Introductory Macroeconomics

Lecture 16: Solow-Swan model, part two

Bruce Preston & Daeha Cho

1st Semester 2021

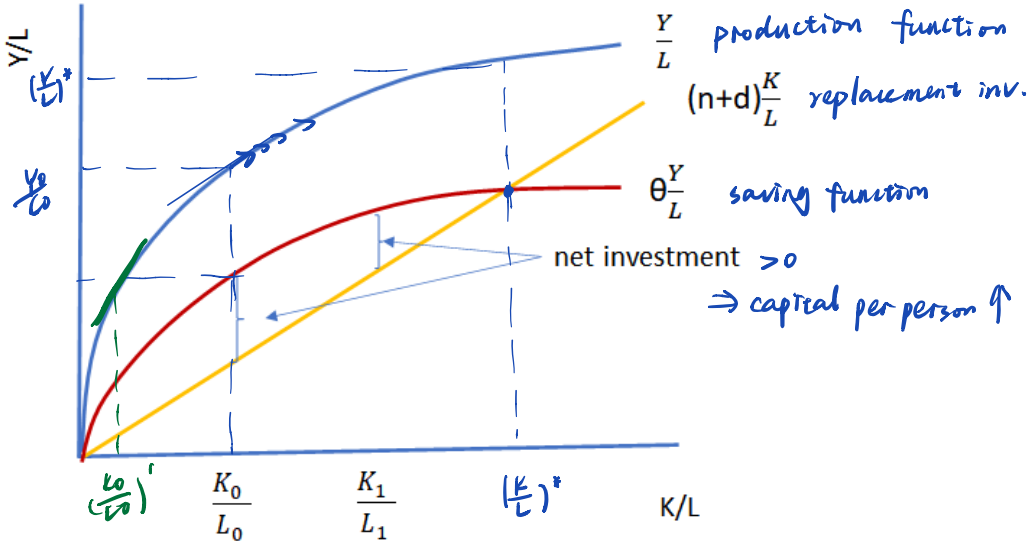
Assignment 2

- Due date is 4 PM May 12 (Wed)
  - must upload the file on the Canvas LMS site under the Assignments tab
- Work alone or in groups
  - groups must be formed via the Canvas LMS site (even the group is the same as the one for A1)
  - should not form groups via the Canvas LMS site if you decide to work alone
  - details on group formation and submission will be announced on the Canvas LMS site after the lecture
- Covers lecture 15 & 16 and tutorial 7 & 8

This Lecture

- More on Solow-Swan Model
  - transitional dynamics
  - empirical performance of the model
  - effect of a change in TFP
- BOFAH chapter 15

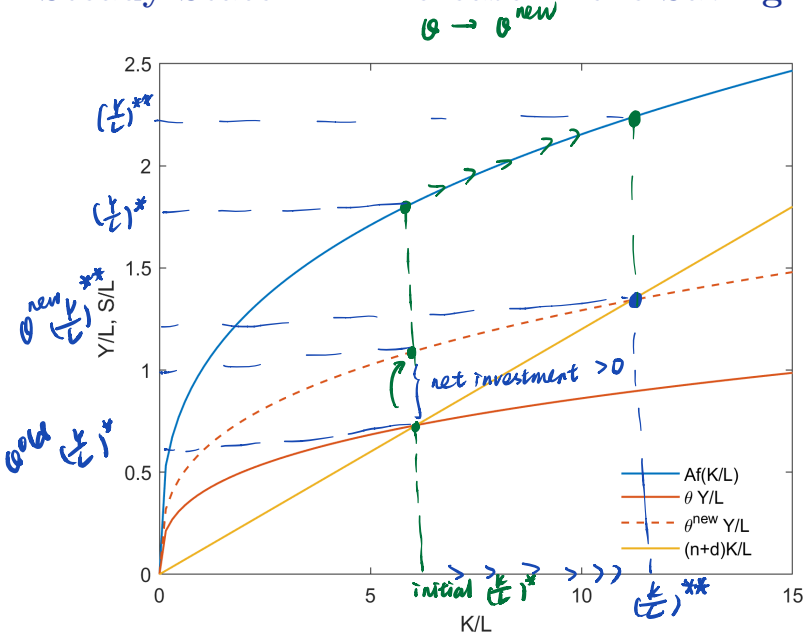
Transition to Steady State



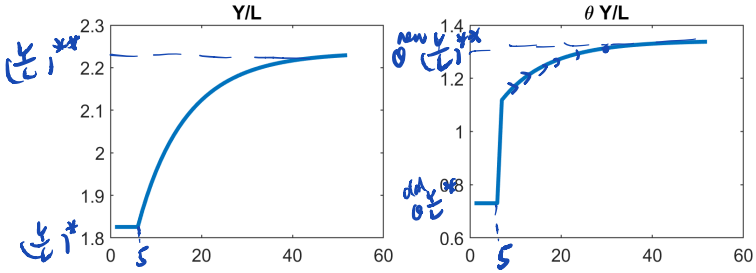
Implications: Transition to Steady State

