

CHAPTER V

GROWTH AND GROWTH POLICY

Determinants of GDP Growth

In Neoclassic Theory GDP volume and growth are determined by:

a) Savings rate

b) Rate of population growth

c) Rate of technical progress

◆ A key determinant of growth is technology

◆ However, a country needs not to invent new technology

◆ It can grow by 'borrowing' technology and by investing in physical and human capital

1. THE ENDOGENOUS GROWTH

Background

Neo-classical growth theory dominated economic thought from 1950 to 1980

The Neo-classical growth theory illustrates that:

- Growth depends on capital and labour growth and factor productivity
- In steady state there are zero growth of per capita savings and growth of per capita output

By 1980s dissatisfaction arose with neo-classical theory

- ◆ Development in developed countries did not support the neo-classical growth theory
- ◆ Savings rates and growth were positively correlated across developed countries
- ◆ So, endogenous growth theory was developed

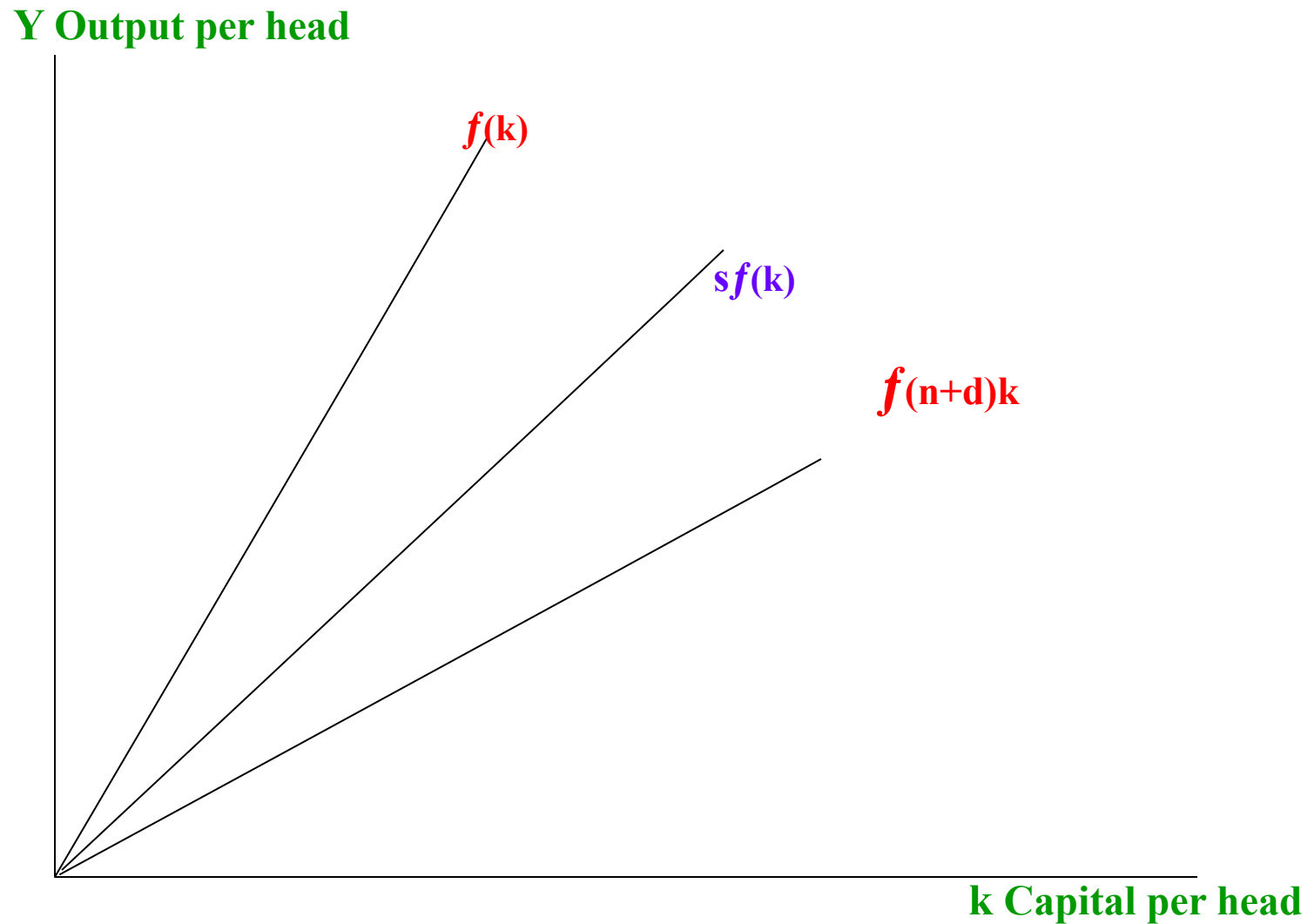
According to Neo-classical theory:

