The Theory of Economic Growth

Economic Growth
• The Importance of Economic Growth
  – Growth of real GDP per capita
    • A measure of standards of living
    • Small changes make large differences over long periods of time
  – The causes and consequences of sustained increases in natural real GDP per capita
    • Debates over the allocating the pie when it is growing rapidly versus slowly

Economic Growth
• Standards of Living as the Consequence of Economic Growth
  – The Poor United Kingdom
  – Economic Growth: Something for Nothing?

Economic Growth
• The Production Functions & Growth
  – Introduction to Neoclassical Theory
    • Output growth comes from 2 components:
      – Growth in factor inputs
      – Growth in output relative to growth in factor inputs
  – The Production Function
    • The production function is the relationship between:
      – Output, Y
      – Autonomous growth factor, A, and
      – Factor inputs, K and N
    \[ Y = A \cdot f(K, N) \]

Economic Growth
• The Production Function & Growth (con’t)
  – Output per Person and the Capital-Labor Ratio
    \[ \frac{Y}{N} = A \cdot f\left(\frac{K}{N}\right) \]
    • Only 2 sources of growth in output per capita
      – Autonomous growth factor, A, assumed to be fixed
      – Ratio of capital to labor, K / N,
    » Figure 9-1
      » Subject to diminishing returns
    • Reveals sources of growth but does not explain why they are different between countries or over time.
      – Also why A(0) rather than A(1)
Economic Growth

- The Production Function & Growth (con’t)
  - Saving, Investment, and the Growth in Capital per Person
    - Savings
      \[ S + (T - G) = I + NX \]
      or
      \[ S(n) = I \]
      assuming \( NX = 0 \)

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- Investment
  \[ I = \delta K + d * K \]
  where \( d \) = average depreciation rate
  Now \( I = (K * \delta K / K) + d * K \)
  \[ I = [(\delta K / K) + d] * K \]
  or \( I = (k + d) * K \)

- A steady state occurs when \( Y \) and \( K \) grow at the same rate, implying a fixed ratio of \( Y \) to \( K \)
  - Requires
    \[ y = k = n \] with \( A = A(0) \)
  - When these conditions are true economy stays at a fixed position on the per capita production function

Economic Growth

- The Production Function & Growth (con’t)
  - Saving & Investment in the Steady State
    - A steady state occurs when \( Y \) and \( K \) grow at the same rate, implying a fixed ratio of \( Y \) to \( K \)
    - Requires
      \[ y = k = n \] with \( A = A(0) \)
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- Solow’s Theory of Economic Growth
  - The Harrod-Domar model of economic growth keeps all of these variables constant
    - But each variable is determined by very different factors
    - Solow flipped the equation
      \[ s * (Y / K) = n + d \]
      \[ s * (Y / N) = (n + d) * (K / N) \]
Economic Growth

- Solow’s Theory of Growth (continued)
  National savings per person,
  \[ s \times \left( \frac{Y}{N} \right) \]
  =
  Steady-state investment per person,
  \( (n + d) \times \left( \frac{K}{N} \right) \)
  – that is how much capital is needed for each additional worker plus how much capital is needed to replace depreciation.

- Solow’s Theory of Growth (continued)
  – Graphically
    - Per person production function and per person savings function
      » Figure 9-2a
    - Steady-state investment per person
      » Figure 9-2b
  – Equilibrium
    » Figure 9-3
  – Disequilibrium dynamics

- Solow’s Theory of Growth (continued)
  – Effects of a Higher Saving Rate
    » Figure 9-4
    - Equilibrium moves from E(0) to E(1)
    - At E(1)
      - \( K(1) / N(1) > K(0) / N(0) \)
      - \( S / N \) and \( Y / N \) are fixed
      - \( y = k = n \)
    - A rise in the saving rate temporary increase \( y \) as \( I \) rises enough to raise \( K \) and \( Y / N \) but then \( y = k = n \)
      - Long-run versus short-run dilemma
Economic Growth

• Technology in Theory and Practice
  – Two Types of Technological Change
    • Labor Augmenting Technological Change
      – Makes workers more efficient
    • Neutral Technological Change
      – Makes both workers and capital more efficient
  – The “Solow Residual”
    – We can measure “a” from
      \[ y - n = a + b * ( k - n ) \]
    – “a” accounts for nearly 90% of \( y / n \)

• Major Puzzles with Solow Growth Theory
  – Income per capita varies too much across countries
  – Poor countries do not have a higher rate of return on capital
  – The facts about immigration differ from the model’s implications
  – Convergence has not been uniform

• Endogenous Growth Theory
  – Trying to Endogenize “A”
  – The Interpretation of Capital
    • Returns to capital do not diminish
      – Still a problem if all capital is alike and freely mobile
    • Human capital versus physical capital
      – Physical capital may be mobile but human capital is not

• Endogenous Growth Theory (continued)
  – The Production of Ideas
    • Rely by monopoly power reinforced by patents and copyrights
    • The concept of ideas helps explain
      – The introduction of new goods
      – The development of better production techniques
      – The development of higher quality
    • Requires the associated investment in physical and human capital
Economic Growth

• Endogenous Growth Theory (continued)
  – Empirical Studies and Policy Implications
    • Faster growth is associated with
      – higher rates of investment
        » either private or government sector
      – relatively low government consumption
      – greater educational attainment
      – greater political stability
      – lower fertility
  • Policy Implications
    – Tax private consumption, restrain public consumption
    – Promote public and private investment

• CASE STUDY: The Economic Miracle of the Four Tigers
  – Growth rates, 1960 - 1990
    • Philippines, about 2% per year
    • China, Japan, Indonesia, Malaysia, Thailand, 3 - 5%
    • Hong Kong, Korea, Taiwan, Singapore, > 6%
      > Figure 9 - 6

• CASE STUDY: The Economic Miracle of the Four Tigers (continued)
  – Growth in Factor Inputs or in Multifactor Productivity?
    • Extensive growth, growth in factor inputs
      – Rapid capital accumulation
      – Rapid increase in labor force
    • Intensive growth, growth in multifactor productivity
      – Very strong
    • Conclusion: both

• CASE STUDY: The Economic Miracle of the Four Tigers
  – Did Public Policy Play a Role?
    • Market-promoting policies
      – encourage free markets, minimize government
      – provide infrastructure
      – promote education and income equality
      – encourage foreign investment and exports
    • Market-interfering policies
      – subsides to investment and exports
      – import barriers and capital controls

• CASE STUDY: The Economic Miracle of the Four Tigers
  – Should Policy Promote Investment and Exports?
Economic Growth

• Conclusion: Are There Secrets of Growth?
  – Probably not but
    • A favorable institutional infrastructure
    • Political and social stability
    • “Capital” deepening
    • Minimizing diversion
    • Openness to foreign trade and capital flows
    • Climate
    • Luck
  – We still have a lot to learn