

R&D expenditure and capital in Europe

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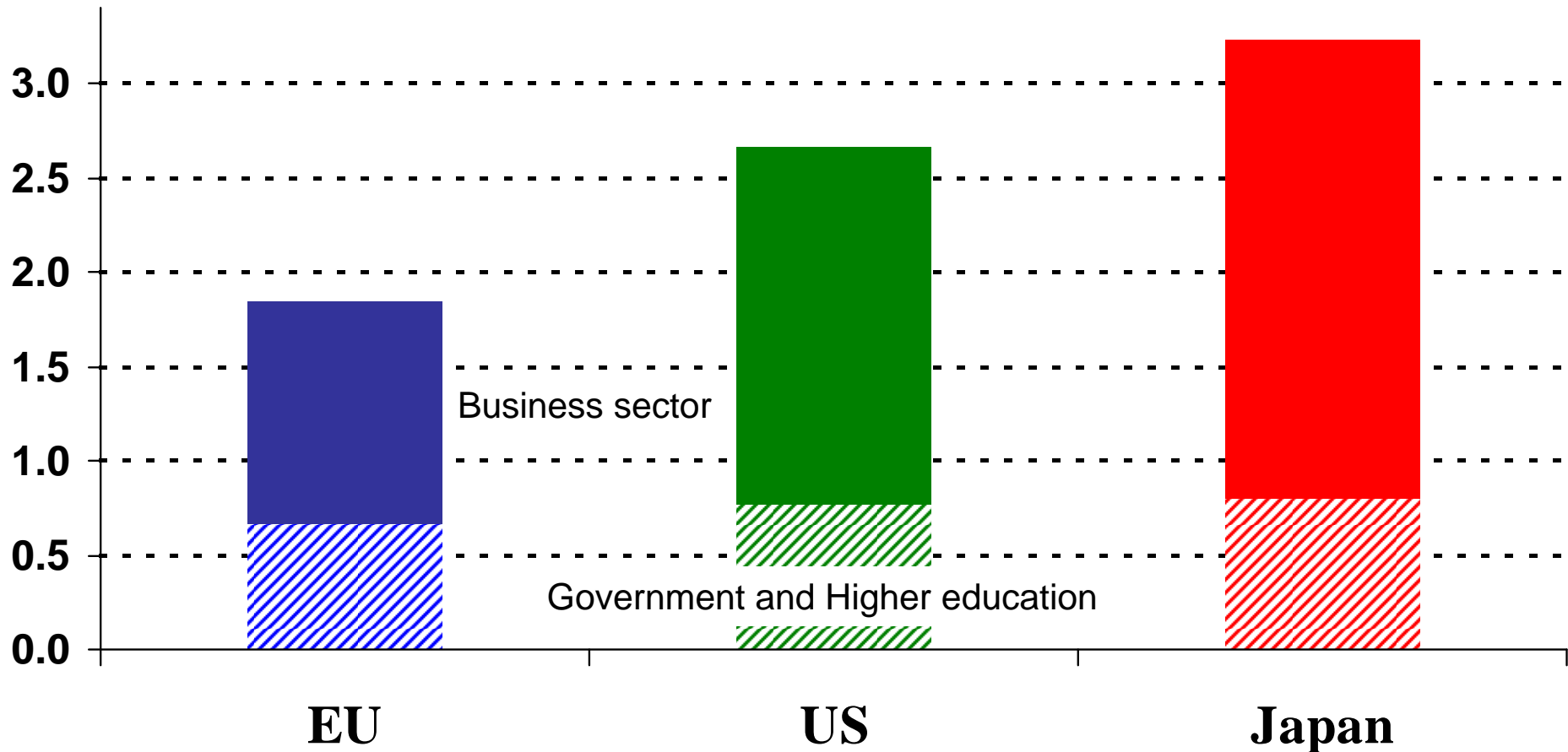
Overview



- R&D expenditure: Basic facts
- R&D: From expenditure to capital stocks
- Business R&D capital stock estimates...
 - ...across countries
 - ...across industries
 - ...relative to value added
 - ...relative to the tangible capital stock
 - ...and how they are correlated with TFP

