

# SLOW-SWAN MODEL (PART II)

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# THE GOLDEN RULE OF CAPITAL ACCUMULATION

We can write the steady-state level of per-capita consumption as:

$$c^* = (1 - s)f[k^*(s)]$$

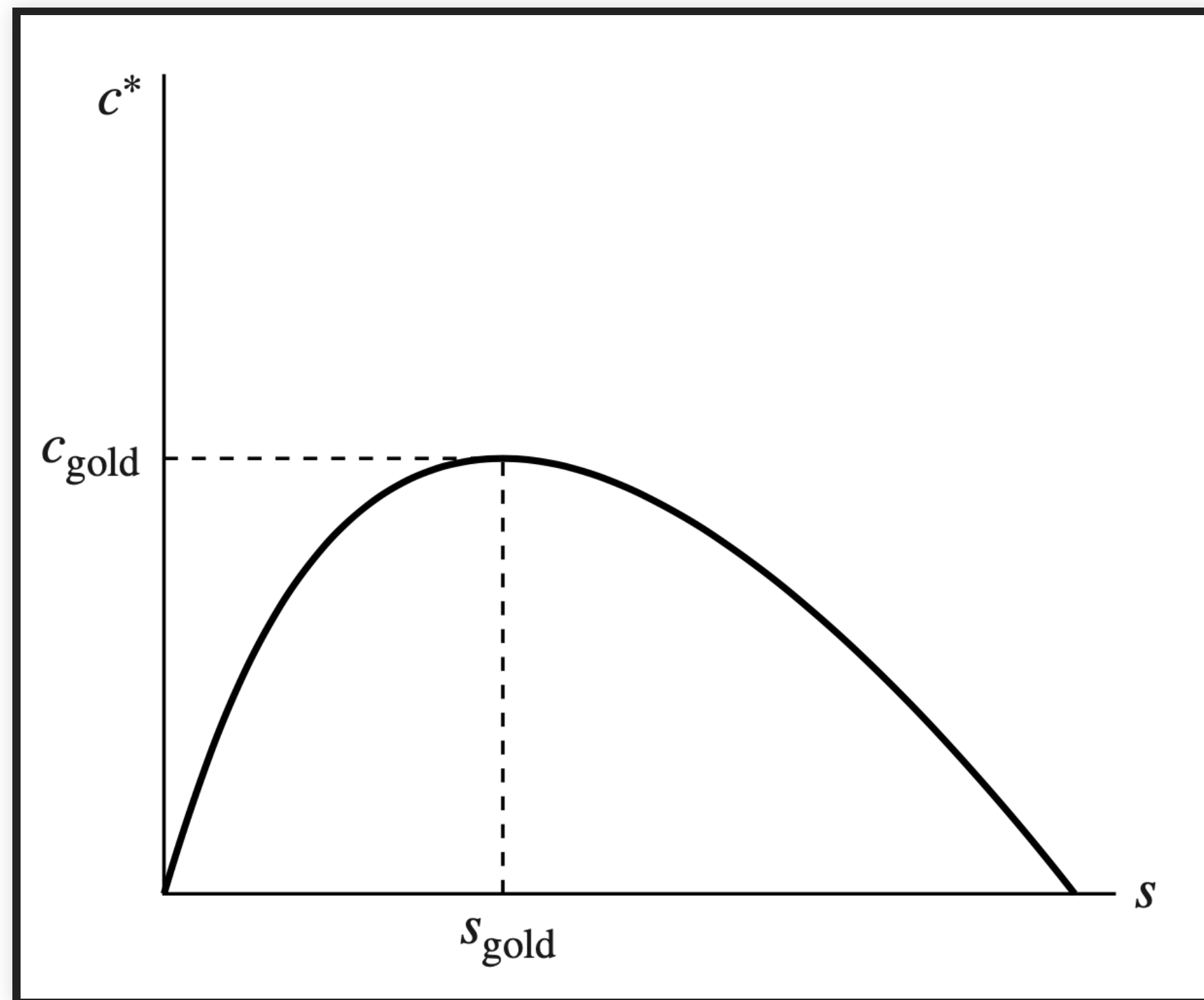
where,  $f[k^*(s)] = (n + \delta)k^*$ , so.

$$c^* = f[k^*(s)] - (n + \delta)k^*$$

So, is there an optimum?:

$$\frac{\partial c^*}{\partial s}$$

# THE GOLDEN RULE OF CAPITAL ACCUMULATION



# TRANSITIONAL DYNAMICS

What do we know on the behavior around steady state?

The growth rate of capital

$$\frac{\dot{k}}{k} = s \frac{f(k)}{k} - (n + \delta)$$

So, what do we know about the shape of  $\frac{\dot{k}}{k}$ ?



