

## ~~Science and Engineering for scalability of ideas~~

## Optimum Reallocation of Human Role for maximizing gain:

- Growth of R&D investment is leading to reduction of role of humans in production and wages  $\rightarrow Q \uparrow C \downarrow$
- There has been exponential growth in R&D investment for producing ideas for maintaining same level to effect on quality and cost improvement - big ideas are getting harder to find.
- R&D is experiencing diminishing return.
- Research  $\Rightarrow$  - productivity for firms fell, 10% / year
  - need 15 times more researchers than 30 years ago to produce same rate of economic growth.
- Nicholas Bloom
  - It's getting harder and harder to make new ideas, and the economy is more or less compensating for that.
  - The only way we've been able to roughly maintain growth is to throw more and more scientists at it.

## \* Forming and Understanding Market for Leveraging Ideas:

### - Carl Marks

- human beings have inherent tendency of producing and pursuing ideas to recreate the world.

———— As economic value creation primarily depends on three factors

$$Y = F(\text{natural resource, labor, ideas})$$

### - Prof. Schumpeter

- major ideas grows as waves causing destruction to incumbent products, jobs and firms - giving birth to creative destruction phenomenon.

- This creative destruction also ~~needs~~ leads to wealth annihilation - due to loss of market value of assets, ZPs, and shares.

Hence, wealth formation and annihilation are ~~coupld~~ coupled in ideal wealth creation in the market economy.



## ⊗ Science and Engineering For Scalability of Ideas:

- market economy focused on transferring art into science, tinkering into systematic investigation, and craftsmanship into engineering
- for scaling up wealth creation out of ideas, smart market economy practitioners gave emphasis on Science and Technology R&D
- There is no natural correlation between R&D and wealth creation out of ideas in competitive market - due to the episodic nature.

⊗ 1899  $\Rightarrow$  No R&D Jobs

⊗ American project of Nuclear Bomb.

⊗ A section of Dr Vanneman Bush's Report to the US President:

- Surely, we will not reach our goal by standing still, merely by making the same things we made before and selling them at the same price or higher prices. We will not get ahead in international trade unless we offer new and more attractive and cheaper products.

- How will we find ways to make better products at lower cost?
- There must be a stream of new scientific knowledge to turn the wheels of private and public enterprise.

### ⊗ Science, Market and Wealth creation - Bumpy Relation

- Science is needed for supporting the creation of flow of ideas.
- competition in pursuing ideas from rolling waves - generating pervasive uncertainties in profiting from ideas.
- The cumulative effect of incremental flow of ideas lead to growing wave, resulting in price setting capability for attaining the ability of offering the best quality at the least cost.

### ⊗ Perfect Market:

- a theoretical market in which buyers and sellers are so numerous and well informed that monopoly is absent and market prices cannot be manipulated - everybody is taken of the price set by the equilibrium of supply and demand of commodity product.



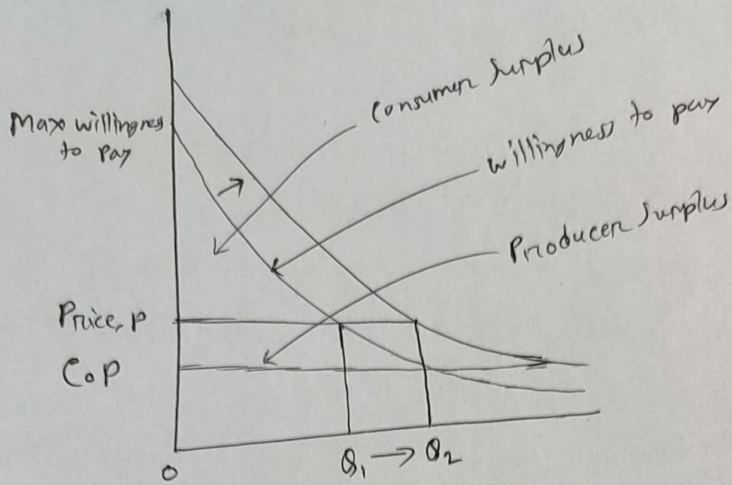
## ⊗ Imperfect Market:

- Price setting capability of smart firm/s for making profit and compelling competitors to take lower price and incur loss.
- The market's goods and services are heterogeneous or differentiated. This means that firms can charge higher prices as their goods and services are perceived as better.

