

The facts of economic growth

The economy in the long run

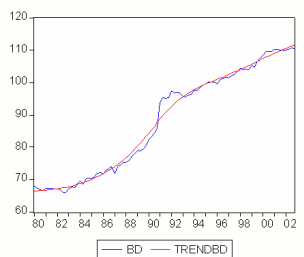
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The long run

- In the long run what dominates is not fluctuations but growth in output per capita.
- Most countries exhibit an upward trend in output per capita, that is output divided by population.
- Why output per capita and not output? 1) Measuring standards of living. 2) Cross-country comparisons.

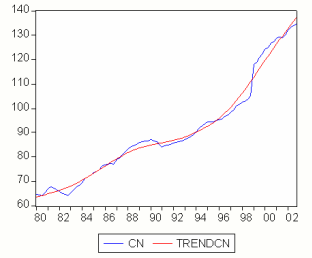
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The long run: Germany



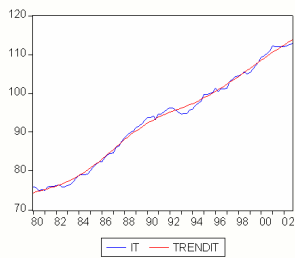
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The long run: Canada



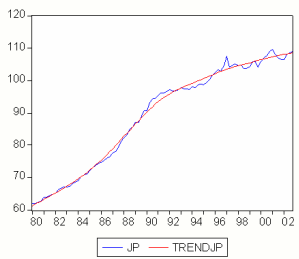
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The long run: Italy



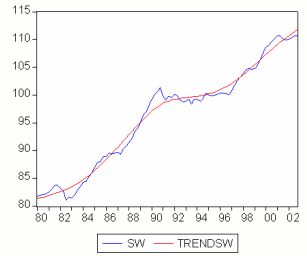
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The long run: Japan



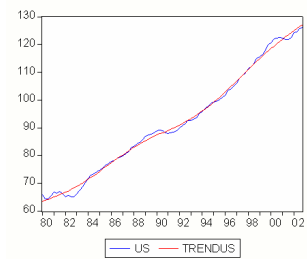
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The long run: Switzerland



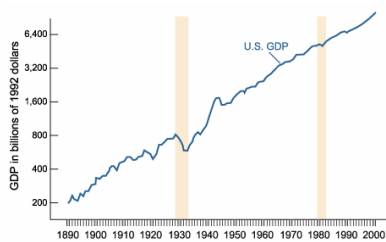
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The long run: United States



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U.S. real output since 1890



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Output per capita

	Annual Growth Rate Output per Capita (%)		Real Output per Capita (1996 dollars)		
	1950-1973	1974-2000	1950	2000	2000/1950
France	4.0	1.8	5,519	22,371	4.1
Japan	7.4	2.3	2,417	24,671	10.2
United Kingdom	2.4	1.8	7,641	22,188	2.9
United States	2.4	2.1	10,601	33,308	3.1
Average	4.1	2.0	6,544	25,634	3.9

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Measuring output per capita

- In general, output per capita is obtained for each country and expressed in domestic currency.
- Cross-country comparisons require a common currency unit! We could use market exchange rates to make the conversion.
- This is not good: market exchange rates vary substantially over time, and different countries have systematic large differences in price levels! => PPP exchange rate!

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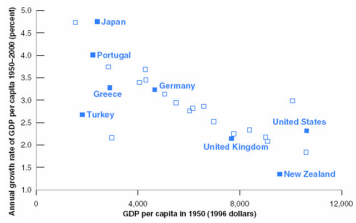
Three major facts

- There has been a major increase in output per capita levels since 1950.
- There has been a marked slowdown in the growth rate of output per capita since the mid-seventies.
- Output per capita levels seem to have converged over time.

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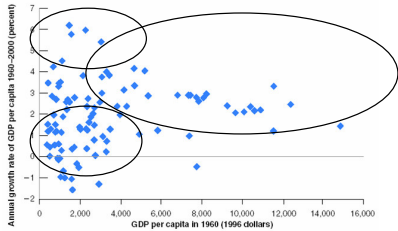
Convergence?



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Convergence?



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A framework for growth

- The production function relates inputs in production, namely capital and labour, to output:

$$Y = F(K, N)$$

- For given quantities of capital and labour the state of technology determines the level of output!

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The production function

- Two assumptions restrict the shape of the production function: constant returns to scale, and decreasing returns to capital and labour.

- Constant returns to scale:

$$xY = F(xK, xN)$$

- Doubling the quantities of both inputs results in a doubling of output.

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The production function

- Decreasing returns to capital and labour:

$$F'(\cdot) > 0, F''(\cdot) < 0$$

- Suppose that the quantity of one input increases. Output will increase. However, further increases in capital will result in smaller and smaller increases in output.

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Output per worker

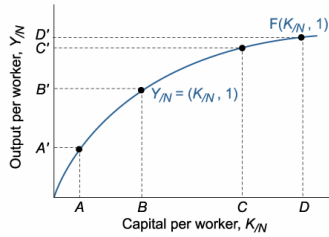
- Using constant returns to scale and dividing all terms of the production function by labour yields

$$\frac{Y}{N} = F\left(\frac{K}{N}, \frac{N}{N}\right) = F\left(\frac{K}{N}, 1\right)$$

- The amount of output per worker depends on the amount of capital per worker.

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The production function



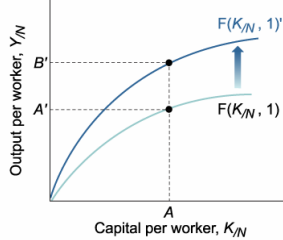
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Determinants of output per capita

- Output per capita increases when capital per worker increases! We move along the production function.
- Output per capita increases when the state of technology improves! The production function shifts upwards.

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Technological progress



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Determinants of growth in output per capita

- Capital accumulation cannot account for sustained growth in output per capita. Decreasing returns to capital mean that further increases in capital per worker will lead to smaller and smaller increases in output...
- Sustained growth in the long run requires sustained technological progress!

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