Lecture 6: Growth Theory II: The Short and Long Run

See Barro Chapter 4

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Short Run and Long Run

- We have a framework for thinking about growth

$$k^* = \left(\frac{s\delta + n}{sA}\right)^{\frac{1}{\alpha-1}}$$

$$\Delta^* k = sAk^{\alpha-1} - s\delta - n$$

$$y = Ak^\alpha$$

$$c = sAk^\alpha$$

- We want to think about how changes in k, s, A, or n, will change consumption, production, and capital in the short and long run.

Shock to Capital

- What happens if, after being at k^*, we suddenly lose a bunch of capital?

$$k^* = \left(\frac{s\delta + n}{sA}\right)^{\frac{1}{\alpha-1}}$$

$$\Delta^* k = sAk^{\alpha-1} - s\delta - n$$

$$y = Ak^\alpha$$

$$c = sAk^\alpha$$

- In the long run, we know nothing has changed because k^* hasn't changed.

- In the short run, we can see that when capital goes down
  - $y \downarrow$
  - $y \downarrow \Rightarrow \Delta^* k \uparrow, \; c \downarrow, \; r \uparrow$

Permanent Shock to the Level of Productivity

- Productivity moves from A to A', $A' < A$

$$k^* = \left(\frac{s\delta + n}{sA}\right)^{\frac{1}{\alpha-1}}$$

$$\Delta^* k = sAk^{\alpha-1} - s\delta - n$$

$$y = Ak^{\alpha}$$

$$c = sAk^{\alpha}$$

- In the long run, we now know the level of capital is lower
- We have "too much" capital and "too much" production
- Therefore, we save "too much" and have a lower level of capital tomorrow, higher than long run
- We slowly converge to the steady state from above
- A period of declining consumption, declining capital, high interest rates

Permanent Shock to Depreciation

- Depreciation moves from δ to δ', $\delta' < \delta$

$$k^* = \left(\frac{s\delta + n}{sA}\right)^{\frac{1}{\alpha-1}}$$

$$\Delta^* k = sAk^{\alpha-1} - s\delta - n$$

$$y = Ak^{\alpha}$$

$$c = sAk^{\alpha}$$

- In long run, we now know the level of capital is lower
- We have "too much" capital and "too much" production
- Therefore, we save "too much" and have a lower level of capital tomorrow, higher than long run
- Higher depreciation means we converge more quickly to the steady state
- A period of declining consumption, declining capital, high interest rates

Permanent Shock to Savings Rate

- Savings moves from s to s', $s' > s$

$$k^* = \left(\frac{s\delta + n}{sA}\right)^{\frac{1}{\alpha-1}}$$

$$\Delta^* k = sAk^{\alpha-1} - s\delta - n$$

$$y = Ak^{\alpha}$$

$$c = sAk^{\alpha}$$

- In long run, we now know the level of capital is higher
- We have "too little" capital
- Our $\Delta^* k > 0$ compared to what it was
- Slowly converge to new steady state
- At first, lower consumption, then, higher consumption

Permanent Shock to Labor Growth Rate

- Population growth moves from n to n', $n' > n$

$$k^* = \left(\frac{s\delta + n}{sA}\right)^{\frac{1}{\alpha-1}}$$

$$\Delta^* k = sAk^{\alpha-1} - s\delta - n$$

$$y = Ak^{\alpha}$$

$$c = sAk^{\alpha}$$

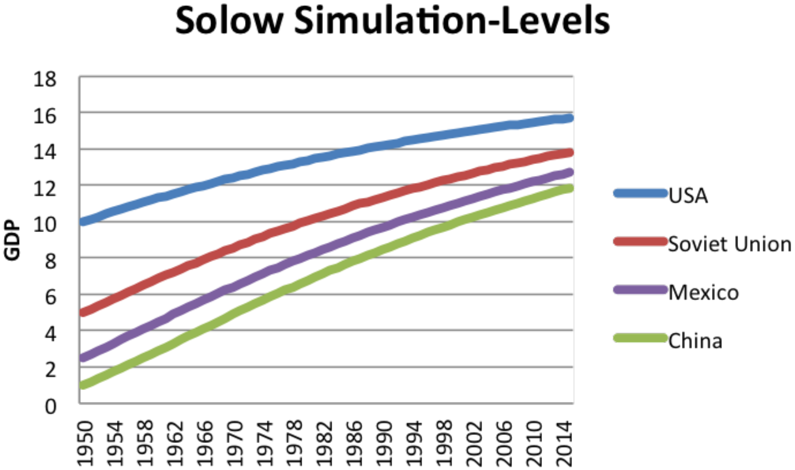
- In long run, capital (per worker) is lower
- We have “too much” capital
- Our choice of $\Delta^* k$ declines because n increases
- Very slowly converge to new steady state