## ⊗ Measuring and Increasing Economic Value:

- consumer surplus (CS)  $\Rightarrow$  consumer benefits.
- CS happens when the price that consumers pay for a product or service is less than the price they're willing to pay.
- Producer Surplus (PS) is the difference between the price charged and cost incurred.
  - Normally startup begin the journey at loss.
- Both CS & PS could be increased by ideas - leading to higher quality and lower cost.
- Wealth creation out of ideas

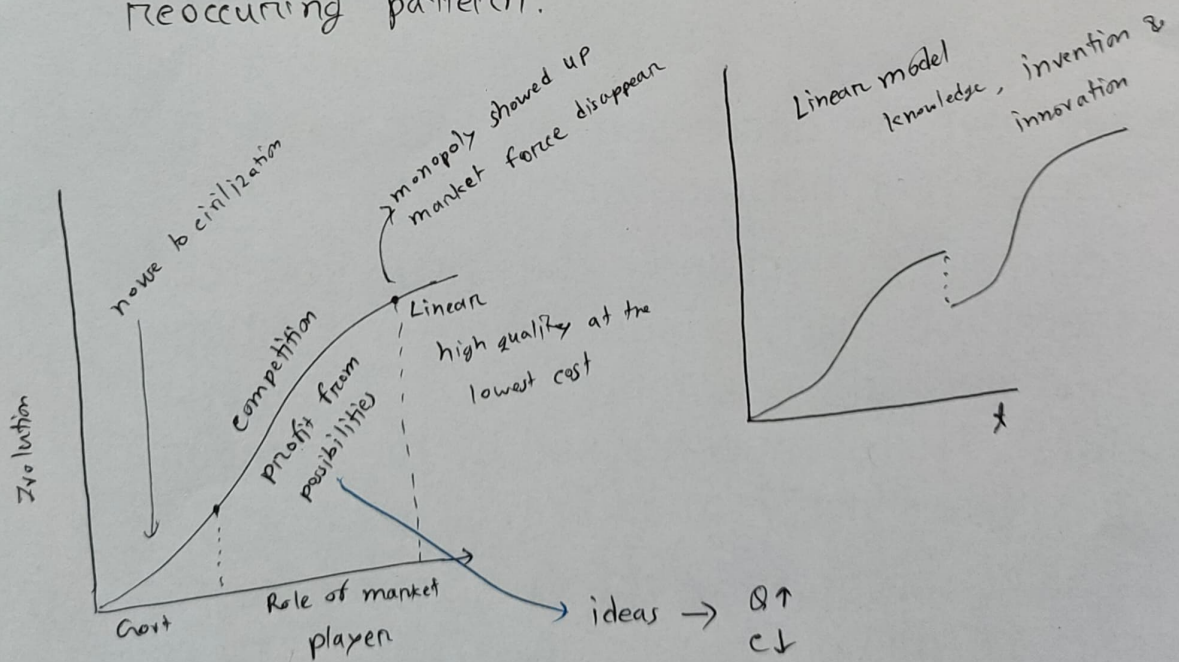
$$W = CS + PS$$



~~consumers~~ CS & PS increase simultaneously.

### ⊗ Evolving technology core

- evolution did not happen as linear progression on staircase steps. not random sparks either.
- it ~~happend~~ happened in an episodic form - as a reoccurring pattern.





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## Lecture Module-3

### \* Production Function:

- Cobb - Douglas production function was derived as a function of labor ( $L$ ) and capital ( $K$ )

$$Y = f(L)$$

$$Y = f(K)$$

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

$$= A' L^{\alpha} K^{\beta}$$

Knowledge & Idea  
- Total Productivity

#### - Physical capital

- machines, production facilities, and so forth that are used in production. Role of machine has been increasing.

#### - Labor:

- the number of hours that are worked in the entire economy.

#### - Human capital

- skills and education embodied in the workforce of the economy.

