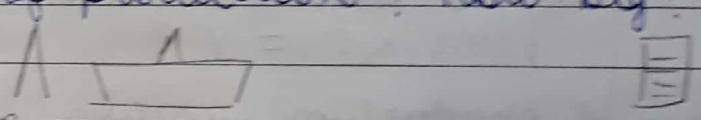
Time

→ Long Run - Time period over which all production factors can be varied / are variable

→ Short run - All factors of production can't be changed in this time frame.

→ When you start production you decide on
1) Scale of production
2) Other variable factors you would like to use.

→ What is the scale of production ? How big?
Say oil production --



So what part of production do you want to do? Entire thing or only components of it? Do you want to make only (part) big?
↳ diff. verticals.

VERTICAL

→ Contract laws → Oliver Hart Nobel Prize
If contracts are easy to make, then you don't necessarily need to have different verticals under the same roof.

→ L, K
In short run, say, only labour can be changed.
Things that have high costs are generally long run fixed factors.

Land & entrepreneurship are fixed factor gen.

→ Short run production function –

$f(L, K) = Y$ → LR specification.

SR → K is fixed, $\bar{K}$ ⇒ $f(L, \bar{K}) = Y_{SR}$

Capital in long run is variable.

→ Average product of L (AP_L) = output produced by 1 unit of labour = $\frac{Y}{L} = \frac{f(L, \bar{K})}{L}$

(MP_L) Marginal product of L = change in output caused by change in 1 unit of labour at a given point.

$= \frac{\Delta Y}{\Delta L} = \frac{dY}{dL}$

At marginal points, if revenue generated > cost incurred then I produce that extra unit.

Marginal benefit > marginal cost

$AP_L = \frac{Y}{L}$ $\quad \frac{dAP_L}{dL} = \frac{\frac{dY}{dL} \cdot L - Y}{L^2} = \left(\frac{dY}{dL} - \frac{Y}{L}\right)\frac{1}{L}$

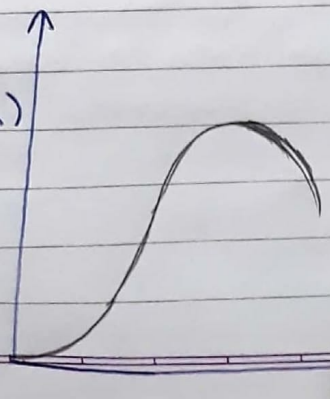
$$\boxed{\frac{dAP_L}{dL} = \frac{1}{L}(MP_L - AP_L)}$$

If $MP_L > AP_L \Rightarrow \frac{dAP_L}{dL} > 0$

$MP_L = AP_L \Rightarrow \frac{dAP_L}{dL} = 0$

$MP_L < AP_L \Rightarrow \frac{dAP_L}{dL} < 0$

→

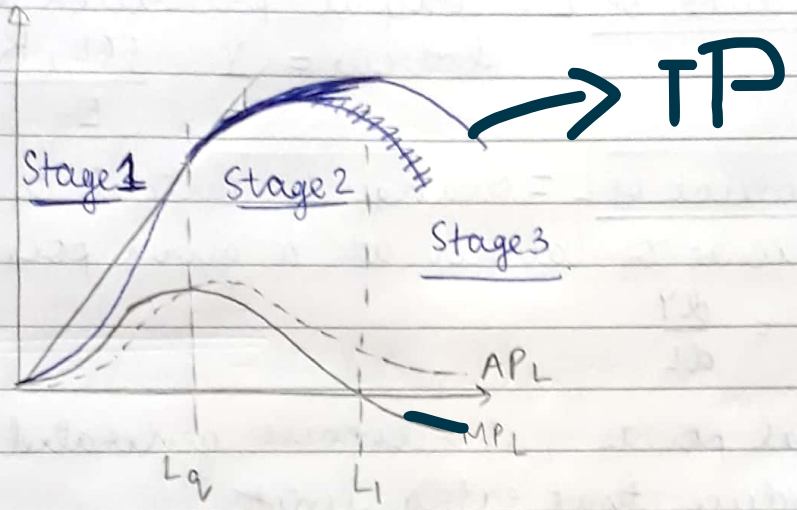


Initially MP_L ↑, it slowly decreases and becomes negative after a point

→ AP_L is the slope of the line joining origin and a point on the total product curve.

→ MP_L is the slope of the TP curve at any point.

→



→ In Stage 2 MP_L keeps decreasing $\Rightarrow \frac{d^2Q}{dL^2} < 0$

MP ← $\frac{dQ}{dL} > 0$

For every unit of labour used, the output increases but it increases in a diminishing rate.

LAW OF DIMINISHING MARGINAL PRODUCTIVITY

→ Profit maximising producers produce in Stage 2

→ Stage 1: $MP_L > AP_L$

→ Returns to Scale –

What happens to output when size of plant changes.

① Increasing Returns to Scale

$f(L, K) \longrightarrow f((1+\lambda)L, (1+\lambda)K)$

$Q_0 \qquad\qquad Q_1$

~~where $\lambda > 1$~~ $\lambda > 0$

$$\frac{Q_1 - Q_0}{Q_0} > \lambda$$

In long run this is the initial stages of production where everything is efficient.

② Decreasing Returns to Scale

↳ Diseconomies of Scale

$$\frac{Q_1 - Q_0}{Q_0} < \lambda$$

Efficiency ↓ → Administrative Causes

→ Or say limit of one of the other fixed factors

say Farming – there is a limit to how much the fertility of the land can increases with the use of fertilizers.

③ Constant Returns to Scale

$$\frac{Q_1 - Q_0}{Q_0} = \lambda$$

→ Production Functions

Say $Q_0 = AL^{\alpha}K^{\beta}$

$L \to (1+\lambda)L$ & $K \to (1+\lambda)K$

$Q_1 = A(1+\lambda)L)^{\alpha}((1+\lambda)K)^{\beta}$

$= A(1+\lambda)^{\alpha+\beta} L^{\alpha} K^{\beta}$

$$\frac{Q_1 - Q_0}{Q_0} = \frac{A(1+\lambda)^{\alpha+\beta} L^{\alpha} K^{\beta} - AL^{\alpha}K^{\beta}}{AL^{\alpha}K^{\beta}} > \lambda.$$

$$(1+\lambda)^{\alpha+\beta} - 1 > \lambda$$

$$(1+\lambda)^{\alpha+\beta} > \lambda + 1$$

$\Rightarrow$ $\alpha+\beta > 1$ IRS

$\alpha+\beta = 0$ CRS

$\alpha+\beta < 1$ DRS.

Return to Scope

$CP(0, Q_2) + CP(Q_1, 0) > CP(Q_1, Q_2)$

If the joint production of two goods Together is more beneficial that producing both separately. Then it is called return to scope.

Intangible Cost → Things whose market value can't be evaluated (say ideas of owner).

Market Supplied Resources – Resource owned by Others which are purchased, hired, rented or leased by the firms.

Owner Supplied Resources – Those supplied by the owner.

(These don't have a value. But Venure Capitalists evaluate these ideas and buy them.)

There is a time gap of 7–8 years to get the return. Many of the investments fail. But the one that succeeds gives a huge return. You should be able to foresee the marketability down the line

→ Economic Cost = Explicit (EC) + Implicit (IC) cost

Economic Profit = TRevenue − EC − IC

= (TR − EC) − IC

= Accounting Profit − Implicit Cost

→ If Implicit Cost > accounting profit, the owner will shut down the business and go elsewhere. Considering only that he/she is interested in only economic money making

→ Knowledge production - Has an increasing return but it has a huge cost.