III   Economic Growth

A   Introduction to Growth Theory

1   The Importance of Economic Growth

The Significance of 1% Growth in GDP					
Growth Rate (%)	10	7	5	2.5	1
Time to Double Income (Years)	7.3	10.2	14.2	28.1	69.7

2   Some Stylized Facts about Economic Growth (Kaldor, 1963)

- Per capita output grows over time, and its growth rate does not tend to diminish.

- Physical capital per worker grows over time.

- The ratio of physical capital to output is nearly constant.

- The shares of labor and physical capital in national income are nearly constant.

- Per capita output differs substantially across countries.

- The growth rate of per capita output varies greatly across countries and over time.

3   Development of growth theory

3.1   Classical Growth Theories

- Adam Smith (1776) and David Ricardo (1817)

- Thomas Malthus (1798)

- Frank Ramsey (1928)

- Joseph Schumpeter (1934)

3.2   Neoclassical Growth Models

(i)   Solow-Swan Model (1956)

- Constant returns to scale

- Diminishing returns to each input

- Fixed savings rate

- Exogenous technological progress

- No technological progress $\Rightarrow$ no growth in per capita income

- (Transitional dynamics) Lower starting level of real per capita GDP $\Rightarrow$ higher growth rate

- Dynamic inefficiency

(ii)   Cass and Koopmans Model (1965)

- Endogenous savings rate
- Competitive equilibrium – Pareto optimal

3.3   Early Attempts to Endogenize Technological Progress

(i)   Arrow Model (1962)

- Learning-by-doing
- Technological progress – unintended by-product of production or investment
- No compensation is paid to technological progress and capital and labor receive their marginal products
- Technological progress is endogenous (in the sense that saving propensity affects its time path)

(ii)   Uzawa Model (1965)

- Optimal accumulation of physical and human capital
- No compensation is paid to technological progress

(iii)   Shell Model (1967)

- Government-financed R&D
- Technological progress is modeled as a result of economic choices
- Strictly decreasing returns
- No growth in per capita income

3.4   Endogenous Growth Models

- Long-run growth rate is endogenously determined

(i)   Capital-based Models

- Physical and/or human capital accumulation $\Rightarrow$ economic growth
- Emphasize externalities of capital accumulation

(ii)   Innovation-based Models

- Innovation $\Rightarrow$ technological progress $\Rightarrow$ economic growth
- Stress intentional R&D activities

(iii)   Other Endogenous Growth Models