# DYNAMICS OF THE SOLOW-SWAM MODEL

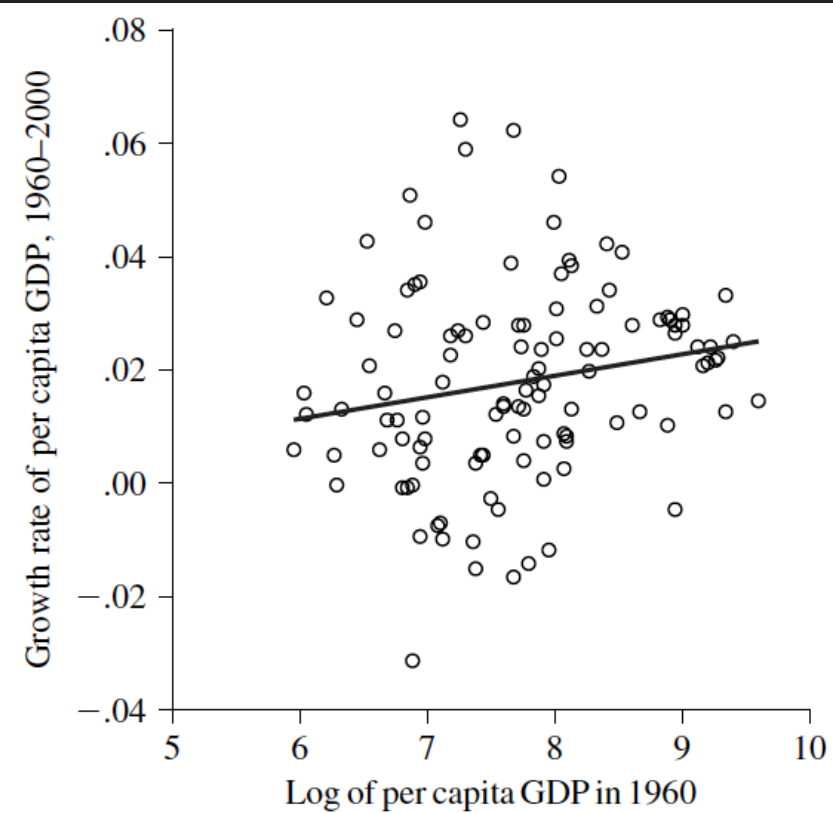
# ABSOLUTE AND CONDITIONAL CONVERGENCE

$$\frac{\partial \frac{\dot{k}}{k}}{\partial k} = [f'(k)] - f(k)/k$$

does this result mean that economies with lower capital per person tend to grow faster in per capita terms? In other words, does there tend to be convergence across economies?

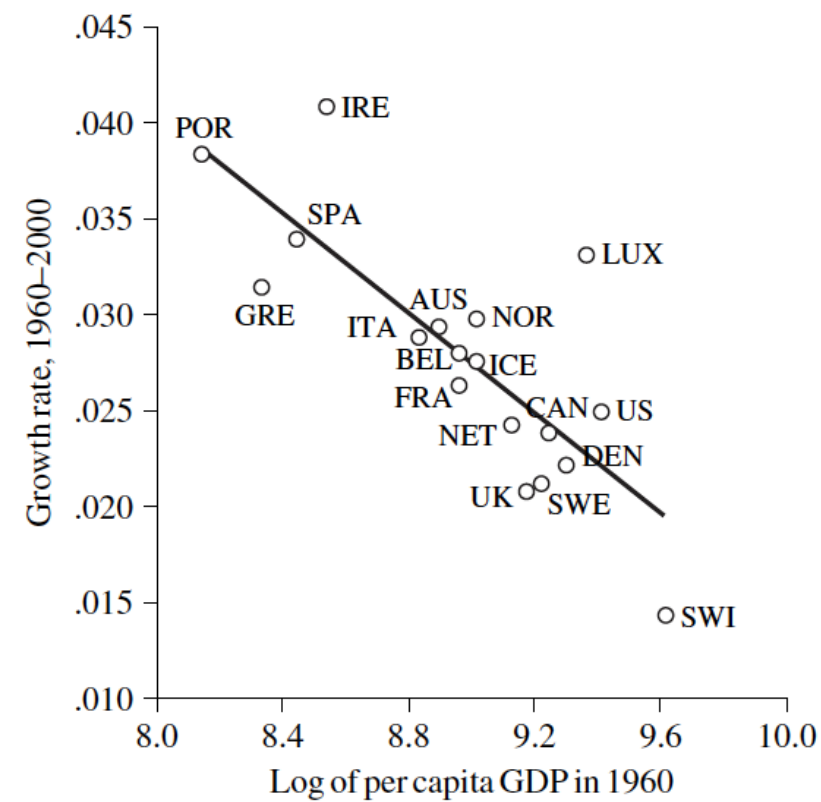
# ABSOLUTE CONVERGENCE

The hypothesis that poor economies tend to grow faster per capita than rich ones— without conditioning on any other characteristics of economies

