and Organization.

Capital – is a man made factor of production.
When labour works on land, it produces two types of goods
Consumers’ goods - that satisfy human wants directly
Capital Goods – that satisfy human wants indirectly.
Capital is often defined as the produced means of further production.
A production function represents the relationship between inputs and outputs, often depicted as a curve or a surface in a multidimensional space. The concept of isoquants is central to this framework, as they represent combinations of inputs that result in the same level of output. Economies of scale refer to the cost advantages that come from producing larger quantities, allowing businesses to lower costs per unit as output increases.

### Agents of Production

**Land, Labour, Capital and Organization.**

- **Organization** - refers to that factor of production which coordinates the various other factors in a manner to:
  - minimize the cost of production
  - maximize the output.
Production Function

- is the technical relationship telling the maximum amount of output capable of being produced by each and every set of specified inputs. It is defined for a given set of technical knowledge.

- is also defined as the relationship between the rates of input of productive services and the rate of output of the product. It is the economist’s summary of technical knowledge.
Short–run vs. Long-run Production Function

The short-run is that period of time in which at least one of the factors of production remains fixed. Whereas, the long-run is that period of time in which all factors are variable.

When one or more inputs remain constant we consider that period of time as short period, whereas when all inputs are capable of being varied that period is regarded as long period.
Production Function, ISO-quants and Economies of scale

Laws of Returns and Returns to Scale

A: Laws of Returns

or the Law of Variable proportions, clearly explains the relationship between the inputs and the output in the process of production.

The Law examines the production function with only one factor variable, keeping quantities of other factors constant.
Laws of Returns and Returns to Scale

A: Laws of Returns

Comprises of three phases:

[a] the Law of Increasing Returns.
[b] the Law of Constant Returns.
Laws of Returns and Returns to Scale

A: Laws of Returns

If in any process of production, the factors of production are so combined that if the varying quantity of one factor is combined with fixed quantity of other factors, then there will be three tendencies about the additional or marginal output.

Firstly – in the beginning as more and more units of variable factor are added to the units of fixed factor, the additional output will go on increasing.

Here we have the Law of Increasing Returns in operation.
Laws of Returns and Returns to Scale

A : Laws of Returns

If in any process of production, the factors of production are so combined that if the varying quantity of one factor is combined with fixed quantity of other factors, then there will be three tendencies about the additional or marginal output.

Secondly – if still more units of variable factor inputs are added to the units of fixed factor, the additional output or marginal returns will remain constant.

Here we have the Law of Constant Returns in operation.
Laws of Returns and Returns to Scale

A : Laws of Returns

If in any process of production, the factors of production are so combined that if the varying quantity of one factor is combined with fixed quantity of other factors, then there will be three tendencies about the additional or marginal output. Finally – if still more units of variable factor inputs are fed into the process of production then, the additional output or marginal returns begin to decline.

Here we have the Law of Diminishing Returns in operation.
Production Function, ISO-quants and Economies of scale

Laws of Returns and Returns to Scale

A: Laws of Returns

Marginal & Average Product Curves

Returns

\[
\begin{align*}
\text{APC} & \quad \text{MPC} \\
\end{align*}
\]
Laws of Returns and Returns to Scale

A: Laws of Returns

If in any process of production, the factors of production are so combined that if the varying quantity of one factor is combined with fixed quantity of other factors, then there will be three tendencies about the additional or marginal output.

The factors of production are imperfect substitutes for one another hence the diminishing returns. If divisibility of factors of production was there, law of variable proportions would not have been tenable.
Laws of Returns and Returns to Scale

B: Returns to Scale

In the process of production, when all the inputs can be varied in equal proportion then the relation between factor inputs and the output gives rise to returns to scale.

Returns to scale become relevant only in the long period when all the inputs can be varied simultaneously in the same ratio.
Laws of Returns and Returns to Scale

**B: Returns to Scale**

The ratio of proportionate change in output to a proportionate change in inputs is called the production function $\epsilon$.  

\[
\frac{\Delta q}{q} = \frac{\Delta n}{n}
\]

i.e.  $\epsilon = \frac{\Delta q}{q}$ where $\Delta q/q$ is proportionate change in output and $\Delta n/n$ is proportionate change in all inputs.
Laws of Returns and Returns to Scale

**B : Returns to Scale**

The ratio of proportionate change in output to a proportionate change in inputs is called the production function $\epsilon$.

\[
\frac{\Delta q}{q} = \frac{\Delta n}{n}
\]

i.e. $\epsilon = \frac{\Delta q}{q}$

- If $\epsilon > 1$, we have Increasing Returns to Scale.
- If $\epsilon = 1$, we have Constant Returns to Scale.
- If $\epsilon < 1$, we have Decreasing Returns to Scale.
The Cobb Douglas Production Function

The Cobb Douglas Production Function is a Linear Homogeneous Production function implying constant Returns to Scale.