- ❖ Steady-state is achieved at a point where savings and investment requirement lines cross
- ❖ So long saving is more than minimum investment requirement, the economy grows, because capital is added to the economy
- ❖ Development process reaches steady state and stops
- ❖ Investment requirement line has a constant positive slope, but savings line flatten out in long run, so investment requirement line and savings curve are guaranteed to cross

Endogenous growth theory (Figure -1)

- ◆ **Modifies the shape of the production function**
- ◆ **It denies law of diminishing marginal return**
- ◆ **It assumes constant marginal product of capital**
- ◆ **Saving is everywhere greater than required investment**
- ◆ **Savings curve no longer flattens out**
- ◆ **Production and savings curve are straight lines**
- ◆ **Higher is the savings rate, bigger is the gap between saving and investment and faster is growth (Figure -1)**

Figure -1: Production and saving function in endogenous growth theory



Endogenous growth theory presumes capital as the only factor for growth, so:

$$Y = aK \quad (1)$$

$$\Rightarrow \Delta Y = a \Delta K \quad (2)$$

$$\Rightarrow \Delta Y/Y = a \Delta K/Y \text{ [Dividing (2) with Y]}$$

$$\Rightarrow \Delta Y/Y = a\Delta K/aK \text{ [Putting } Y = aK]$$

$$\Rightarrow \Delta Y/Y = \Delta K/K \quad (3)$$

- ◆ **Equation (3) says that growth of output depends on the growth of capital stock**
- ◆ **Endogenous growth theory further assumes that:**
 - ◆ **Savings rate, s , is constant, and**
 - ◆ **There is neither population growth nor depreciation of capital, and**

As there is neither population growth nor depreciation of capital, and all saving goes to increase capital stock, So:

$$\Delta K = sY$$

$$\Rightarrow \Delta K = s (aK) \quad [As Y = ak]$$

$$\Rightarrow \Delta K/K = sa \quad (4)$$

❖ Equation (4) says that growth rate of capital is proportional to savings rate

From equation (3) and (4) we have

$$\Delta Y/Y = sa \quad [\Delta K/K = \Delta Y/Y] \quad (5)$$

❖ Equation (5) expresses that growth rate of output is proportional to savings

❖ Higher is the savings rate, higher is the growth rate of output

❖ This is the assumption of endogenous growth theory

Savings and Investment

- ◆ Higher is the savings rate chosen by a society, higher is the steady state capital and income
- ◆ It means, higher is the savings rate, higher is the per capita capital and per capita income in the in the steady state.
- ◆ Conclusion: Steady state can be achieved at different living standard.

Limitation

- ◆ Higher is k , greater is the investment required to maintain capital-labour ratio
- ◆ Hence, higher is k less is consumption
- ◆ So, too high a savings rate can lead to high income but low consumption

Let us assume:

- ◆ **Steady-state income equals $y^* = f(k^*)$**
- ◆ **Steady state investment is $(n + d)k^*$,**
- ◆ **Steady-state consumption is c^* , then**
- ◆ **$c^* = f(k^*) - (n + d)k^*$**

Conclusion

Steady state consumption is maximised, when just enough is invested to cover the increased output

- ◆ **Above this level, saving should be cut and more consumed**
- ◆ **Below this level, consumption should be increased**

3. DEEPER ECONOMICS OF ENDOGENOUS GROWTH

Difference between neo-classical and endogenous growth theory:

- ◆ Endogenous growth theory abolishes law of diminishing marginal returns
- ◆ It imposes constant returns to scale on capital
- ◆ This violates one of the basic microeconomic principles

This implies that:

- ◆ Firms with twice as much capital produces twice as much output
- ◆ This suggests that larger and larger firms grow more and more
- ◆ It means that ultimately a single firm comes to dominate the entire economy

Endogenous Growth theory argues

- ❖ **Practically, there is no monopoly**
- ❖ **Individual firm cannot capture all benefits of constant returns to scale at the same time**
- ❖ **Some of the benefits remain external to firm**
- ❖ **Some firms use these factors and some firms have other factors of efficiency**
- ❖ **A firm can not use all factors of productivity at the same time**
- ❖ **Hence, there is no monopolisation of the economy**