Convergence

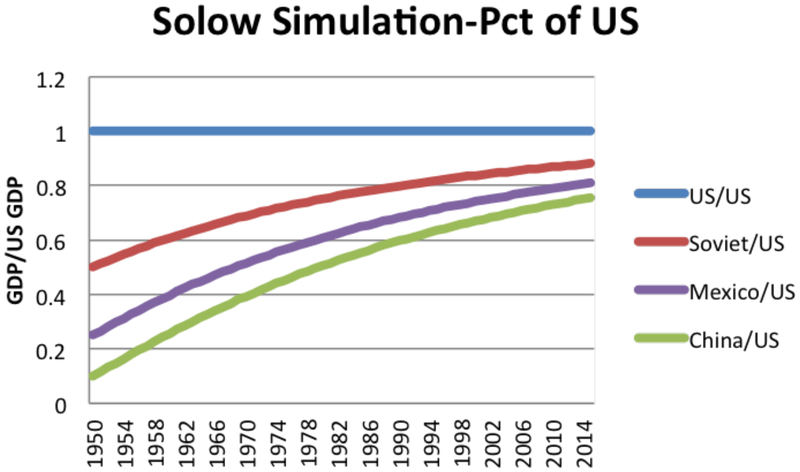
- $k^* = \left(\frac{s\delta+n}{sA}\right)^{\frac{1}{\alpha-1}}$

Parameter	k^*
s	$+$
A	$+$
n	-
δ	-
L(0)	0

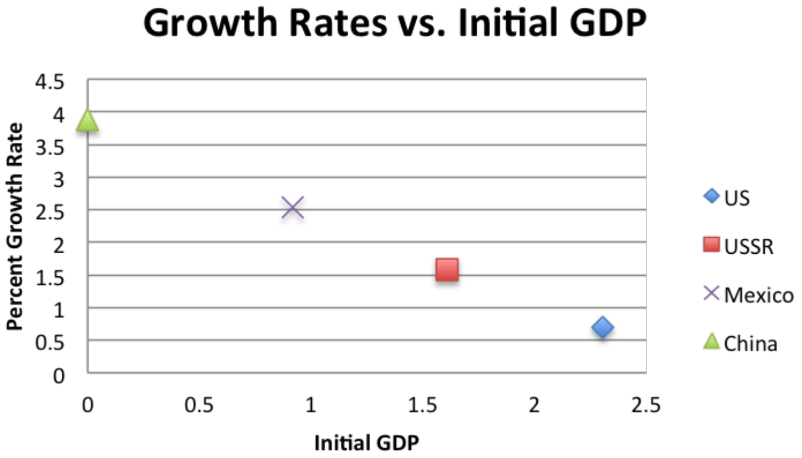
Initial Capital



Initial Capital



Initial Capital



Does Convergence Hold Up?

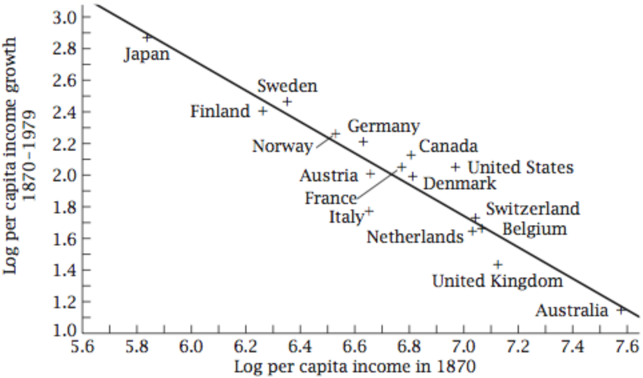


FIGURE 1.7 Initial income and subsequent growth in Baumol's sample (from DeLong, 1988; used with permission)

Romer figure 1.7

Q: What kind of countries will we have good historical data for?

Does Convergence Hold Up?