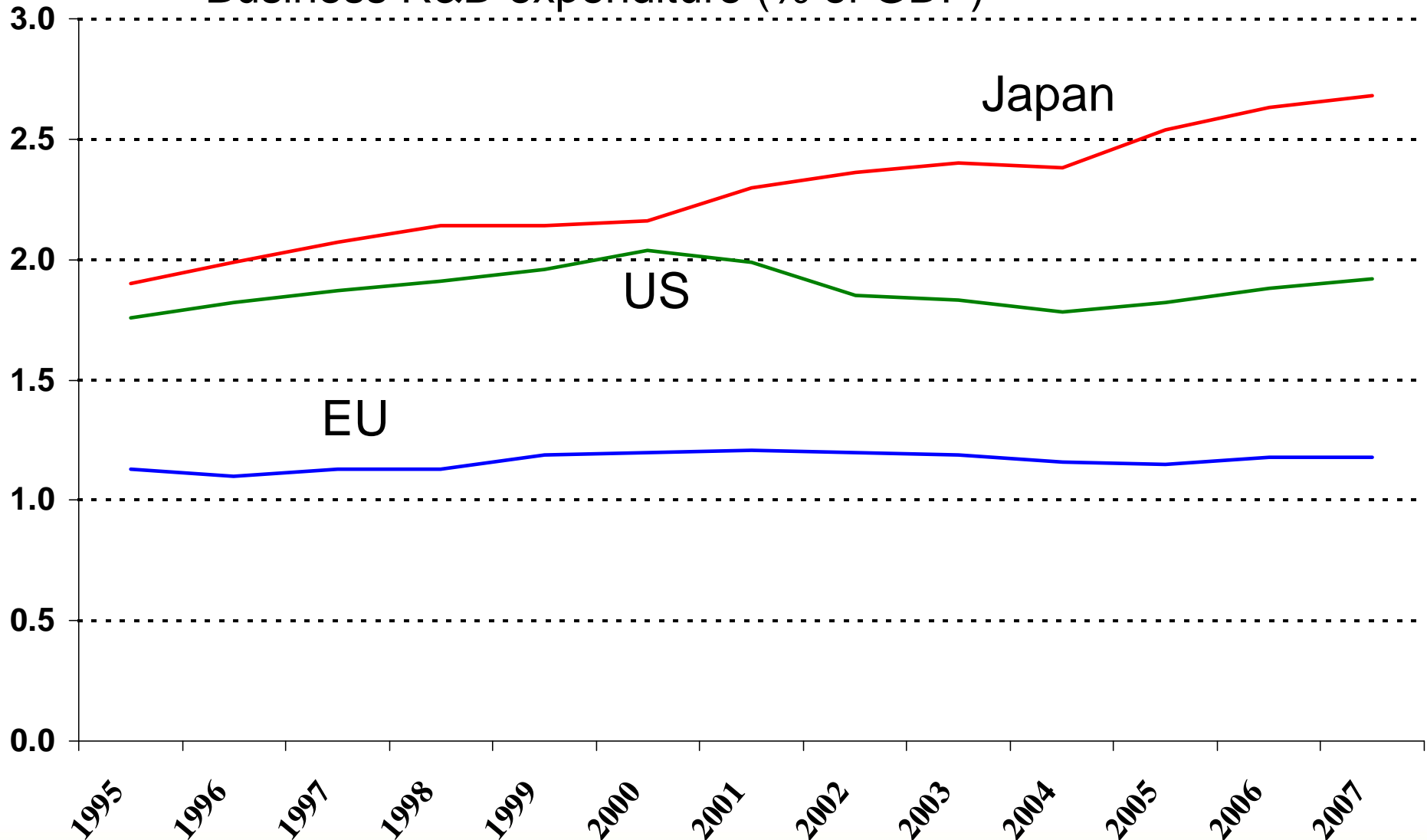
Basic facts on R&D expenditure (1)

R&D expenditure by sector (% of GDP), 2000-07



Basic facts on R&D expenditure (2)