Further endogenous growth theory separates different capitals:

- ◆ There are not only new machines but new ways of doing things
- ◆ Some firms assume technological advantage because of research
- ◆ Some assume unforeseen (unexpected) opportunity
- ◆ Benefits of new machines can be copied
- ◆ But benefits of new methods and new ideas can not be copied easily
- ◆ Hence monopolisation is hold up

4. CONVERGENCE

- ◆ **Endogenous growth theory assumes that higher savings rate leads to higher growth rate**
- ◆ **Countries those invest more grow faster**
- ◆ **However, impact of higher investment on growth is transitory**
- ◆ **Country with higher investment achieves higher per capita income**
- ◆ **But afterward growth rate slows down**
- ◆ **Endogenous growth theory predicts convergence for economies**
- ◆ **It predicts all economies should reach same steady state and same per capita income ultimately**

For Endogenous growth theory says:

- ◆ Economies converge and converge conditionally
- ◆ Those save and invest more converges fast
- ◆ Those save and invest less converges slowly
- ◆ Hence, international differences in growth rates and per capita income sustain in the time being
- ◆ But growth rate of faster growing countries slows down
- ◆ The growth rate of slowly growing countries goes up
- ◆ Ultimately all economies should reach same steady state and same per capita income

Endogenous growth theory remarks that:

Till 1980s

- ◆ Convergence was taking place at a rate of 2% annually
- ◆ India's income level was 5% of USA in 90s
- ◆ Hence, it was concluded that India would achieve the US level in 151 years

However, the period of convergence could be shorten considerably by:

- ◆ Increasing savings rate, and labour productivity in India
- ◆ Some of such options are discussed below

Illustrations

Let's per capita income of USA and India in 2005 were \$35000 and \$700 respectively. If per capita income of India converges at the rate of 2%, 5%, 8% 10% and 15% to that of USA, how many years India will require achieving USA standard

Let the convergence rate is 2%

- ◆ India's present per capita income is \$ 700
- ◆ US present per capita income is \$ 35000
- ◆ India is converging at the rate 2% to the USA

We know that:

◆ $\text{Future Income} = \text{Present Income} (1+r)^n$

Where n is the years and r is the rate of growth

□ $35000 = 700 (1+2\%)^n$

□ $50 = (1+2/100)^n$

□ $\text{Log } 50 = \text{Log } (102/100)^n$

□ $\text{Log } 50 = n [\text{Log } 102 - \text{Log } 100]$

□ $1.699 = n [2.0086 - 2]$

□ $1.699 = n \times .0086$

□ $n = 197 \text{ Years}$

□ It means India requires 197 years to converse to USA

Let the convergence rate is 5%

We know that:

$$\blacklozenge \text{ Future Income} = \text{Present Income} (1+r)^n$$

Where n is the years and r is the rate of growth

$$\blacklozenge 35000 = 700 (1+5\%)^n$$

$$\blacklozenge 50 = (1+5/100)^n$$

$$\blacklozenge \text{Log } 50 = \text{Log } (105/100)^n$$

$$\blacklozenge \text{Log } 50 = n [\text{Log } 105 - \text{Log } 100]$$

$$\blacklozenge 1.699 = n [2.0212 - 2]$$

$$\blacklozenge 1.699 = n \times .0212$$

$$\blacklozenge n = 84 \text{ Years}$$

\blacklozenge It means India requires 84 years to converse to USA

Let the convergence rate is 8%

We know that:

$$\blacklozenge \text{ Future Income} = \text{Present Income} (1+r)^n$$

Where n is the years and r is the rate of growth

$$\blacklozenge 35000 = 700 (1+8\%)^n$$

$$\blacklozenge 50 = (1+8/100)^n$$

$$\blacklozenge \text{Log } 50 = \text{Log} (108/100)^n$$

$$\blacklozenge \text{Log } 50 = n [\text{Log } 108 - \text{Log } 100]$$

$$\blacklozenge 1.699 = n [2.0334 - 2]$$

$$\blacklozenge 1.699 = n \times .0334$$

$$\blacklozenge n = 51 \text{ Years}$$

\blacklozenge It means India requires 51 years to converse to USA

Let the convergence rate is 10%

We know that:

◆ **Future Income = Present Income $(1+r)^n$**

Where n is the years and r is the rate of growth

◆ **$35000 = 700 (1+10\%)^n$**

◆ **$50 = (1+10/100)^n$**

◆ **$\text{Log } 50 = \text{Log } (110/100)^n$**

◆ **$\text{Log } 50 = n [\text{Log } 110 - \text{Log } 100]$**

◆ **$1.699 = n [2.0414 - 2]$**

◆ **$1.699 = n \times .0414$**

◆ **$n = 41 \text{ Years}$**

◆ **It means India requires 41 years to converse to USA**

Let the convergence rate is 12%

We know that:

◆ **Future Income = Present Income $(1+r)^n$**

Where n is the years and r is the rate of growth

◆ **$35000 = 700 (1+12\%)^n$**

◆ **$35000 = 700(1+12/100)^n$**

◆ **$\text{Log } 50 = \text{Log } (112/100)^n$**

◆ **$\text{Log } 50 = n [\text{Log } 112 - \text{Log } 100]$**

◆ **$1.699 = n [2.0792 - 2]$**

◆ **$1.699 = n \times .0492$**

◆ **$n = 34.67 \text{ Years}$**

◆ **It means India requires 21.4 years to converse to USA**

Let the convergence rate is 15%

We know that:

$$\blacklozenge \text{ Future Income} = \text{Present Income} (1+r)^n$$

Where n is the years and r is the rate of growth

$$\blacklozenge 35000 = 700 (1+15\%)^n$$

$$\blacklozenge 50 = (1+15/100)^n$$

$$\blacklozenge \text{Log } 50 = \text{Log } (115/100)^n$$

$$\blacklozenge \text{Log } 50 = n [\text{Log } 115 - \text{Log } 100]$$

$$\blacklozenge 1.699 = n [2.0607 - 2]$$

$$\blacklozenge 1.699 = n \times .0607$$

$$\blacklozenge n = 27 \text{ Years}$$

\blacklozenge It means India requires 27 years to converse to USA

- ◆ **Up to 1990 India converged only at rate of 2%**
- ◆ **So, she had to wait 151 years to achieve USA standard**
- ◆ **However, relying on neo-classical force of convergence, India cannot look forward to catch up with USA**

If, India saves and invests more as Endogenous Growth Theory predicts:

- ◆ **It can magically reduce convergence period as above**
- ◆ **If it can achieve only a growth rate of 8% annually that She is doing now:**
 - **Convergence time is reduced to 50 years only**
 - **This is true for all developing countries**

Actually India convergence rate is 8%

We know that:

$$\blacklozenge \text{ Future Income} = \text{Present Income} (1+r)^n$$

Where n is the years and r is the rate of growth

$$\blacklozenge 35000 = 700 (1+8\%)^n$$

$$\blacklozenge 50 = (1+8/100)^n$$

$$\blacklozenge \text{Log } 50 = \text{Log} (108/100)^n$$

$$\blacklozenge \text{Log } 50 = n [\text{Log } 108 - \text{Log } 100]$$

$$\blacklozenge 1.699 = n [2.0334 - 2]$$

$$\blacklozenge 1.699 = n \times .0334$$

$$\blacklozenge n = 50 \text{ Years}$$

It means India requires 50 years to converse to income of USA

5. GROWTH TRAPS AND TWO SECTOR MODELS

- ◆ To explain no-growth and high growth, neo-classical and endogenous growth theories is used
- ◆ There are two kinds of investment opportunities
- ◆ Some investments follow the law of diminishing marginal product
- ◆ Some follow rule of constant marginal product
- ◆ So, society must choose investment in sectors that follow constant marginal product

- ❖ Societies investing in research and development have ongoing growth
- ❖ **Because it helps developing technology for growth**
- ❖ Societies that direct investment toward physical capital may have higher output in the short run but at the price of lower long-run growth

Least developed countries

- ❖ Low-income causes less savings
- ❖ **Less savings do not meet capital requirement for growth**
- ❖ So, growth rate remains low, which leads to low a steady growth state
- ❖ **At high income savings and investments are more than the capital requirement**
- ❖ It leads to ongoing growth

6. PULATION GROWTH AND ECONOMIC GROWTH

Regarding population growth one oldest view is that:

- ❖ **Population growth functions against achievement of high incomes**

Solow's growth model predicts that

- ❖ **High population growth (n) means lower income (and lower steady growth state)**
- ❖ **Because high population growth means less capital per worker**

Rich Countries

- ❖ **With rising incomes birth rates fall**
- ❖ **Rich countries are approaching zero population growth**