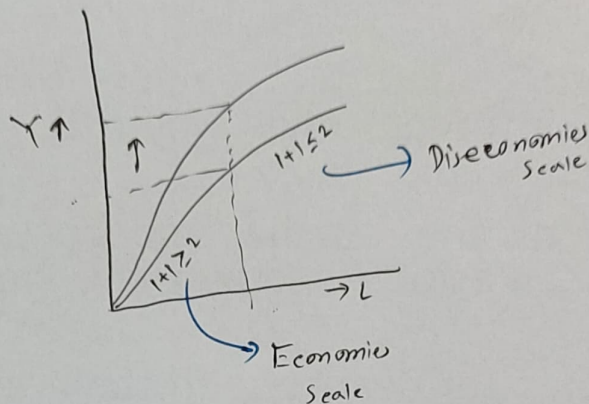
- scope of human capital in production has been falling.

#### - Knowledge

- basic scientific knowledge, and blueprints that describe the available production processes.

## - Perceived Value

- functional value, monetary value, social value,  
ph ~~psi~~ psychological value.



⊗ Training  $\rightarrow L \Rightarrow \alpha \uparrow$

Uplifting  $\rightarrow k \Rightarrow \beta \uparrow$

- Increase Labor Supply
- Give training to Labor about how to operate capital
- import more capital,  $k$
- Give education, so that  $A \uparrow$

⊗ In Bangladesh, one man do all in a software development.

if we collaborate

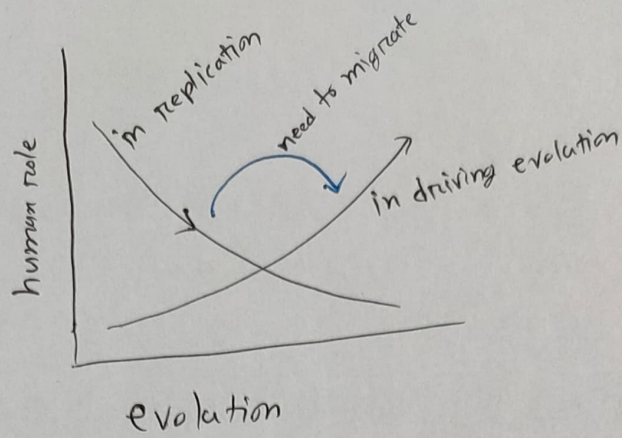
$$1+1 \geq 2$$

Growing Job

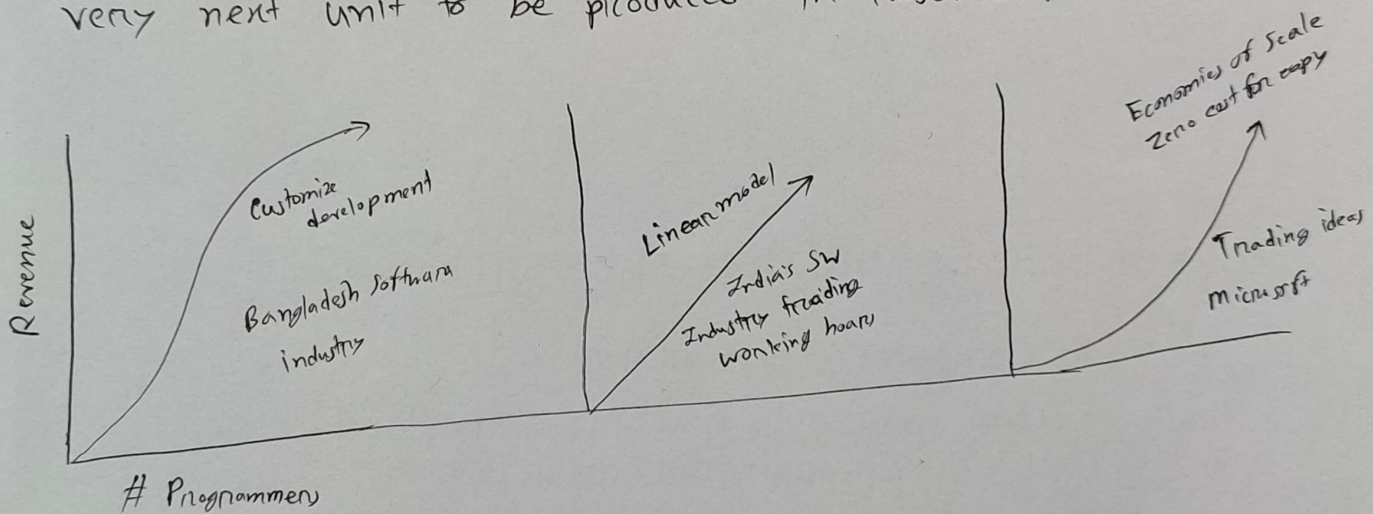
- $\Rightarrow$  one problem is waiting time
- $\Rightarrow$  rework due to introduction or error for miscommunication
- $\Rightarrow$  weaker reusability due to knowledge gap

⊗ How to migrate from linear to exponential graph?

