
Long-Run Economic Growth, Part 2

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Agenda

- Fundamental Determinants of Living Standards.
 - Policies to Raise Long-Run Living Standards.
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The Solow Model

- Fundamental determinants of living standards:
 - The saving rate.
 - Population growth.
 - Productivity growth.
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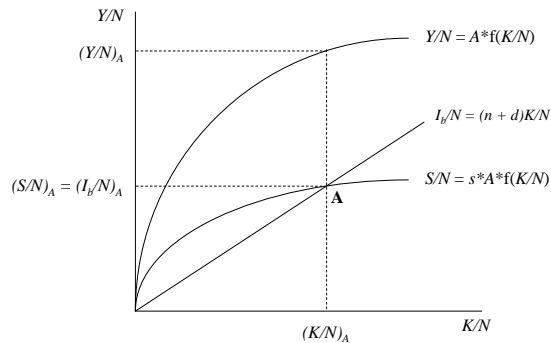
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The Solow Model

- Fundamental determinants of living standards:
 - Increasing the saving rate:
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Effect of an increase in the saving rate



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The Solow Model

- The adjustment mechanism:
 - A higher saving rate shifts the saving function up.
 - At the original K/N , at $(K/N)_A$, S/N is now greater than I_b/N .
 - Consequently, K/N will increase, causing:
 - Y/N to increase along the production function,
 - S/N to increase along the new saving function, and
 - I_b/N to increase along the balanced investment function.

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The Solow Model

- The adjustment mechanism (continued):
 - Because of diminishing marginal product of capital, the increase in S/N is smaller than the increase in I_b/N for every increase in K/N .
 - Eventually S/N will equal I_b/N at a new, higher steady state at B.

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The Solow Model

- The adjustment mechanism (continued):
 - At B, Y/N has increased, K/N has increased, S/N has increased, and I_b/N has increased.
 - At steady state B, $\Delta Y/Y = \Delta N/N = \Delta K/K$.
 - During the transition period from steady state A to steady state B:
 - $\Delta Y/Y > \Delta N/N$ because Y/N was increasing, and
 - $\Delta K/K > \Delta N/N$ because K/N was increasing.

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The Solow Model

- Fundamental determinants of living standards:
 - Increasing the saving rate means:
 - A higher capital-labor ratio, K/N ,
 - A higher output per worker, Y/N , and
 - A higher consumption per worker, C/N .

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The Solow Model

- Fundamental determinants of living standards:
 - Increasing the saving rate:
 - Should raising the saving rate be a policy goal?
 - Not necessarily.
 - » There is a trade-off between present and future consumption.
 - » The cost is lower consumption in the short run.

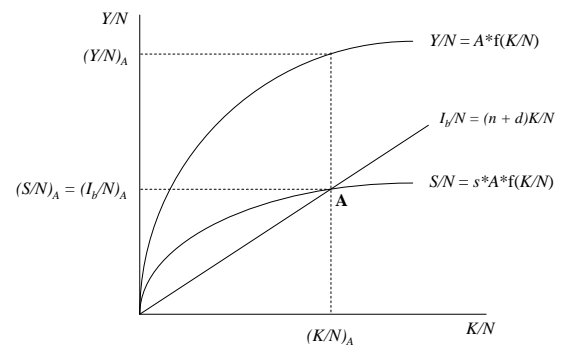
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The Solow Model

- Fundamental determinants of living standards:
 - Slowing the population growth rate:

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Effect of a faster population growth rate



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The Solow Model

- The adjustment mechanism:
 - A slower population growth rate rotates the balanced investment function down.
 - At the original K/N , at $(K/N)_A$, S/N is now greater than I_b/N .
 - Consequently, K/N will increase, causing:
 - Y/N to increase along the production function,
 - S/N to increase along the saving function, and
 - I_b/N to increase along the new I_b/N function.

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The Solow Model

- The adjustment mechanism (continued):
 - Because of diminishing marginal product of capital, the increase in S/N is smaller than the increase in I_b/N for every increase in K/N .
 - Eventually S/N will equal I_b/N at a new, higher steady state at B.