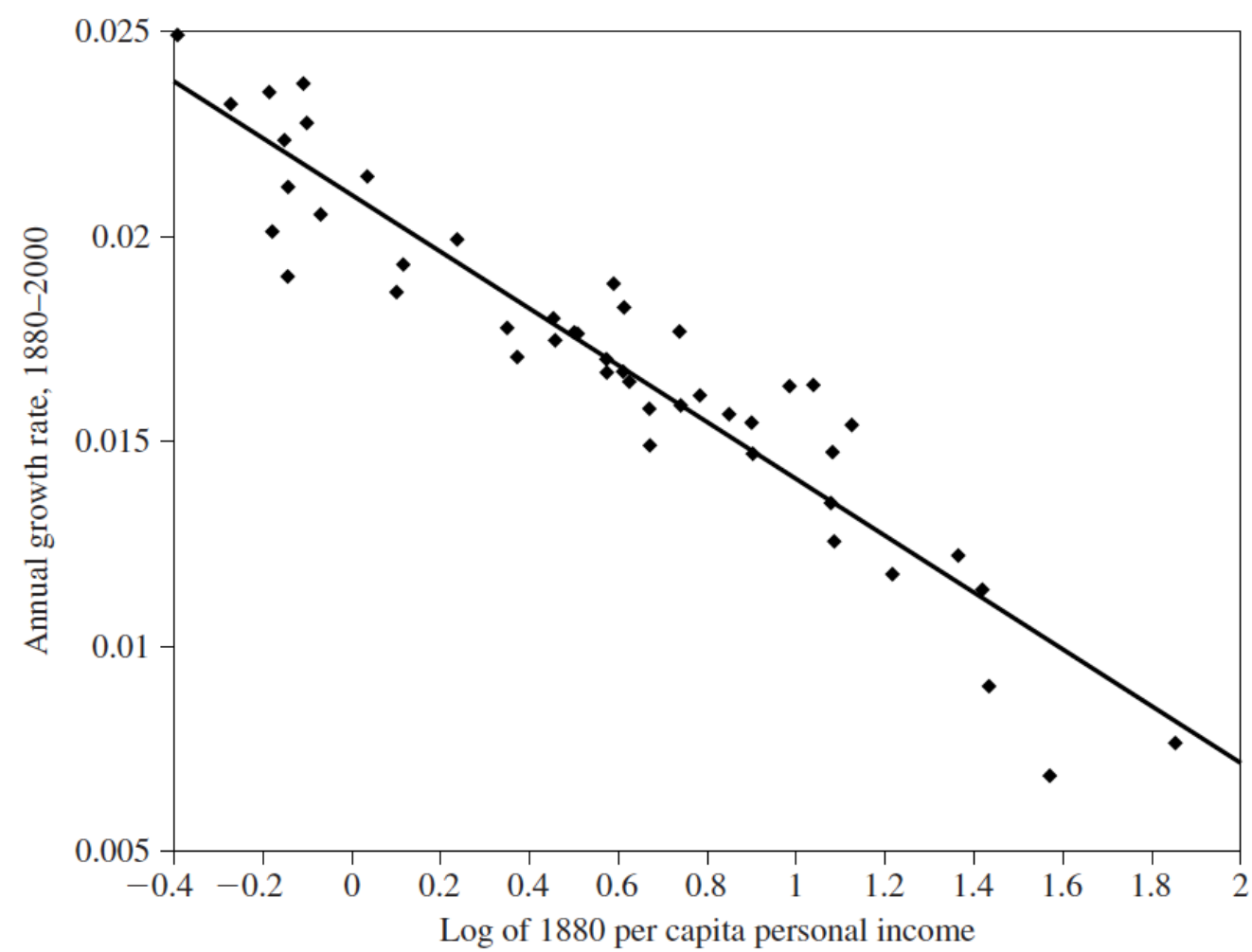


**Figure 1.7**

**Convergence of GDP across countries: Growth rate versus initial level of real per capita GDP for 114 countries.** For a sample of 114 countries, the average growth rate of GDP per capita from 1960 to 2000 (shown on the vertical axis) has little relation with the 1960 level of real per capita GDP (shown on the horizontal axis). The relation is actually slightly positive. Hence, absolute convergence does not apply for a broad cross section of countries.