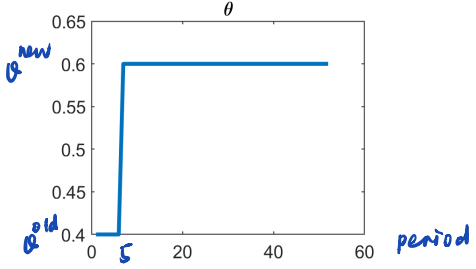
- Let $\left(\frac{K}{L}\right)^*$ be the steady state capital per person
  - if $\frac{K_0}{L_0}$ is below its steady state level, then it increases until it reaches $\left(\frac{K}{L}\right)^*$
  - the lower the $\frac{K_0}{L_0}$, the faster the growth of income per person
- These results rely upon diminishing marginal product of capital (diminishing marginal returns to capital)
  - the higher the $\frac{K_0}{L_0}$, the smaller the effect of net investment on additional income per person

Steady State: An Increase in the Saving Rate



Transition Dynamics: An Increase in the Saving Rate





Other Factors...

- A change in the saving rate changes the steady state, affecting the transition path
  - what happens if the population growth rate changes?
  - what happens if the depreciation rate changes?
  - what happens if TFP changes?

Implications of Solow-Swan Model

- Solow-Swan model predicts *convergence hypothesis*
  - if two countries approach the same steady state, but one is initially poor and the other rich
  - then the poor country grows faster than the rich country

low k high k

⇒ conditional on same characteristics eg saving rate, population rate, depreciation rate

- Convergence hypothesis arises from the diminishing marginal product of capital
  - extra $1 additional capital input produces more extra output in the poor country than in the rich country

Convergence Hypothesis in the Data

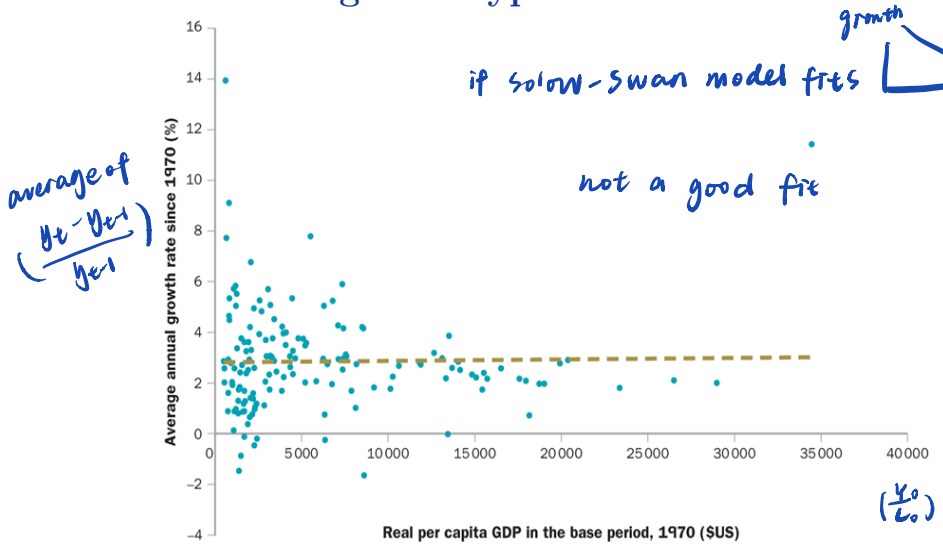


Figure: World (1970-2014)

Conditional Convergence

- Previous figure shows that there is no sign of convergence for countries in the world
- This does not mean that the convergence hypothesis does not hold in the data
  - the convergence hypothesis predicted by Solow-Swan model applies to countries that have same, or at least similar, characteristics: production function, saving rate, deprecation rate, population growth, etc
  - in this sense, Solow-Swan model predicts *conditional convergence*
  - the convergence hypothesis should be tested for economies that are relatively similar
  - the hypothesis could be tested for regions within a country

Conditional Convergence in the Data

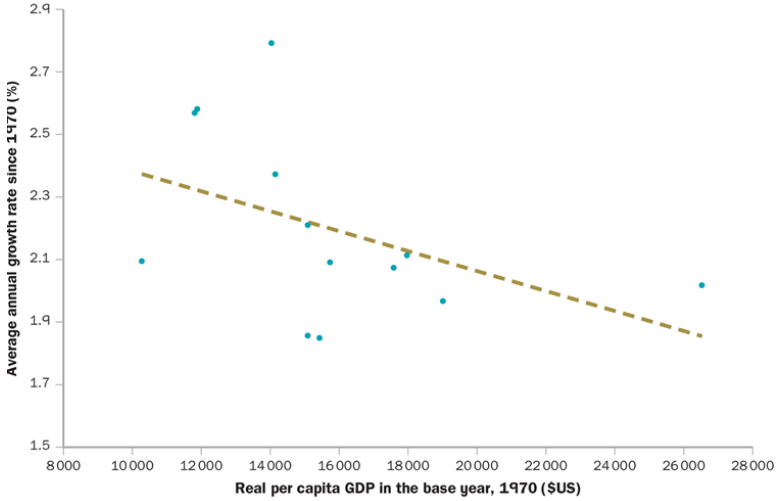


Figure: Some OECD countries (1970-2014)