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The Solow Model

- The adjustment mechanism (continued):
 - At B, Y/N has increased, K/N has increased, S/N has increased, and I_b/N has increased.
 - At steady state B, $\Delta Y/Y = \Delta N/N = \Delta K/K$.
 - During the transition period from steady state A to steady state B:
 - $\Delta Y/Y > \Delta N/N$ because Y/N was increasing, and
 - $\Delta K/K > \Delta N/N$ because K/N was increasing.

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The Solow Model

- Fundamental determinants of living standards:
 - Slowing the population growth rate means:
 - A higher capital-labor ratio, K/N ,
 - A higher output per worker, Y/N , and
 - A higher consumption per worker, C/N .

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The Solow Model

- Fundamental determinants of living standards:

- Slowing the population growth rate :

- Should reducing population growth be a policy goal?

- Doing so will raise consumption per worker but it will reduce total output and consumption.
 - We have also assumed that the proportion of the population of working age is fixed which may not be true.

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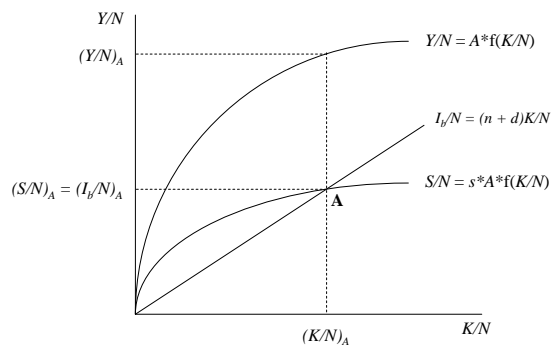
The Solow Model

- Fundamental determinants of living standards:

- Increasing the productivity growth rate:

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Effect of a productivity improvement



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The Solow Model

- The adjustment mechanism:

- An improvement in productivity shifts both the production and saving functions up.
- At the original K/N , at $(K/N)_A$, Y/N is now higher.
- Also at the original K/N , at $(K/N)_A$, S/N is now greater than I_b/N .

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The Solow Model

- The adjustment mechanism:
 - Consequently, K/N will increase, causing:
 - Y/N to increase along the new production function,
 - S/N to increase along the new saving function, and
 - I_b/N to increase along the balanced investment function.

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The Solow Model

- The adjustment mechanism (continued):
 - Because of diminishing marginal product of capital, the increase in S/N is smaller than the increase in I_b/N for every increase in K/N .
 - Eventually S/N will equal I_b/N at a new, higher steady state at B.

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The Solow Model

- The adjustment mechanism (continued):
 - At B, Y/N has increased, K/N has increased, S/N has increased, and I_b/N has increased.
 - At steady state B, $\Delta Y/Y = \Delta N/N = \Delta K/K$.
 - During the transition period from steady state A to steady state B:
 - $\Delta Y/Y > \Delta N/N$ because Y/N was increasing, and
 - $\Delta K/K > \Delta N/N$ because K/N was increasing.

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The Solow Model

- Fundamental determinants of living standards:
 - An improvement in productivity means:
 - A higher capital-labor ratio, K/N ,
 - Higher output per worker, Y/N , and
 - Higher consumption per worker, C/N .

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The Solow Model

- Fundamental determinants of living standards:
 - An improvement in productivity means:
 - Productivity improvement directly improves the amount that can be produced at any capital-labor ratio.
 - The increase in output per worker also increases the supply of saving, and indirectly causes the long-run capital-labor ratio to rise.

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The Solow Model

- Fundamental determinants of living standards:
 - Can consumption per worker grow indefinitely?
 - The saving rate cannot rise forever.
 - The population growth rate cannot fall forever.
 - Productivity and innovation can always occur.

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The Solow Model

- Fundamental determinants of living standards:
 - So living standards can rise continuously.
 - The rate of productivity improvement is the **dominant factor** determining how quickly living standards rise.