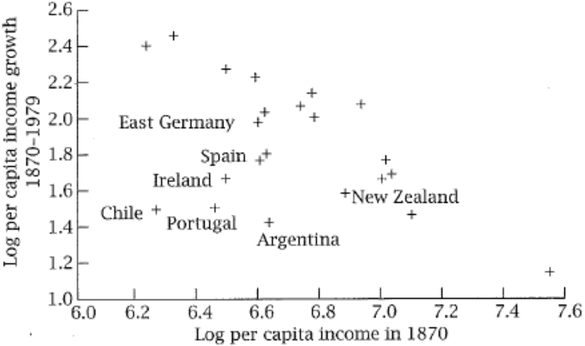


FIGURE 1.8 Initial income and subsequent growth in the expanded sample (from DeLong, 1988; used with permission)

Romer figure 1.8

Does Convergence Hold Up?

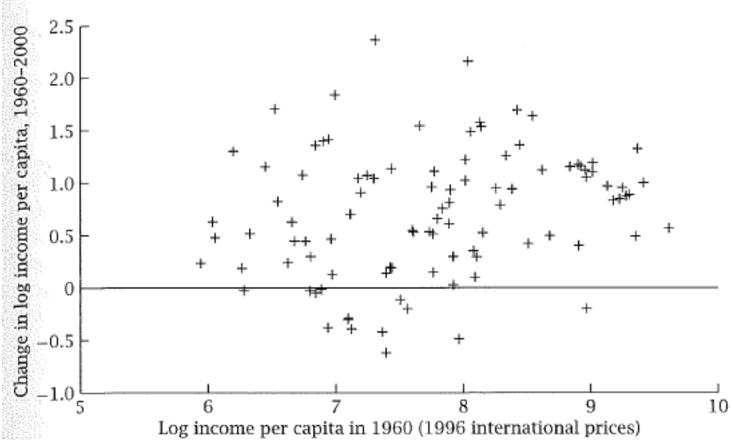


FIGURE 1.9 **Initial income and subsequent growth in the postwar period**

Romer (3rd ed) figure 1.9

Does Convergence Hold Up?

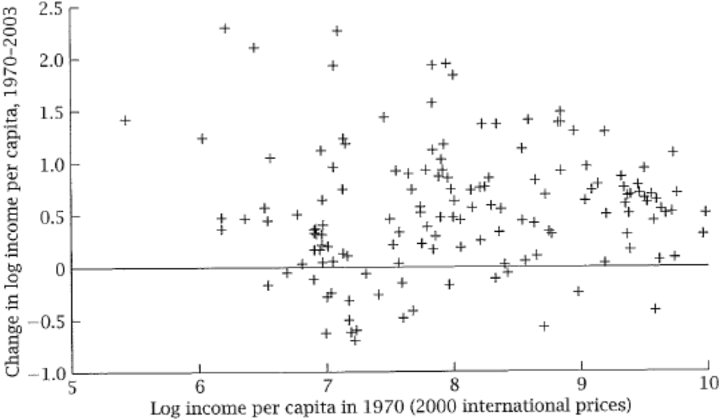
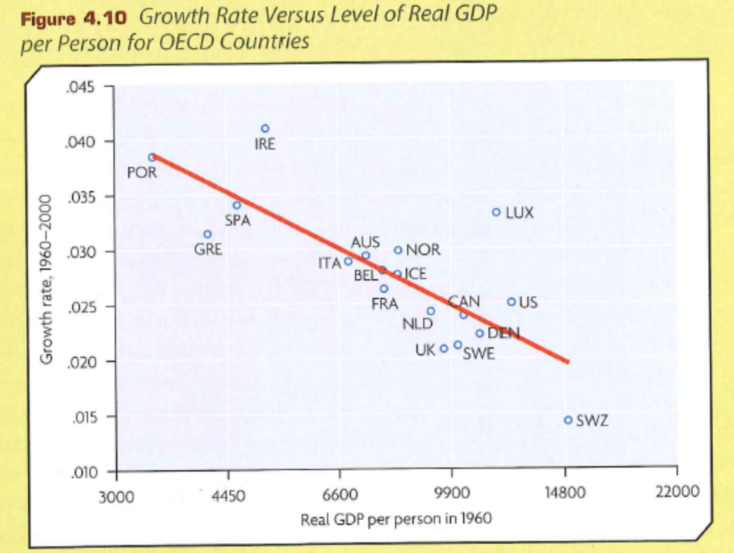