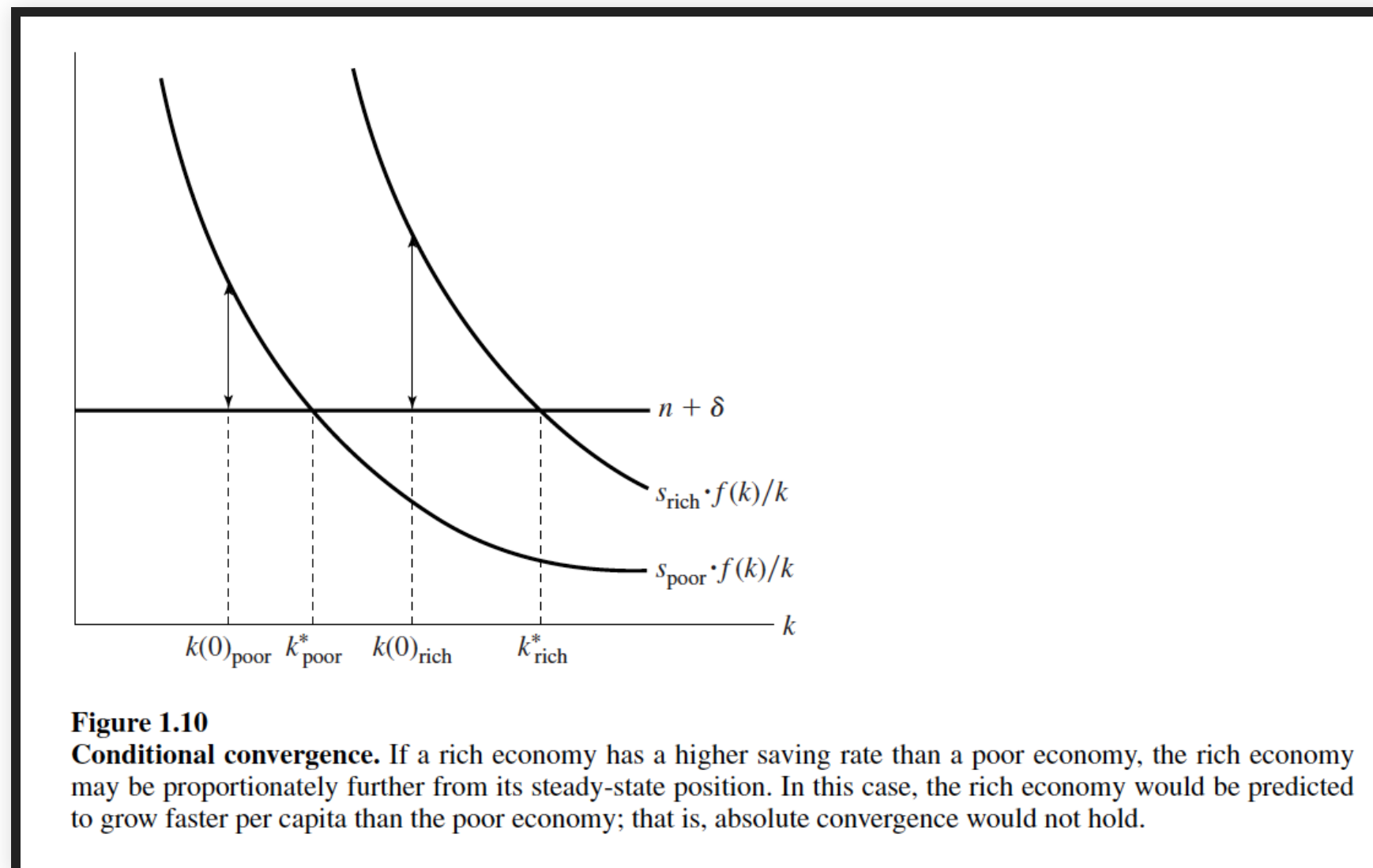
**Figure 1.8**  
**Convergence of GDP across OECD countries: Growth rate versus initial level of real per capita GDP for 18 OECD countries.** If the sample is limited to 18 original OECD countries (from 1961), the average growth rate of real per capita GDP from 1960 to 2000 is negatively related to the 1960 level of real per capita GDP. Hence, absolute convergence applies for these OECD countries.



