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 capita1

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**

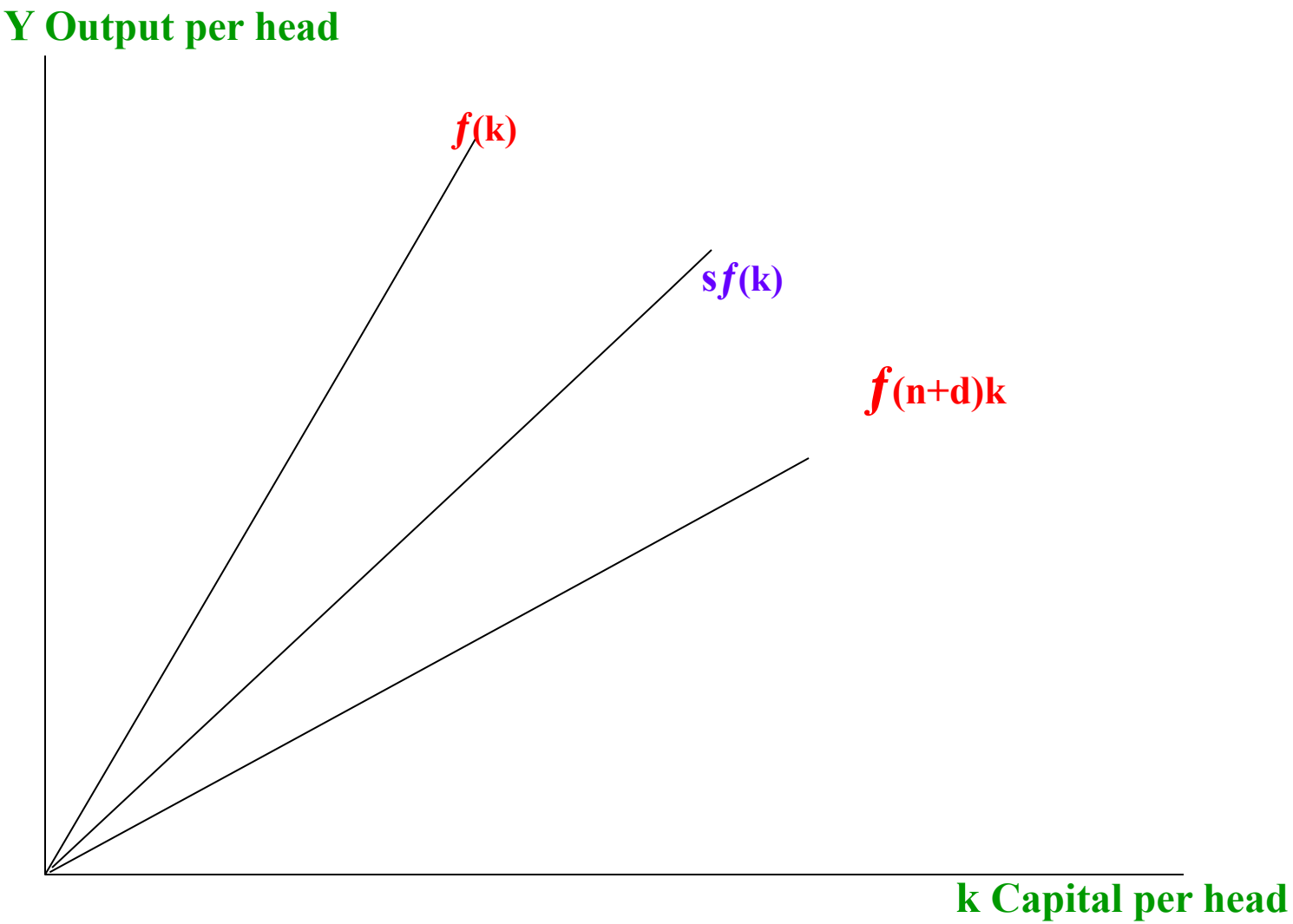
According to Neo-classical theory:

- 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:

$\Delta K = sY$

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

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

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

From equation (3) and (4) we have

$\Delta Y/Y = sa$ [$\Delta K/K = \Delta Y/Y$] (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 capital 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 les 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 converses fast
- Those save and invest les converses 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:

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

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

- $35000 = 700\ (1+2\%)^n$
- $50 = (1+2/100)^n$
- $\text{Log } 50 = \text{Log } (102/100)^n$
- $\text{Log } 50 = n\ [\text{Log } 102 - \text{Log } 100)$
- $1.699 = n\ [2.0086 - 2]$
- $1.699 = n \times .0086$
- $n = 197$ Years
- It means India requires 197 years to converse to USA

Let the convergence rate is 5%

We know that:

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

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

- $35000 = 700\ (1+5\%)^n$
- $50 = (1+5/100)^n$
- $\text{Log } 50 = \text{Log } (105/100)^n$
- $\text{Log } 50 = n\ [\text{Log } 105 - \text{Log } 100)$
- $1.699 = n\ [2.0212 - 2]$
- $1.699 = n \times .0212$
- $n = 84$ Years
- It means India requires 84 years to converse to USA

Let the convergence rate is 8%

We know that:

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

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

- $35000 = 700\ (1+8\%)^n$
- $50 = (1+8/100)^n$
- $\text{Log } 50 = \text{Log } (108/100)^n$
- $\text{Log } 50 = n\ [\text{Log } 108 - \text{Log } 100)$
- $1.699 = n\ [2.0334 - 2]$
- $1.699 = n \times .0334$
- $n = 51$ Years
- 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

- $35000 = 700\ (1+10\%)^n$
- $50 = (1+10/100)^n$
- $\text{Log } 50 = \text{Log } (110/100)^n$
- $\text{Log } 50 = n\ [\text{Log } 110 - \text{Log } 100)$
- $1.699 = n\ [2.0414 - 2]$
- $1.699 = n \times .0414$
- $n = 41$ 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

- $35000 = 700\ (1+12\%)^n$
- $35000 = 700(1+12/100)^n$
- $\text{Log } 50 = \text{Log } (112/100)^n$
- $\text{Log } 50 = n\ [\text{Log } 112 - \text{Log } 100)$
- $1.699 = n\ [2.0792 - 2]$
- $1.699 = n \times .0492$
- $n = 34.67$ Years
- It means India requires 21.4 years to converse to USA

Let the convergence rate is 15%

We know that:

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

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

- $35000 = 700\ (1+15\%)^n$
- $50 = (1+15/100)^n$
- $\text{Log } 50 = \text{Log } (115/100)^n$
- $\text{Log } 50 = n\ [\text{Log } 115 - \text{Log } 100)$
- $1.699 = n\ [2.0607 - 2]$
- $1.699 = n \times .0607$
- n = 27 Years
- It means India requires 27 years to converse to USA

- Up to 1990 India conversed 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:

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

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

- **$35000 = 700\ (1+8\%)^n$**
- **$50 = (1+8/100)^n$**
- **$\text{Log } 50 = \text{Log } (108/100)^n$**
- **$\text{Log } 50 = n\ [\text{Log } 108 - \text{Log } 100)$**
- **$1.699 = n\ [2.0334 - 2]$**
- **$1.699 = n \times .0334$**
- **n = 50 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 les savings
- Les 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 grew 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 those determine the convergence of the economies.
- Lets per capital annual income of USA is $60000 and of Bangladesh is $700. Let the economy of Bangladesh grows in average at the rate of 6%. How many years will Bangladesh require to the economy standard 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