

## The Solow Model

*"All theory depends on assumptions that are not quite true. That is what makes it theory."* Robert Solow

Fall 2010

- The Basic Model
- Conversion to per worker terms
- The Steady State
- Dynamics
- Technological Progress

# Main Predictions of the Basic Solow Model

- Long-run growth path is independent of initial conditions
- ↳ given similar values of  $s$ ,  $n$ ,  $\delta$  and  $g$ , poor economies should catch up
- Income per worker increases with  $s$  and decreases with  $n$  and  $\delta$
- Rich countries have *lower* rates of return on investment than poor
- Long run growth depends *only* on the rate of technical progress

# Evaluation of the Basic Solow Model

- ① Unconditional Convergence
- ② Conditional Analysis
- ③ Cross-country rates of return

# 1. Unconditional convergence

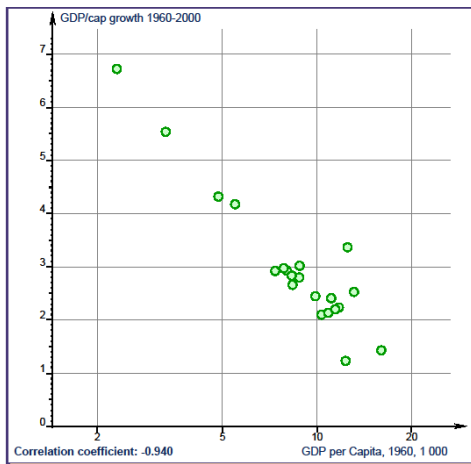


Figure: Growth vs. initial GDP per capita: rich countries

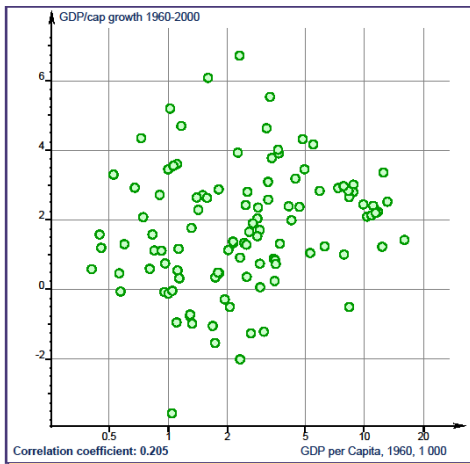


Figure: Growth vs. initial GDP per capita: all countries

## 2. Conditional Convergence

- Requires a more sophisticated statistical analysis
  - ↳ Mankiw, Romer and Weil (1992), Bernanke and Gurkaynak (2002)
- There is evidence of **conditional** convergence despite no unconditional convergence
  - ↳ how can this be?
- Basic Solow model over-predicts speed of convergence

### 3. Cross-country rates of return

- Real rates of return on investment are often higher in rich countries.

↳ inconsistent with diminishing returns to capital

- What could explain this ?



# The Augmented Solow model

- A rich country with high  $k$  can have a high rate of return if it also has high  $h$ .
- Explains data better when conditioning on differences in  $s$ ,  $n$  and  $h$   
↳ Mankiw, Romer and Weil (1992), Bernanke and Gurkaynak (2002)
- Stronger evidence of **conditional convergence**

# Limitations of the Solow model

- Does not “explain” why  $s$ ,  $n$ ,  $g$  and  $h$  vary across countries  
↳ really just puts the question to a deeper level
- Does not explain long run differences in **growth rates**
- While some countries have “caught up”, why haven't others?  
↳ geography, history and institutions ?