Sustainable Economic Growth

- Solow-Swan model tells there is no more growth once a country reaches the steady state
- Many advanced countries are experiencing growth, inconsistent with the model
  - this means that capital per person alone cannot explain the growth in output per person
  - an increase in the saving rate, a decrease in the depreciation rate, a fall in the population growth rate can boost up output person, but they are either unrealistic or not sustainable
  - this brings the role of additional factors of production: changes in TFP (technology)

Lack of Convergence in the Data

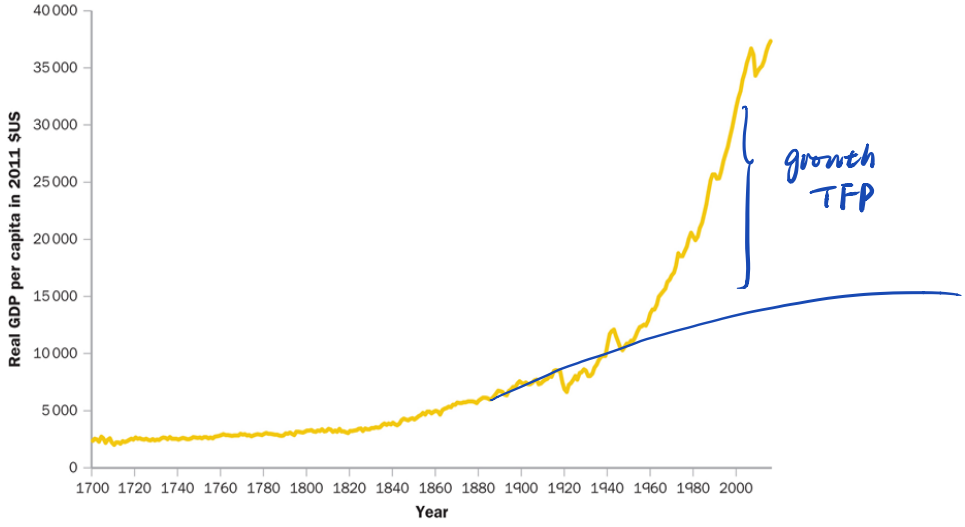
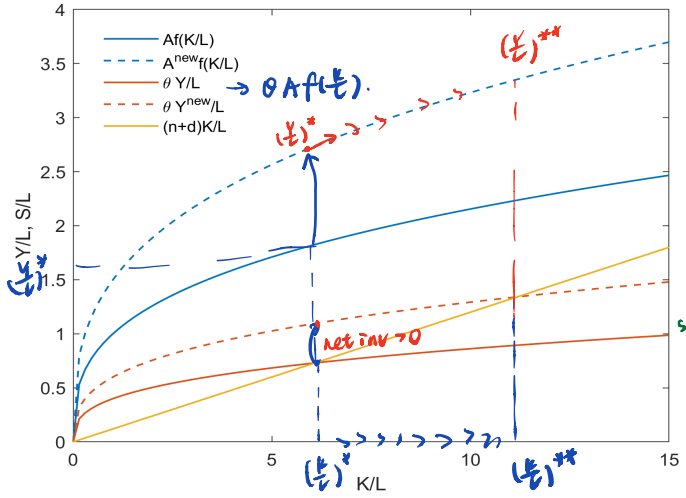


Figure: Real per capita GDP in the UK

Steady State: An Increase in TFP

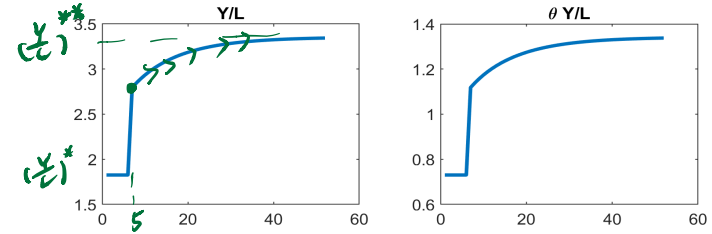
A change ⇒ change { production function / saving function

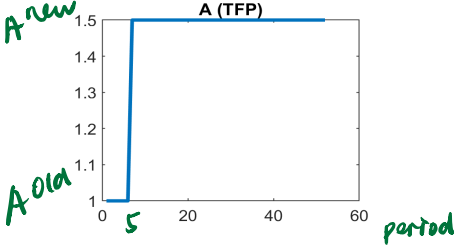


shift ↑ in saving curve
⇓
net inv > 0
⇓
move from $(\frac{K}{L})^*$ to $(\frac{K}{L})^{**}$

sudden shift ↑ in $(\frac{K}{L})$

Transition Dynamics: An Increase in TFP





Next Lecture

- International trade
  - absolute/comparative advantage
  - production possibilities curve
  - gains from specialization
  - how trade occurs and gains from trade