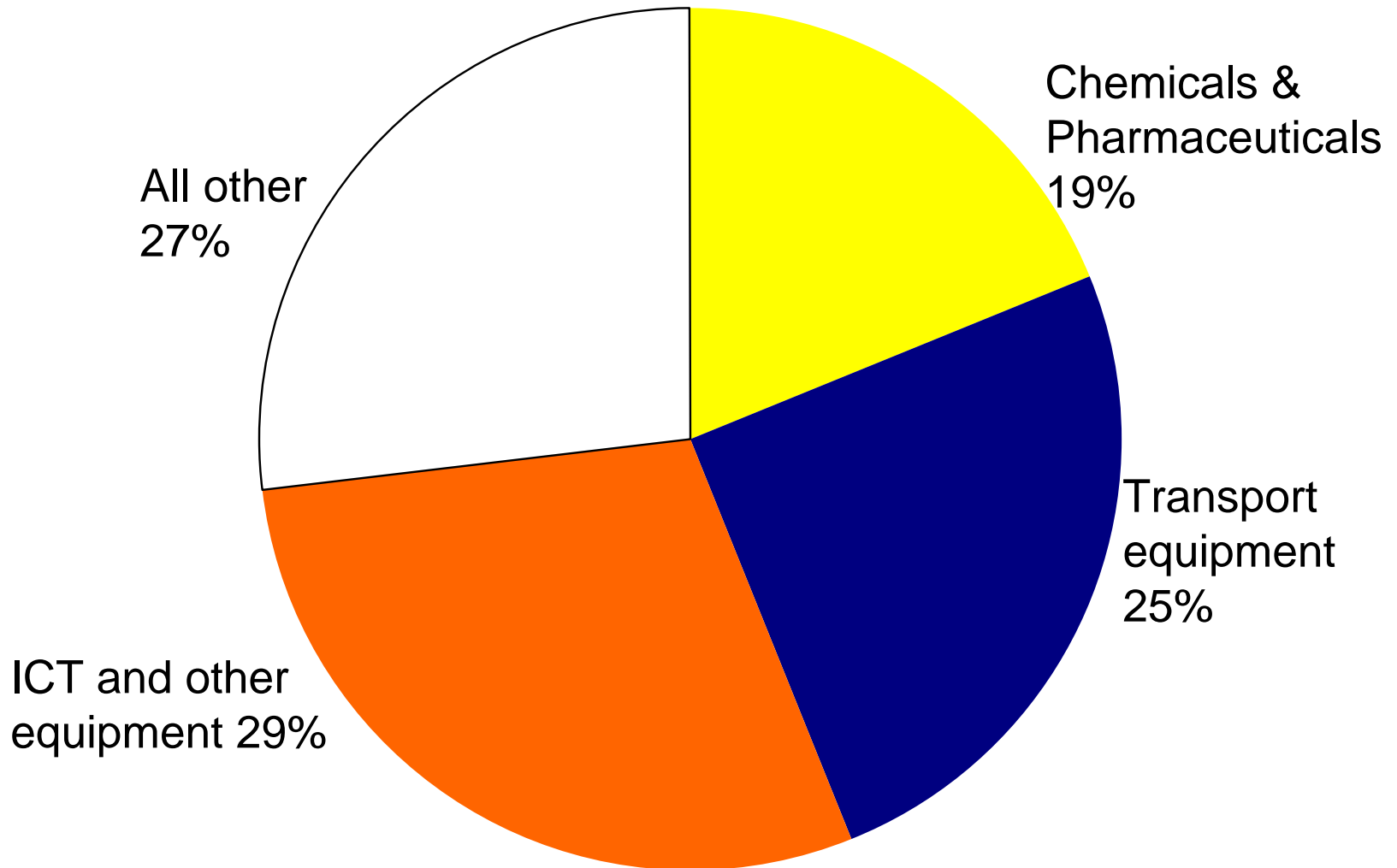
Business R&D expenditure (% of GDP)



Basic facts on R&D expenditure (3)



Industry shares in EU total business R&D expenditure, 2005



From R&D expenditure to capital stocks

Perpetual inventory method (PIM)

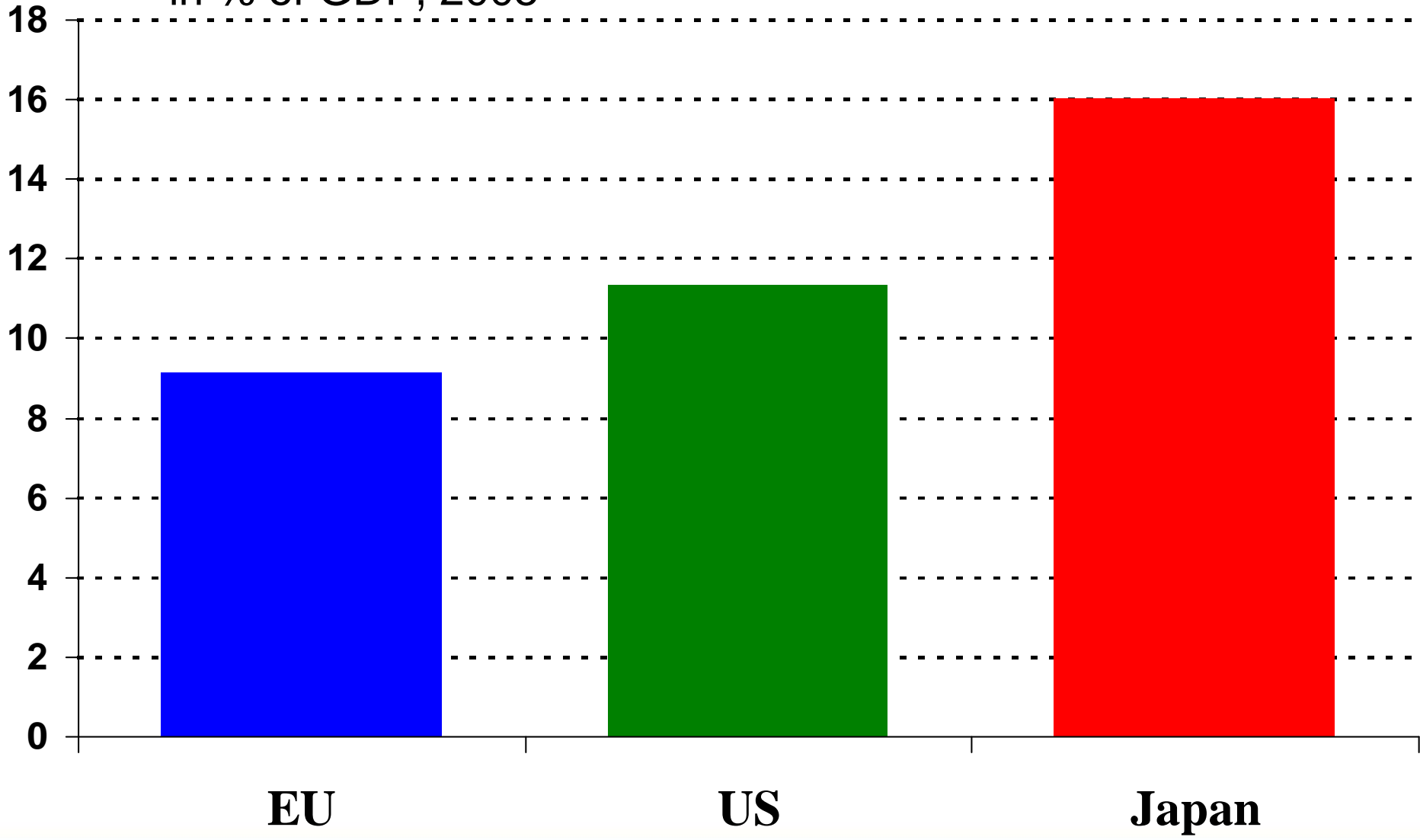
$$K_t = K_{t-1} (1 - \textit{depreciation rate}) + I_t$$