It takes the form \( Q = A\cdot L^\alpha \cdot K^{1-\alpha} \)

Where \( Q \) stands for the Output, \( L \) & \( K \) are inputs (labour & capital), \( A \) is a positive constant, and \( \alpha \) is positive fraction i.e. \( \alpha < 1 \).
The Cobb Douglas Production Function

The Cobb Douglas Production Function is a Linear Homogeneous Production function implying constant Returns to Scale.

It shows that elasticity of substitution equals one, it hints that if one of the input is zero, the output also will be zero.

It is criticized as it considers only two factors, ignores diminishing returns, assumes a) capital input (which is subject to depreciation) can be measured, b) prevalence of perfect competition and c) all the units of labour to be homogeneous.
ISO-Quant or Equal Product Curve

Iso-quant literally means equal quantity or the same amount of output. It is a locus of points showing that different combinations of factor inputs give the same quantity of output.

It is also known as Equal Product Curve
Production Function, ISO-quants and Economies of scale

ISO-Quant or Equal Product Curve.
This is an iso-quant curve representing 20 units of output. Different factor combinations on this curve are to yield 20 units output.
Production Function, ISO-quants and Economies of scale

ISO-Quant or Equal Product Curve.

The iso-product map consists of two (or more) iso-quant curves representing various (15 & 20) units of output.
ISO-Quant or Equal Product Curve.

Marginal Rate of Technical Substitution

The iso-quant curve shows that, with different combinations of factors, we get the same output. It necessarily implies that, factors of production are substituting each other. This rate, at which one factor input is substituted by the other, is called the Rate of Technical Substitution.

The Marginal Rate of Technical Substitution is calculated by finding out how many of factor Y units are substituted by addition of one unit of factor X.
Production Function, ISO-quants and Economies of scale

ISO-Quant or Equal Product Curve.

**Marginal Rate of Technical Substitution**

\[ \frac{\Delta Y}{\Delta X} \]

i.e. MRTS = \[ \frac{\Delta Y}{\Delta X} \]

It must be noted that the MRTS goes on diminishing, giving rise to the Principle of Diminishing Marginal Rate of Technical Substitution. And negative slope to iso-quant curve.
Production Function, ISO-Quants and Economies of Scale

ISO-Quant or Equal Product Curve.

Properties of Iso-quant.

- The iso-quant curve must slope downward from left to right.

If the curve was to have positive scope and move upwards from left to right, with addition of one unit of factor X, more units of factor Y will be there in the new combination, More units of X as well as Y would yield MORE and not the same output which is the requirement of the iso-quant.
ISO-Quant or Equal Product Curve.

Properties of Iso-quant.

- The iso-quant curve must be convex to the point of origin.

If the curve was to be concave, with addition of one unit of factor X, more units of factor Y will be there in the new combination, defeating the Principle of Diminishing Marginal Rate of Technical Substitution.
Production Function, ISO-quants and Economies of scale

ISO-Quant or Equal Product Curve.

Properties of Iso-quant.

- **No two iso-quant curves should intersect.**

If the iso-quant curves of 15 units and, say, 20 units were to intersect, the same combination of X and Y factors would yield output of 15 and 20 units! This is not possible, hence no two iso-quant curves can intersect.
**Production Function, ISO-quants and Economies of scale**

**Producer’s Equilibrium : The point of Least Cost Factor Combination**

From the iso product map, producer would like to adopt the highest possible iso quant, as it yields maximum output. His decision is determined by the budgetary constraints, as he may not possess resources required for the combination of factors reflected by that highest iso-quant.

Based on funds available, if he was to obtain units of factor Y only, the quantity of units is OA. And instead of Y, if he was to obtain units of factor X only, the quantity of units is OB. We now have extreme situations of A & B. If we join the points of A & B, we get the Iso-cost line shown ahead.
Production Function, ISO-quants and Economies of scale

Producer’s Equilibrium: The point of Least Cost Factor Combination

ISO Cost Line

Factor X

Factor Y
Producer’s Equilibrium: The point of Least Cost Factor Combination

When we superimpose the iso-quant map on the Iso- cost line in the next slide, we observe that certain iso-quants lie above the cost line, so they are beyond the economic reach of the producer e.g. 25 q. Some iso-quant lies below the cost line, e.g. 15, but this iso-quant will not exhaust his funds fully.

At point E, the iso-cost line is a tangent to the iso-quant 20q providing highest output within the cost line. Thus the tangency between iso-cost line and iso-quant represents the point of producer’s equilibrium.
Production Function, ISO-quants and Economies of scale

Producer’s Equilibrium: The point of Least Cost Factor Combination
Production Function, ISO-quants and Economies of Scale

The Output – Expansion Path and The Scale Line

In the producer’s equilibrium we found point E allows producer best use for his outlay of funds. If producer can increase his outlay, (and prices of X & Y units remain same) this point E will shift to higher iso-quant at E₁, with more outlay to E₂ etc. The line E, E₁, E₂ shows the output expansion path also called Scale Line.