Poor Countries

- ❖ Poor countries have high birth resulting high population growth
- ❖ And as incomes rise, death rates fall and population growth rises
- ❖ Poor countries are recognizing need to reduce population growth
- ❖ So, contraceptives are being persuaded and policies instituted
- ❖ Reducing population growth in poor countries is difficult
- ❖ In poor countries large families function as a social security system
- ❖ Children ensures that parents are taken care of in their old age

8. LESSONS FROM THE ASIAN TIGERS

Because of high economic growth and quick development

◆ **Hong Kong, Singapore, South Korea, and Taiwan are called 'Asian Tigers'**

From 1966 to 2000 per capita GDP grew annually in average in (Table-1):

◆ **Hong Kong 5.7%**

◆ **Singapore 6.8%**

◆ **South Korea 6.8%**

◆ **Taiwan 6.7%**

◆ **They are seen as model for developing countries**

They followed some policies, which are worthy of copying:

- ◆ **These policies are hard work and sacrifice**

These countries have:

- ◆ **Saved more and invested more**
- ◆ **Put more people to work**

Hence, labour force increased from 1966 to 2000 in (Table-1):

- ◆ **Hong Kong 38-49%**
- ◆ **Singapore 27-51%**
- ◆ **South Korea 27-36%**
- ◆ **Taiwan 27-37%**

❖ They concentrated on education in order to raise human capital

People with SSC and Higher Education grew from 1966 to 2000 in (Table-1):

❖ Hong Kong 27-71%

❖ Singapore 16-66%

❖ South Korea 27-75%

❖ Taiwan 26-68%

❖ Total Factor Productivity in these countries however, did not grow fast

From 1966 to 2000 TFP grew (Table-1):

- ◆ 2.3 times in Hong Kong
- ◆ 0.2 times in Singapore
- ◆ 1.7 times in South Korea
- ◆ 2.6 times Taiwan
- ◆ They have relatively stable governments
- ◆ They follow an export-oriented economic policy
- ◆ Encourage their industries to export
- ◆ They liberalize their market and encourage their industries to compete in free market
- ◆ They directed their investments

Table 4.1: Growth in the Tiger Countries (1966-2000)

	Hong Kong	Singapore	South Korea	Taiwan
Per Capita GDP Growth	5.7	6.8	6.8	6.7
TFP Growth	2.3	0.2	1.7	2.6
Growth of Labour force	38-49	27-51	27-36	28-37
Growth of SSC & Higher Education	27-71	16-66	27-75	26-68

- ❖ **They have encouraged foreign investment to bring in new technologies**
- ❖ **The Tigers Countries have achieved something extraordinary in human history**
- ❖ **Their high growth rate transformed them from poorest countries to rich countries**

This is done in the old-fashioned way

- ❖ **Through saving, investment, hard work of the labour force and competition**

9. THE GROWTH OF POOR COUNTRIES

- ❖ **Growth of Bangladesh illustrates a striking problem**
- ❖ **Till 1990 it had actually no economic growth**
- ❖ **This is true also for: Burma, Nepal, Ghana, etc**
- ❖ **Income in these is so low that much of the population lives under subsistence**
- ❖ **So, savings are very low**
- ❖ **From 1960 to 1985 investment in Bangladesh was only 4.6% of GDP**
- ❖ **In the same time, it was 36.6% to 24% in Japan and USA respectively**

What to do

- ❖ Population growth in poor countries was much higher than in Japan & USA- It must be reduced
- ❖ They must invest in human capital
- ❖ They have hostile climates for foreign investment – It must be liberalized
- ❖ Enabling economic and legal environment for foreign investment must be ascertained
- ❖ Repatriate investments and profits must be guaranteed for foreign investments
- ❖ Export must be discouraged

Questions

Describe the factors on which the growth of the economy depends?

Explain indigenous growth theory.

Explain the relationship between output and savings according to indigenous growth theory.

What is the deeper significance of indigenous growth theory?

What is meant by two-sector model of the economy in indigenous growth theory?

Discuss the factors that determine the convergence of the economies.

Let the per capita annual income of USA is \$60000 and of Bangladesh is \$700. Let the economy of Bangladesh grow on average at the rate of 6%. How many years will Bangladesh require to reach the economy standard of USA if the economy of USA stagnates?

Explain the theoretical lesson from the 'Asian Tiger Countries'.

Explain the impact of rate of population growth on economic growth of a developing economy.

End of the Chapter

Thank You Very Much

For Patient Listening