

**Topic 4: Economic Growth**

1. Potential GDP and the Production Function

(1). Definition

Potential GDP: the real GDP an economy could produce if its labor and the other resources were fully employed.

Determined by resources: capital, labor,..... and technology

How to describe technology?

(2). Production Function: shows the volume of output that can be produced from given inputs (K, L), given the available technology.

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

(3). Growth rate of potential GDP

GDP=hours of work\*output per hour=hours of work\*labor productivity

$$\text{Or } Y = L \times (Y/L)$$

$$\ln Y = \ln L + \ln(Y/L)$$

$$\Rightarrow dY/Y = dL/L + d(Y/L)/(Y/L)$$

2. Determinants of Productivity Growth

Already know two of them: capital $\uparrow$  and technology $\uparrow$

K $\uparrow$  $\Rightarrow$  A=Y/L $\uparrow$  think about why?

Y=zF(K,L), hold K and L unchanged, z $\uparrow$   $\Rightarrow$  A=Y/L $\uparrow$

Insight: L is different across countries! (think about the labor in US and in Africa)

Definition: **Human Capital** is the amount of skill embodied in the workforce.

Measurement: education & training

Extend the production function to Y=zF(K, H\*L)

Hold the z, K, L unchanged, H $\uparrow$  $\Rightarrow$  H\*L $\uparrow$   $\Rightarrow$  Y $\uparrow$   $\Rightarrow$  Y/L $\uparrow$

Example: “East Asia Growth Miracles”

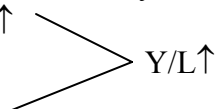
Japan, “four little tigers (or dragons)”: Taiwan, Singapore, Hong Kong, South Korea

It’s not a “miracle” but an application of economic growth theory!

a. high domestic saving hence high investment $\Rightarrow$  K $\uparrow$

b. imitating $\Rightarrow$ z $\uparrow$

c. education (human capital) $\Rightarrow$  H $\uparrow$



Remark: Level, Rate and Convergence

$$\text{Growth Accounting: } \frac{d(Y/L)}{Y/L} = \frac{dZ}{Z} + (1-\alpha) \frac{dH}{H} + \alpha \frac{d(K/L)}{(K/L)}$$

Only growth rate matters, not the level.

Convergence Hypothesis: Economic growth rate tends to be higher in poorer countries than those of richer countries.

If this is true, sooner or later, China will catch up with US!

Why? "FROGLEAP"

Richer countries: innovating, R&D

Poorer countries: imitating, second-mover advantage

Example: Boeing 767 for domestic line, Cellular Phone, Web Access in China

### 3. Growth Policy: How it can be successful?

(1). Encouraging capital formation  $K \uparrow$

---lower interest rate

---tax credit on capital gain

---technology change also brings about higher investment

---growth of demand Example: China's highway system

---political stability and property rights enforcement

(2). Spurring technology progress  $z \uparrow$

---more education, especially scientific, engineering and managerial education

---more investment

---R&D

(3). Improving education and training  $H \uparrow$

more educated earns higher wage  $\Rightarrow$  embodied H

### 4. Productivity Slowdown and Speed-up

1973-1995: Slowdown

1995-present: Speed-up

(1) Productivity slowdown: possible explanations

---lagging investment

---oil shock

---workforce skill down. Indicator: SAT score  $\downarrow$

(2). Productivity Speed-up: Why?

---surging investment

---falling energy price?

---IT technology change