The output expansion path shows the least cost way of producing each level of output. It traces out as to how the firm will expand its scale of production as a result of increase in its investment outlay.
Economies and Diseconomies:

In the process of production firm enjoys certain advantages and experiences certain disadvantages. These could be due to scale of operation or due to its location. They affect cost of production favorably or unfavorably.
Economies and Diseconomies:

Those advantages or disadvantages that accrue to a firm from within, as a result of scale of operation are referred to as *Internal Economies and Diseconomies*;

whereas those advantages or disadvantages that accrue to a firm from outside and faced by the industry as a whole are referred to as *External Economies and Diseconomies* respectively.
Economies and Diseconomies:

*Internal Economies* – are those advantages which a firm enjoys from within itself by way of reduction in its average cost of production as its scale of operation expands.

They are categorized into:
*Technical, managerial, commercial, financial and risk-bearing.*
Production Function, ISO-quants and Economies of scale

Internal Economies:

*Technical Economies* — are those advantages which a firm enjoys from large scale of operation like

1. *Division and specialization of labour*
2. *Utilization of specialized machinery*
3. *Research and training*
4. *Utilization of bigger machines with high initial cost but low operating cost*
5. *Mechanical advantages*
Internal Economies:

**Managerial Economies** – are those advantages which a firm enjoys from large scale of operation like

1. Appointment of experts as function heads.
2. Division of each department into independent sections.
3. Total division of labor in management
Production Function, ISO-quants and Economies of scale

Internal Economies:

Commercial Economies — are those advantages which a firm enjoys from large scale of operation like

1. Buying large quantities and gaining best prices and terms.
2. Greater quantity of goods can be sold at a little extra cost.
3. Many products are made and sold, one product acts as an advertisement for other products.
4. Expert sales, purchase heads are employed.
Production Function, ISO-quants and Economies of scale

Internal Economies:

*Financial Economies* — are those advantages which a firm enjoys from large scale of operation like

1. Lower interest rates.
2. Credit and finance at better terms and conditions.
3. Facility to offer better security.
Internal Economies:

*Risk-bearing Economies* – are those advantages which a firm enjoys from large scale of operation like

1. **Strength to meet variations in demand**
2. **Chance to develop different markets for its products**
3. **Obtaining materials from various sources.**

Production Function, ISO-quant and Economies of scale
Internal Diseconomies:

The disadvantages accruing to the firm when it produces the output beyond a particular point, resulting in an increase in the average cost of production are termed as diseconomies of scale.

All economies of scale are converted into internal diseconomies, once the output crosses optimum level.

These are discussed next.
Production Function, ISO-quants and Economies of scale

Internal Diseconomies:

**Efficiency to Inefficiency:**
Once the output crosses optimum level, mismanagement creeps in, supervision becomes ineffective.

**Administrative difficulties.**
With expansion, administration becomes unwieldy and impersonal. Problems of competition, coordination and control are experienced.
Production Function, ISO-quants and Economies of scale

Internal Diseconomies:

*Industrial Unrest.*

Contact between workers & management is lost. Atmosphere of discontent, distrust and frustration sets in.

*High cost of Reconversion.*

Initial high cost in fixed assets becomes irredeemable. Management is unable to produce required goods.
Internal Diseconomies:

**Enhancement of Risks.**

In case of any interruptions, standing costs are very high. Large inventory is locked up, huge wage cost has to be incurred. Trained workers leave.

**Increasing costs.**

The high demand for materials, capital labour results in high cost in procuring them. Output beyond optimum level is inefficient and sub-standard.
External Economies:

External Economies are those advantages which accrue indirectly and externally from the growth, not in the size of the firm, but in the size of the industry as a whole.

Economies of Concentration: Since many firms are located in one region, labour is available with desired skill regularly; common services are there in plenty; training, research, ancillary centers are located nearby, reputation is automatically earned.
External Economies:

External Economies are those advantages which accrue indirectly and externally from the growth, not in the size of the firm, but in the size of the industry as a whole.

Economies of Information: workers doing the same type of job come together to share their experience and knowledge. Data on effective techniques and methods is circulated.
External Economies:

External Economies are those advantages which accrue indirectly and externally from the growth, not in the size of the firm, but in the size of the industry as a whole.

Economies of Disintegration: firms do not have to make each part, they can be bought as firms in the Region specialize in parts in which they hold competence.
External Diseconomies:
Excessive concentration or localization of industries results in diseconomies for the firms within that region. Diseconomies of concentration are reflected in excessive pressure on transport, high cost of scarce land, shortage of skilled labour, militant labour unions, scarcity of power and raw materials etc. The region gets polluted, over crowded and unhygienic.