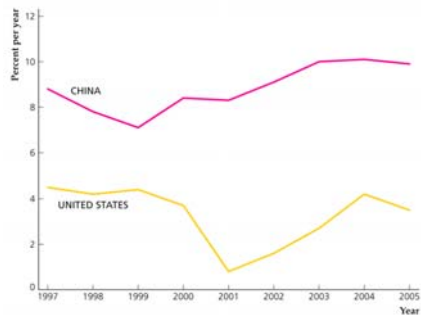
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Application: The growth of China

- Population of 1.3 billion people.
 - A huge labor force with a comparative advantage in labor-intensive industries where wages are low.
- A low, but rapidly growing, level of GDP.
 - About 1/9 of US GDP per capita in 1998.
 - About 1/7 of US GDP per capita in 2007.

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Real GDP growth in China and the US



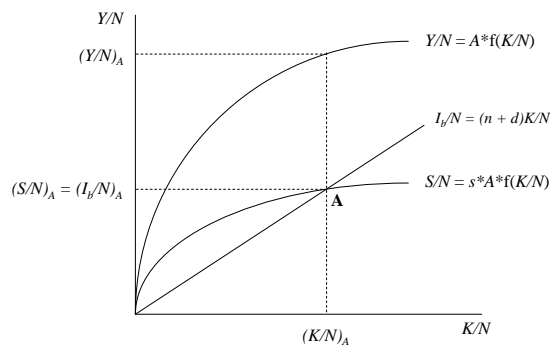
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Application: The growth of China

- Rapid output growth attributable to:
 - Saving is very high.
 - Current consumption is very low.
 - Huge increases in capital investment.
 - Productivity growth is very rapid.
 - Due in part from changing to a market economy.
 - Due to adopting foreign technologies through FDI, etc.
 - Population growth has slowed.

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Application: The growth of China



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Application: The growth of China

- Will China ever catch up to the U.S.?
 ➤ Problems China faces:
 - Weak banking system.
 - Rapidly aging population.
 - Increasing income inequality.
 - Much unemployment in rural areas.

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Policies to Raise Long-Run Living Standards

- Policies to increase the **saving rate**:
 - If private markets are efficient, the government should not try to change the saving rate.
 - The private markets' saving rate represents its optimal trade-off of present for future consumption.
 - However, if tax laws or myopia cause an inefficiently low level of saving, government policy to raise the saving rate may be justified.

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Policies to Raise Long-Run Living Standards

- Policies to increase the **saving rate**:
 - Increase private saving.
 - Raise the real interest rate to encourage saving.
 - The response of saving to changes in the real interest rate seems to be small.
 - Provide tax incentives to encourage saving.
 - The response of saving to changes in tax incentives also seems to be small.

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Policies to Raise Long-Run Living Standards

- Policies to increase the **saving rate**:
 - Increase government saving.
 - Reduce the government deficit or run a surplus.
 - Through reduced government purchases or higher taxes.
 - » But under Ricardian equivalence, tax increases to reduce the deficit won't affect national saving.

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Policies to Raise Long-Run Living Standards

- Policies to raise the **productivity growth rate**:
 - Improve the infrastructure:
 - Infrastructure is the highways, bridges, utilities, dams, airports, etc.
 - Research suggests a link between the amount and quality of infrastructure and productivity growth.

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Policies to Raise Long-Run Living Standards

- Policies to raise the **productivity growth rate**:
 - Build human capital:
 - Research shows a strong connection between productivity and human capital.
 - Government can encourage human capital formation through educational policies, worker training and relocation programs, and health programs.
 - Another form of human capital is entrepreneurial skill.
 - Government could help by removing barriers like red tape.

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Policies to Raise Long-Run Living Standards

- Policies to raise the **productivity growth rate**:
 - Encourage research and development:
 - Encourage R & D through direct and/or indirect means:
 - Government funding of R & D efforts.
 - Government tax incentives for R & D activities.
 - Enforcement of patents, trademarks, etc.

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Summary

- Fundamental determinants of living standards:
 - The saving rate,
 - The population growth rate, and
 - Productivity growth.
- The productivity growth rate is the **dominant factor** in determining how quickly living standards increase.

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Summary

- Government can influence living standards with policies designed to:
 - Increase the saving rate,
 - Slow the population growth rate, and/or
 - Raise the productivity growth rate.

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