- ❖ Capitalisation rate: 100%
- ❖ Deflation of R&D expenditure: GDP deflator
- ❖ Geometric depreciation: 12%
- ❖ Initial capital stock: “First-7-years-growth” assumption
- ❖ Data source: R&D expenditure from OECD ANBERD
- ❖ Existing work
 - ❖ EU-KLEMS R&D capital stocks for 15 countries 2003
- ❖ Our work
 - ❖ We updated EU-KLEMS R&D capital stocks to 2005/06
 - ❖ We estimated R&D capital stocks for 7 more countries

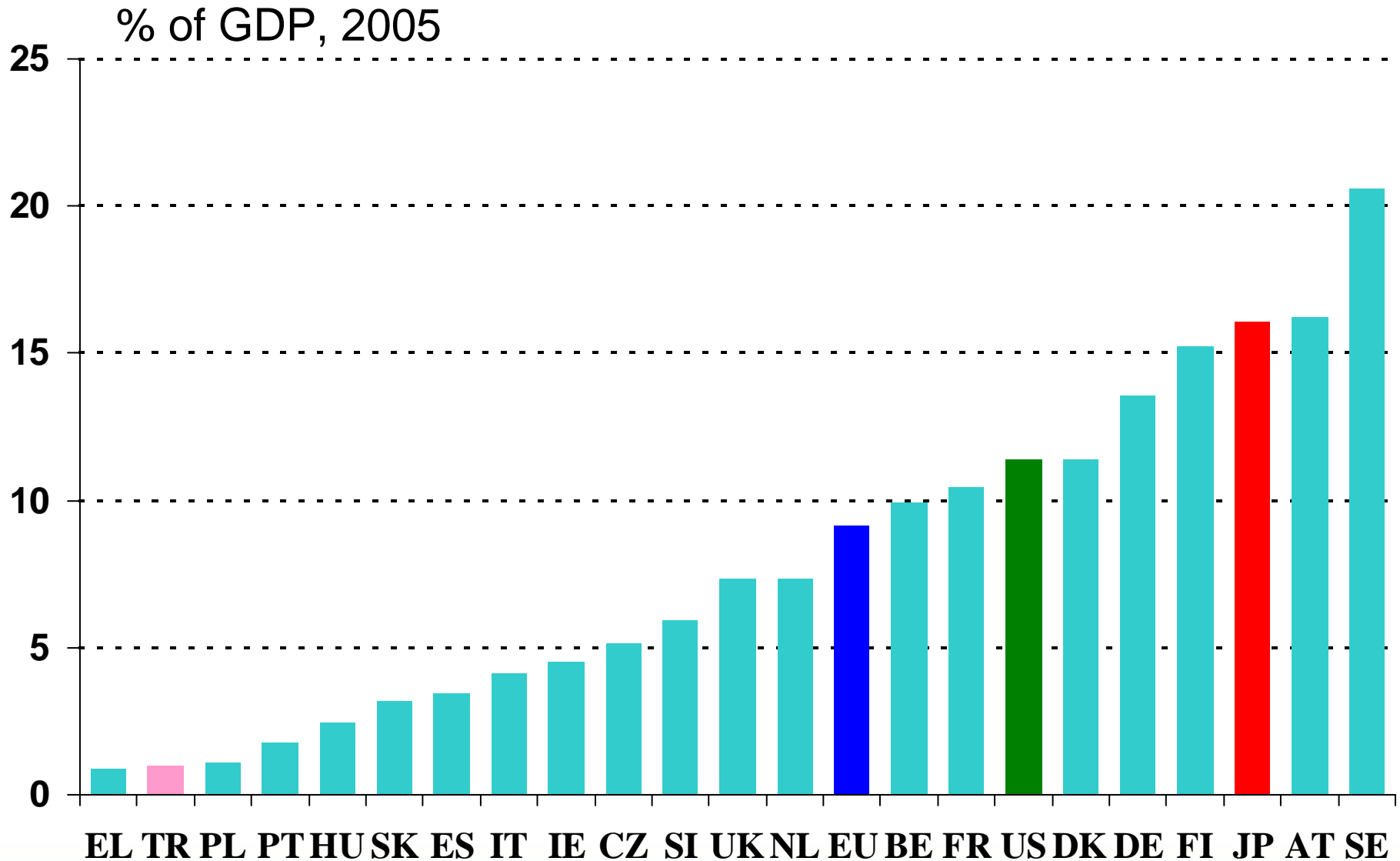
Business R&D capital stock estimates



in % of GDP, 2005

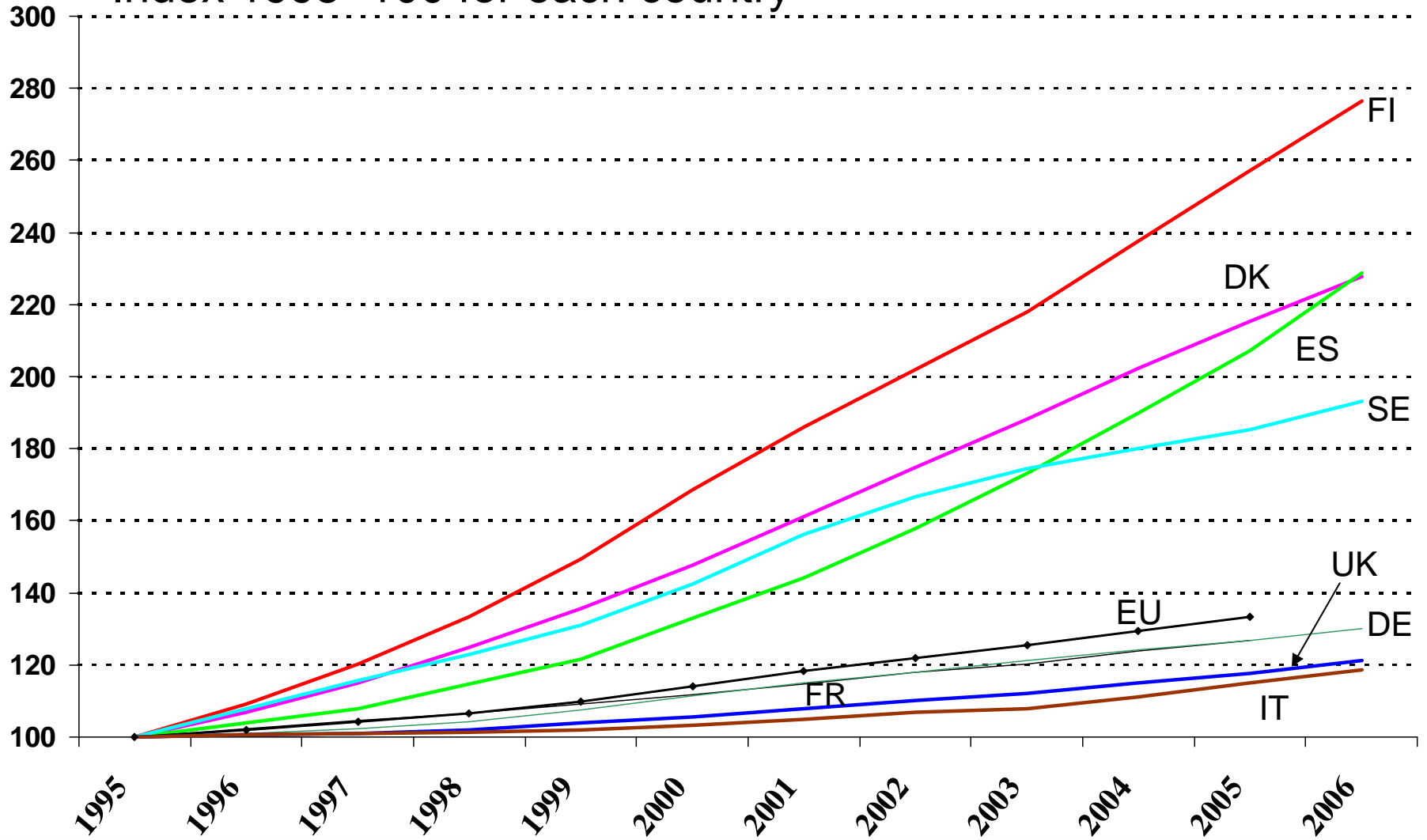


R&D capital stocks across countries