**Figure 1.9**

**Convergence of personal income across U.S. states: 1880 personal income and income growth from 1880 to 2000.** The relation between the growth rate of per capita personal income from 1880 to 2000 (shown on the vertical axis) is negatively related to the level of per capita income in 1880 (shown on the horizontal axis). Thus absolute convergence holds for the states of the United States.

# ABSOLUTE CONVERGENCE



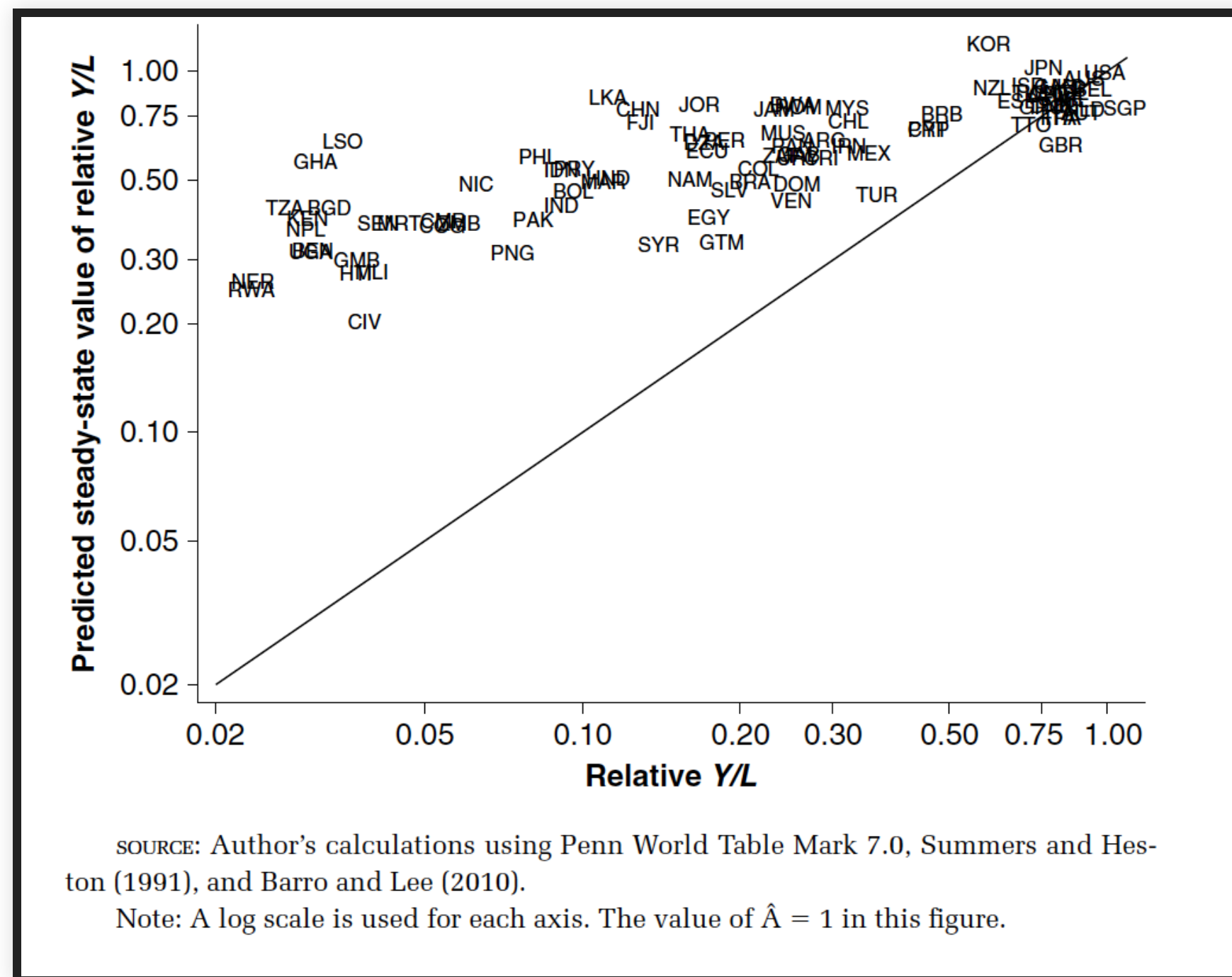


# THE EMPIRICS OF ECONOMIC GROWTH

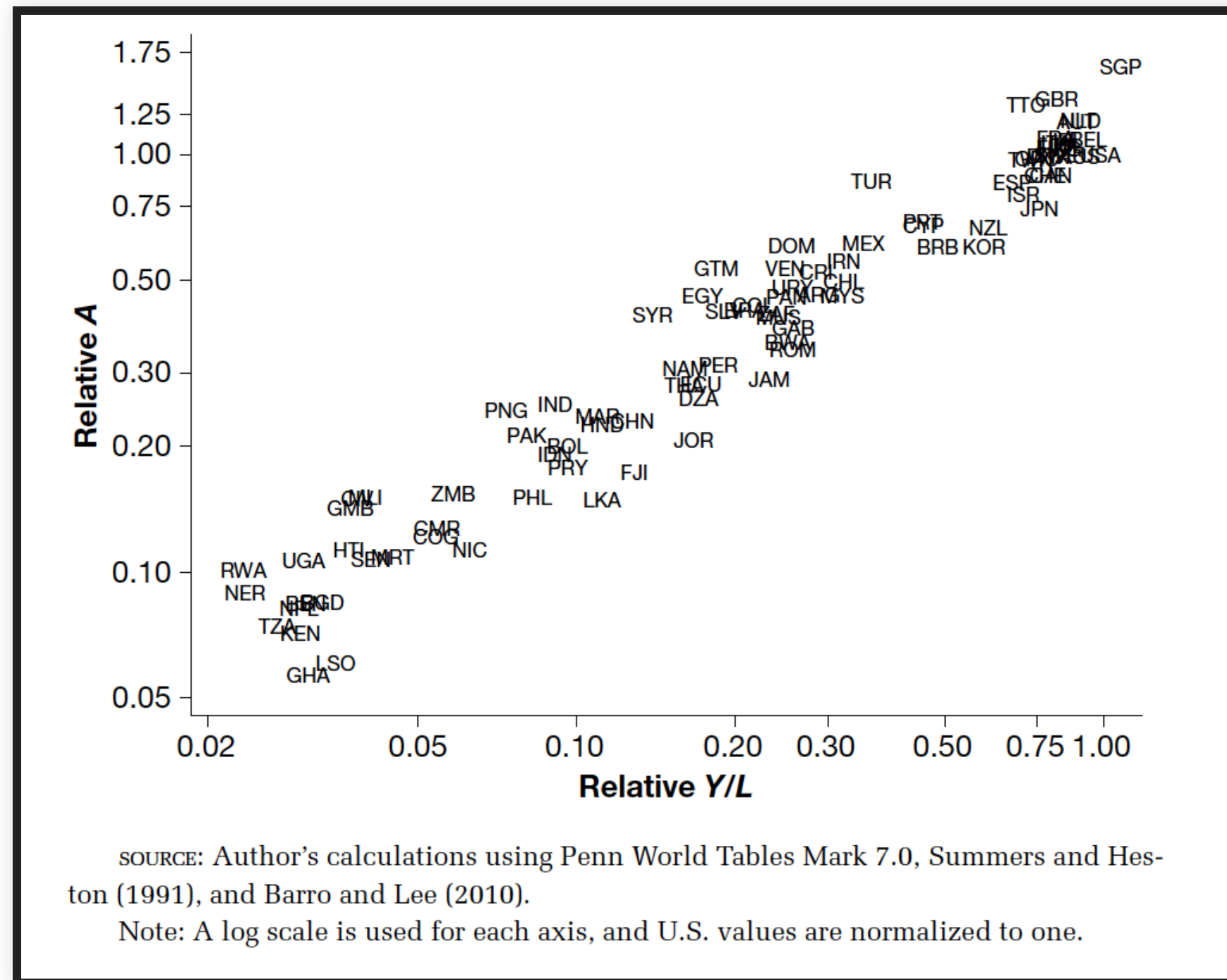
(Mankiew, Romer and Weil, 1992)