FIGURE 1.9 Initial income and subsequent growth in a large sample

Romer (4th ed) figure 1.9

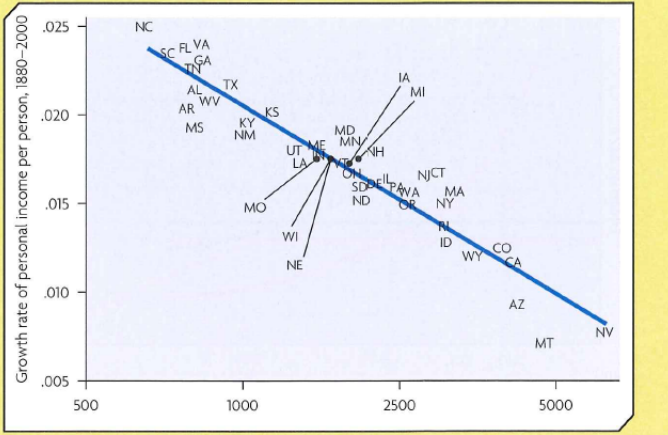
Does Convergence Hold Up?



Barro figure 4.10.

Does Convergence Hold Up?

Figure 4.11 *Growth Rate Versus Level of Income per Person for U.S. States, 1880–2000*

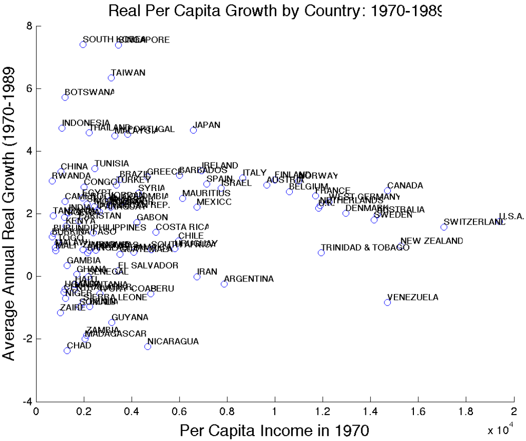


Barro figure 4.11.

Why Might Convergence Fail?

- Differences in everything we talked about, except initial capital!

An Explanation?

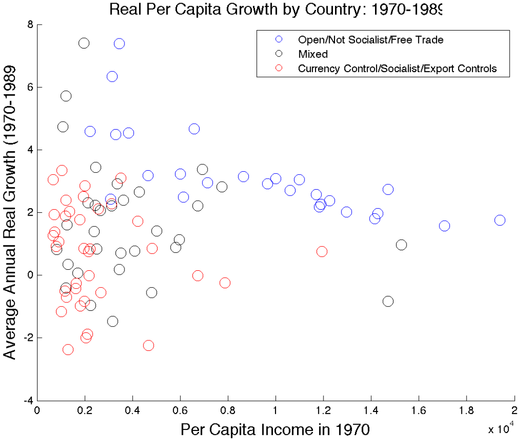


Sachs Warner 1995

An Explanation?

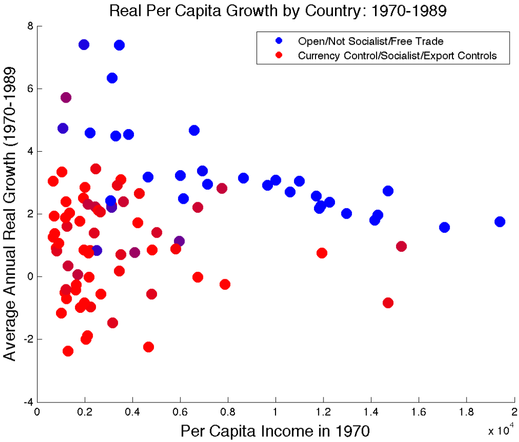
Sachs Warner 1995: Let's break things up by "free market"

An Explanation?



Sachs Warner 1995

An Explanation?



Sachs Warner 1995

An Explanation?

- Note that "socialism" isn't your father's socialism
- Typified by state ownership of labor, land, materials
- Typified by state planning and price setting
- What we might call with a broad brush "communism" or "command-and-control"
- **Not** what we mean by Northern Europe or original EU members

Conclusion

- We have our first scientific prediction from a model
  - Countries growth rates should be linear in log-initial-capital
- Initial success based on bad data
- Failure looking at world at large
- Success looking at advanced/similar countries
- Success looking at states within the US
- Success looking at "free market" economies