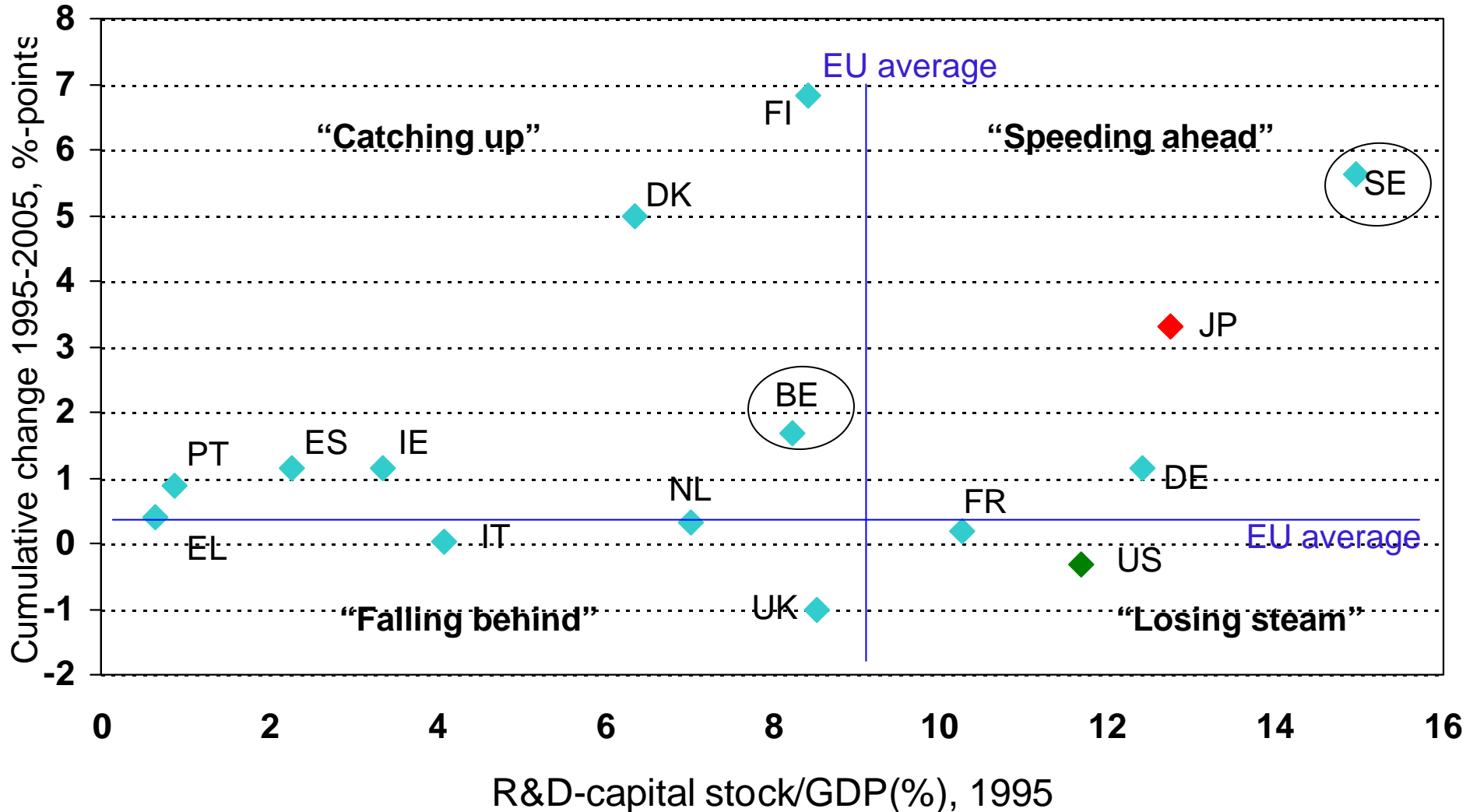


Different growth speeds of R&D capital stocks

Index 1995=100 for each country



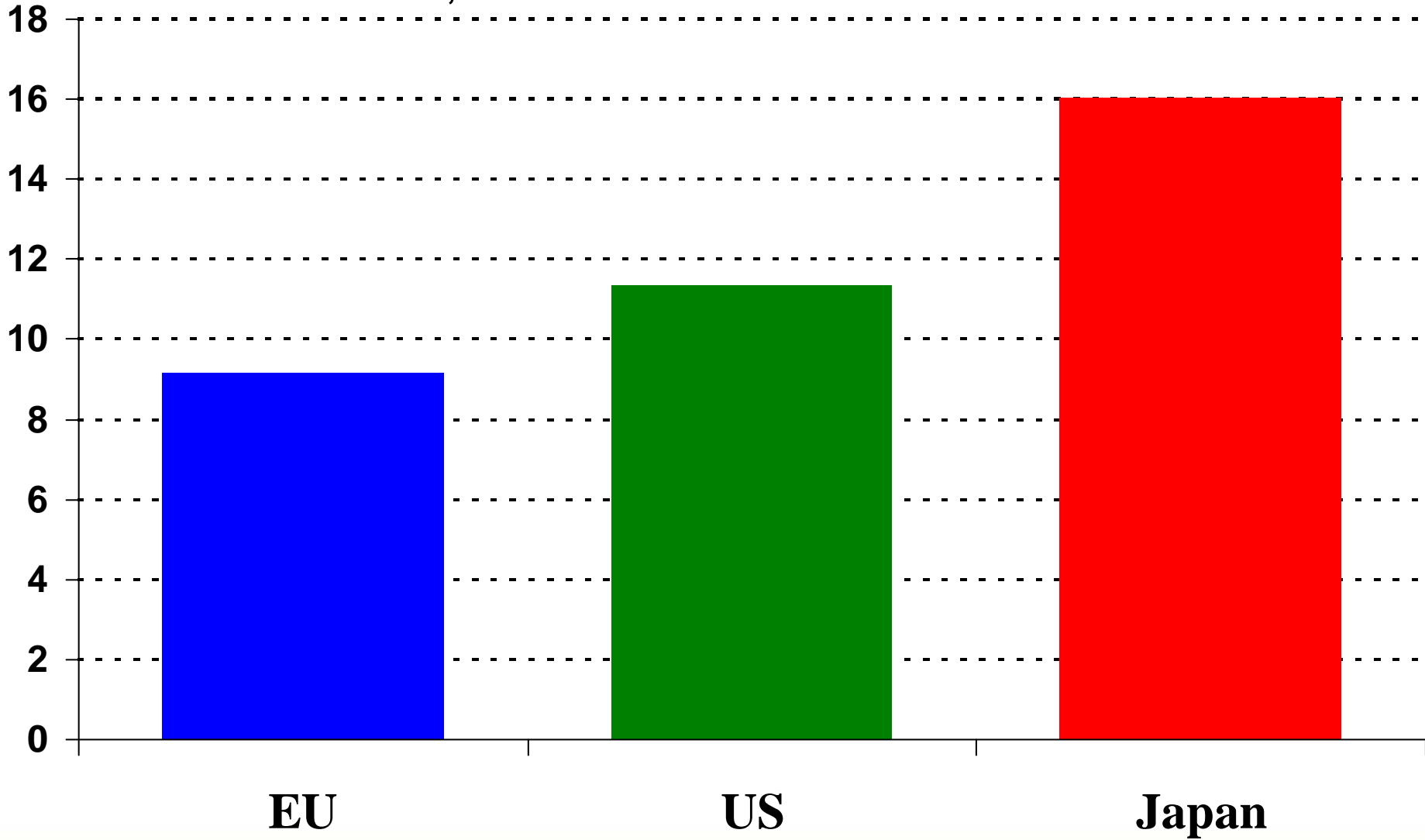
More of a standstill than convergence