- Basic model =  $A = K^\alpha (AH)^{1-\alpha}$
- Where  $H = e^\Pi L$

# THE “FIT” OF THE NEOCLASSICAL GROWTH MODEL, 2008



# PRODUCTIVITY LEVELS, 2008

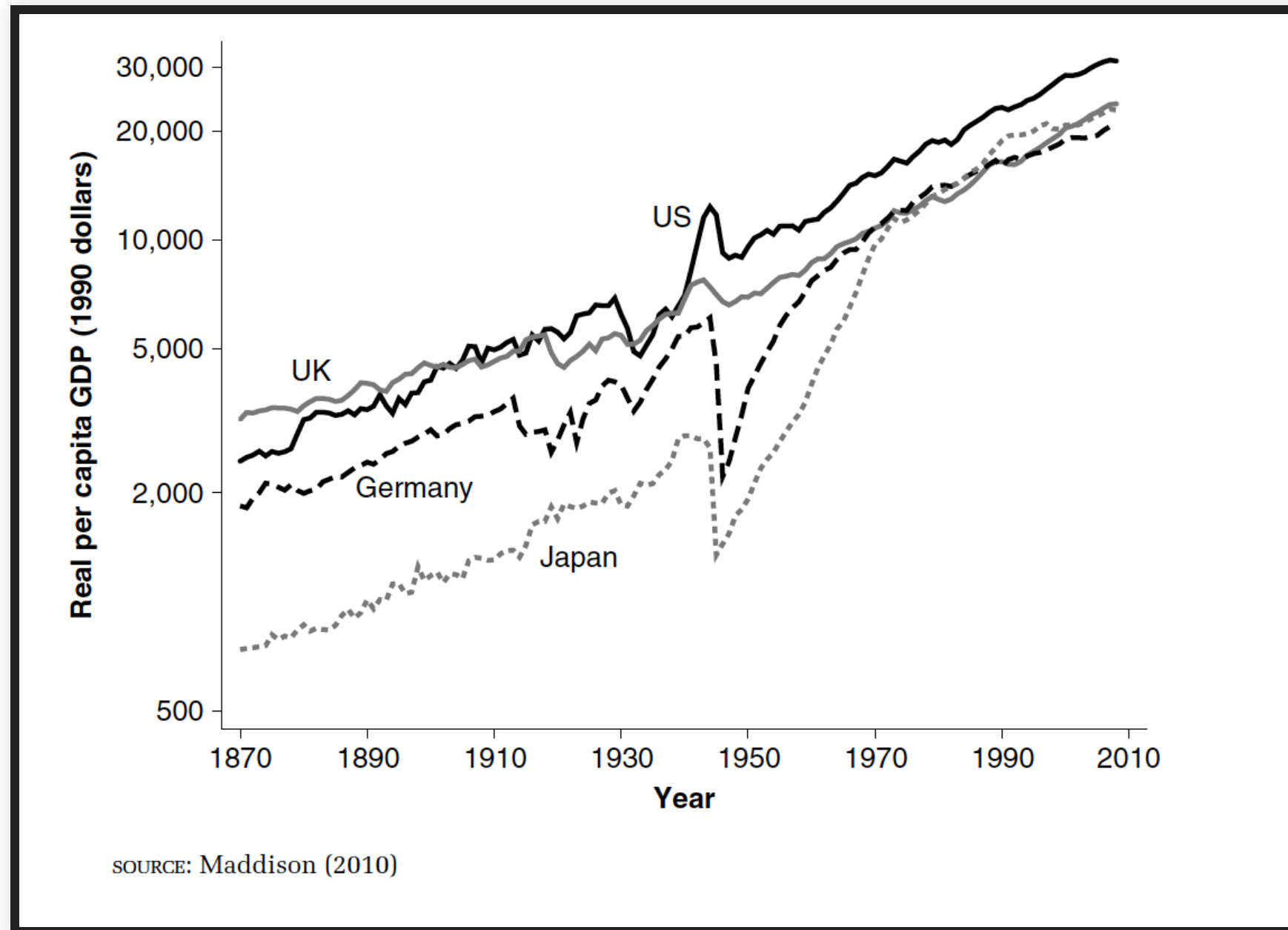


- Countries that invest a large fraction of their resources in physical capital and in the accumulation of skills are rich.
- Countries that use these inputs productively are rich
- The countries that fail in one or more of these dimensions suffer a corresponding reduction in income