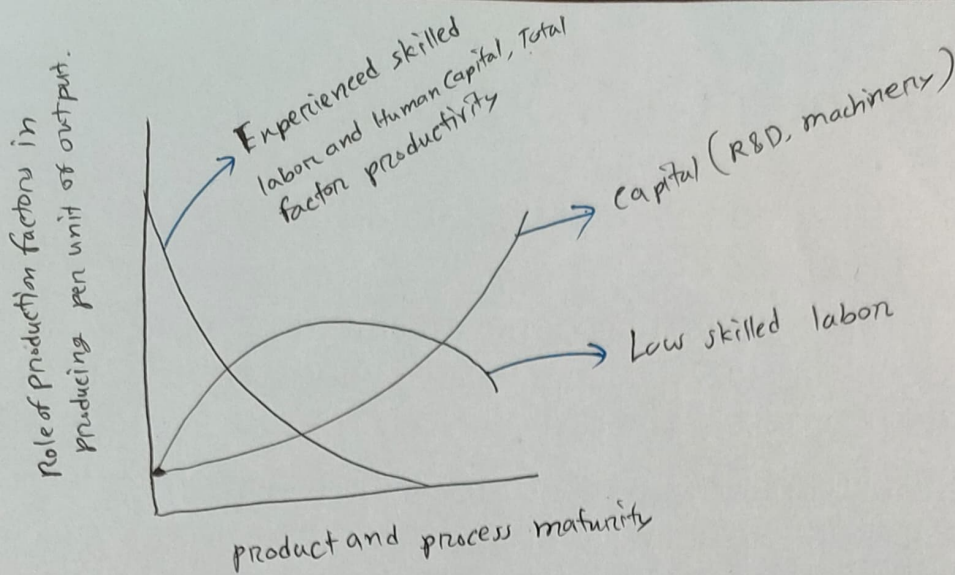




- ⊗ Total product is the total amount produced per set of resources, average product is the average cost per unit produced per set of resources, and marginal product is the cost for the very next unit to be produced in resources.



- ⊗ Short Run
  - One factor of production is fixed.
- ⊗ Long Run
  - Both labour and capital are variable.
- ⊗ Very Long Run
  - When all factors of production are variable, including technology/regulation.



## ⊗ Solow Growth Model:

- The Solow residual,  $SR(t)$ , is the portion of an economy's output growth that cannot be attributed to the accumulation of capital and labor.

$$SR(t) = \frac{\frac{\partial Y}{\partial t}}{Y} - \left( \alpha \frac{\frac{\partial K}{\partial t}}{K(t)} + (1-\alpha) \frac{\frac{\partial L}{\partial t}}{L(t)} \right)$$

$$\underbrace{\frac{dY}{Y}}_{\text{Growth in output}} = \underbrace{\alpha \frac{dK}{K}}_{\text{contribution of capital}} + \underbrace{(1-\alpha) \frac{dL}{L}}_{\text{contribution of labour}} + \frac{dA}{A}$$

$\frac{dA}{A} \rightarrow \text{growth in TFP} \rightarrow \text{Total Factor Productivity} \rightarrow \text{Technology growth \& efficiency}$

## ⊗ Human Capital

- human capital in production has been falling
- but in R & D has been growing.

$$Y = F(K, L, H)$$

~~$$Y = F(K, L, H, A, D)$$~~

$$Y = F(A, X)$$

$\xrightarrow{\text{Ideas \& Object}} \text{Ideas}$   
 $\searrow \text{Object}$



## ⊗ Ideas and Economic Value:

- There is a need for understanding the dynamics of economic value creation out of ideas in a competitive market.
- This understanding of the dynamics (D) is ~~w~~ vital for making decisions (D) for creating economic value out of ideas.
- D will provide guidance about what ideas should be produced and how those should be converted into economic value.

$$Y = F(K, L, H, A, D)$$

↪ most important

need to spend here first to identify other parameters

- the investment should be made for increasing the understanding of technology innovation dynamics for improving decision (D) making role for creating economic value out of ideas (A).