So, why capital is not a fundamental for the long-term growth

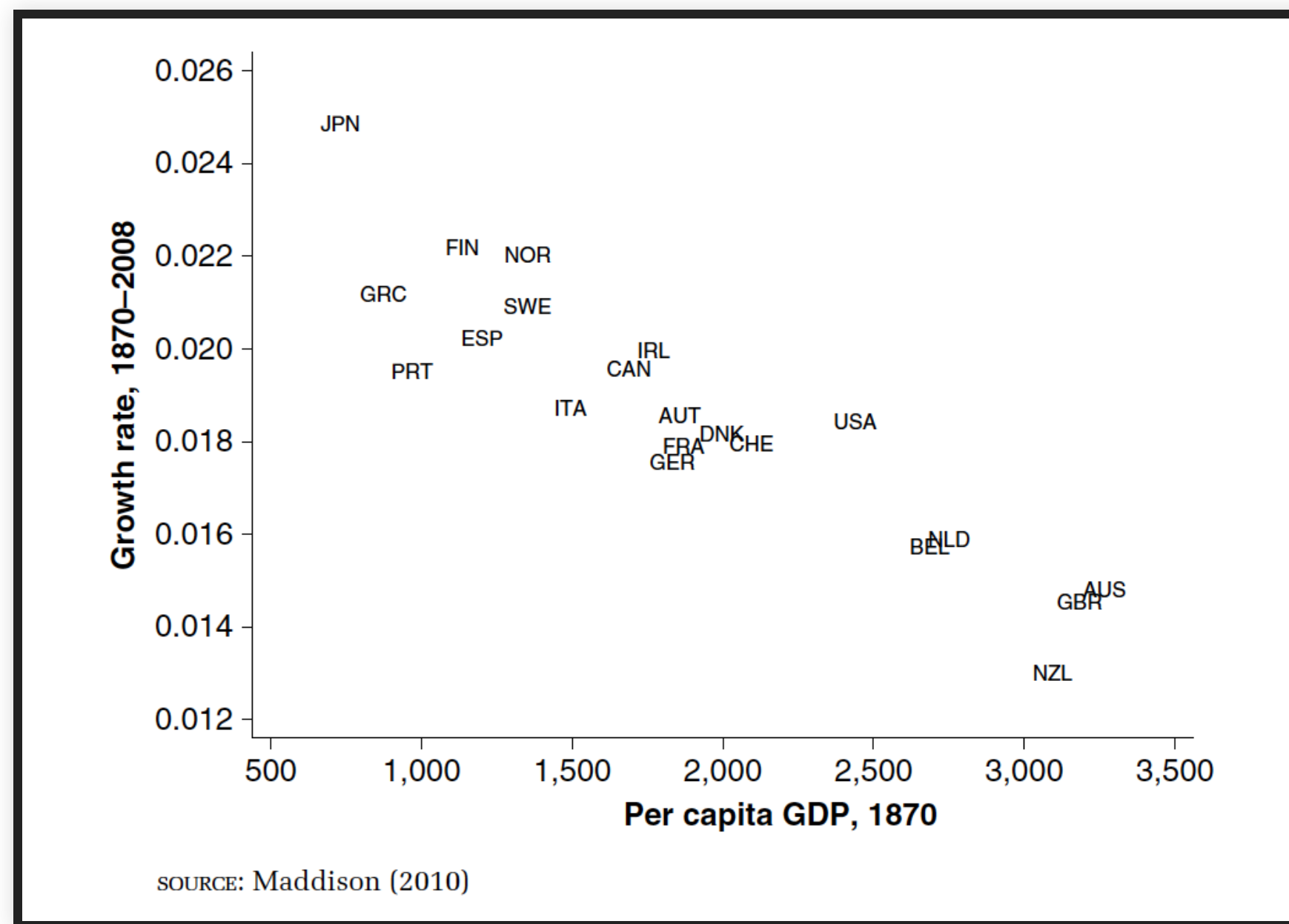
# WHAT ABOUT CONVERGENCY!

# PER CAPITA GDP, 1870–2008



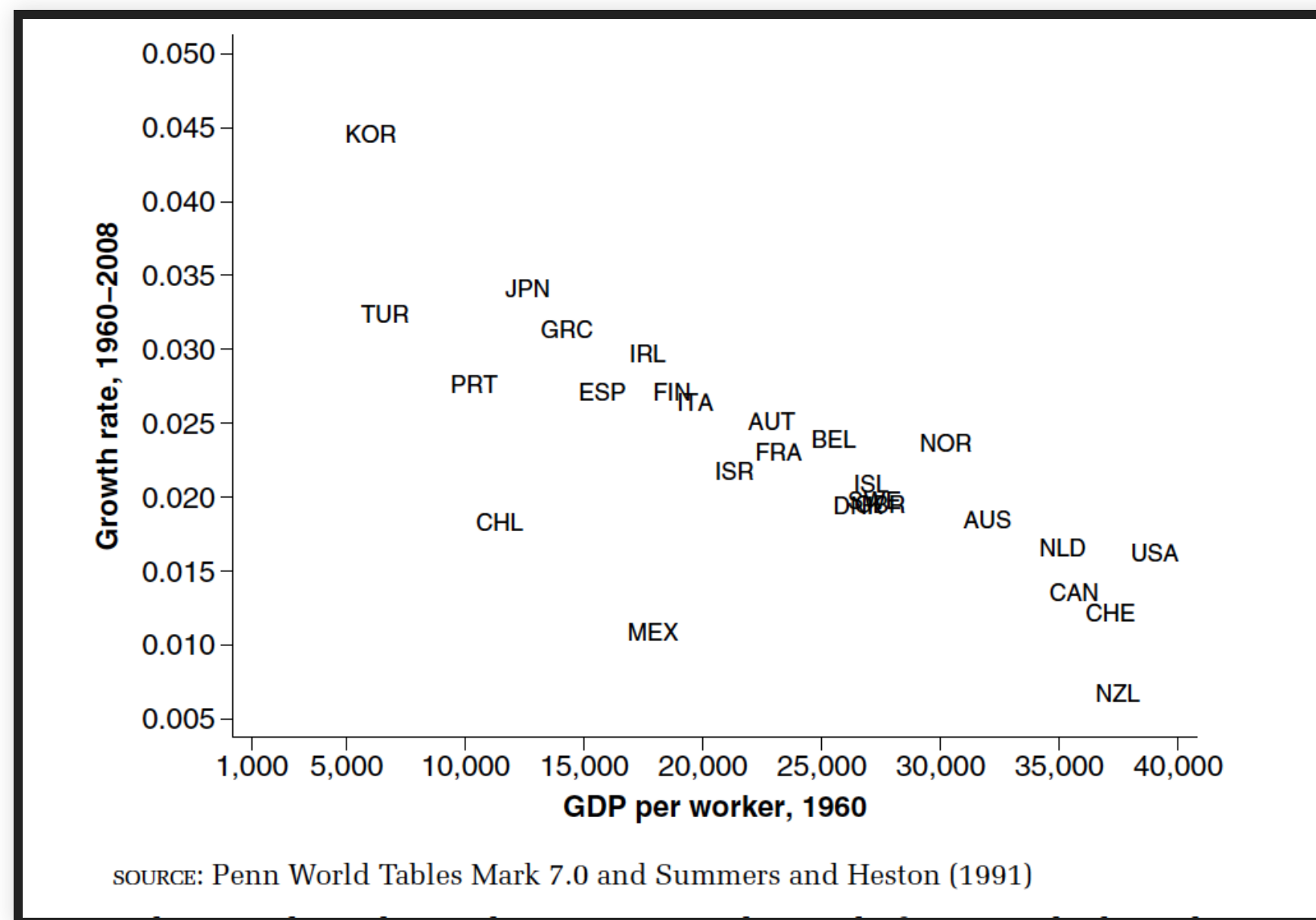
# GROWTH RATE VERSUS INITIAL PER CAPITA GDP,

## 1870–2008

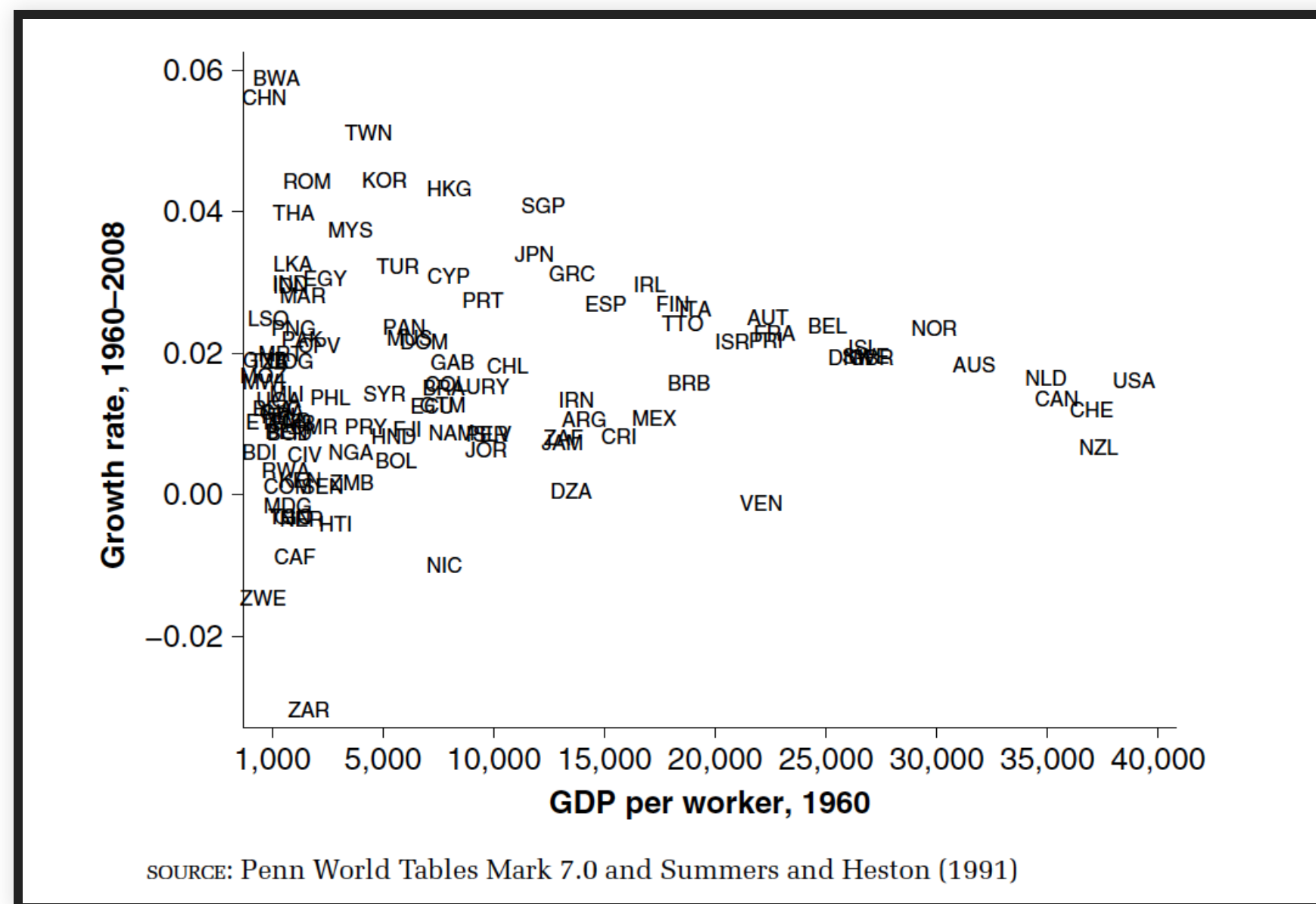




# GROWTH RATE VERSUS INITIAL PER CAPITA GDP, 1870–2008



# THE LACK OF CONVERGENCE FOR THE WORLD, 1960–2008



THANKS