Business R&D capital stock estimates



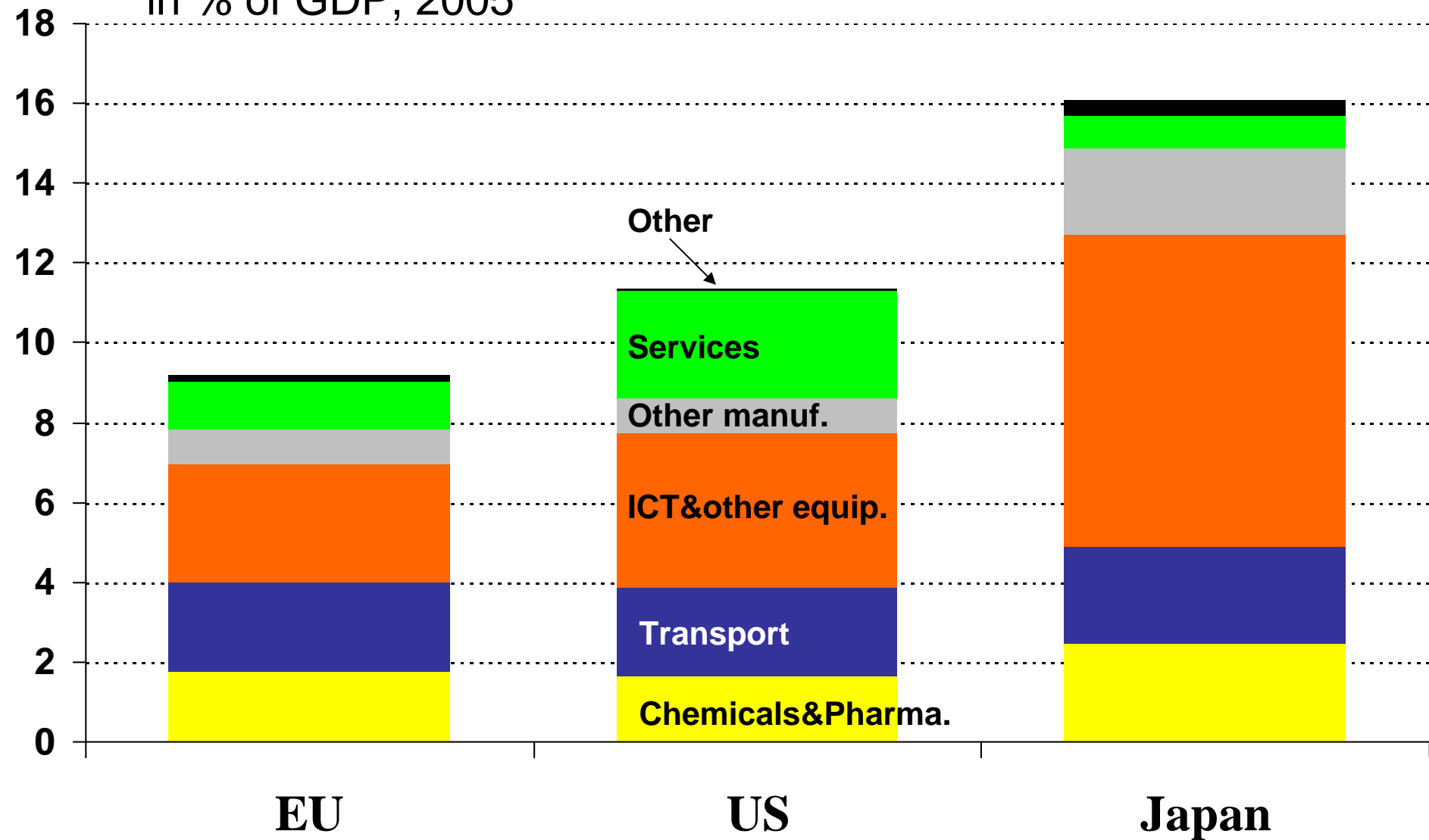
in % of GDP, 2005



R&D capital stocks by industry



in % of GDP, 2005

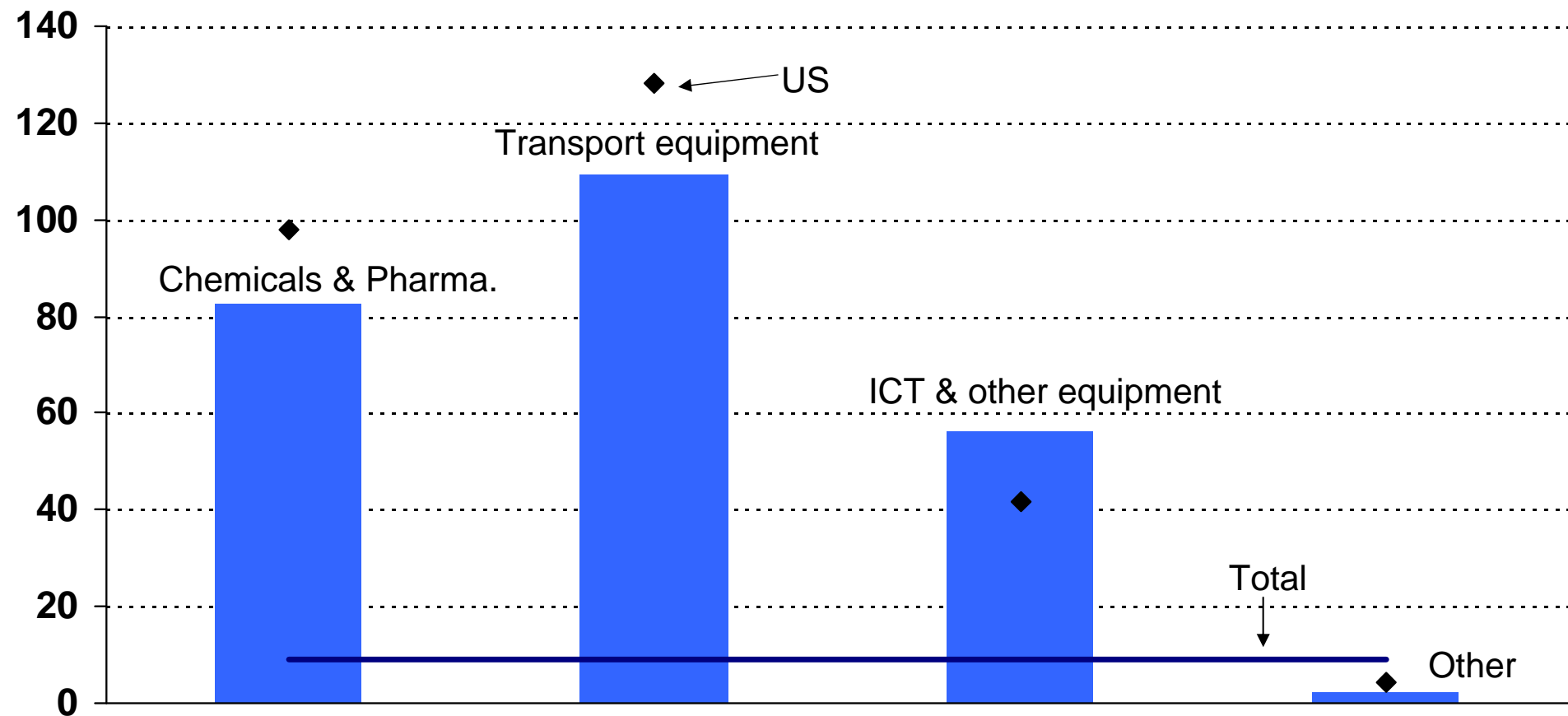




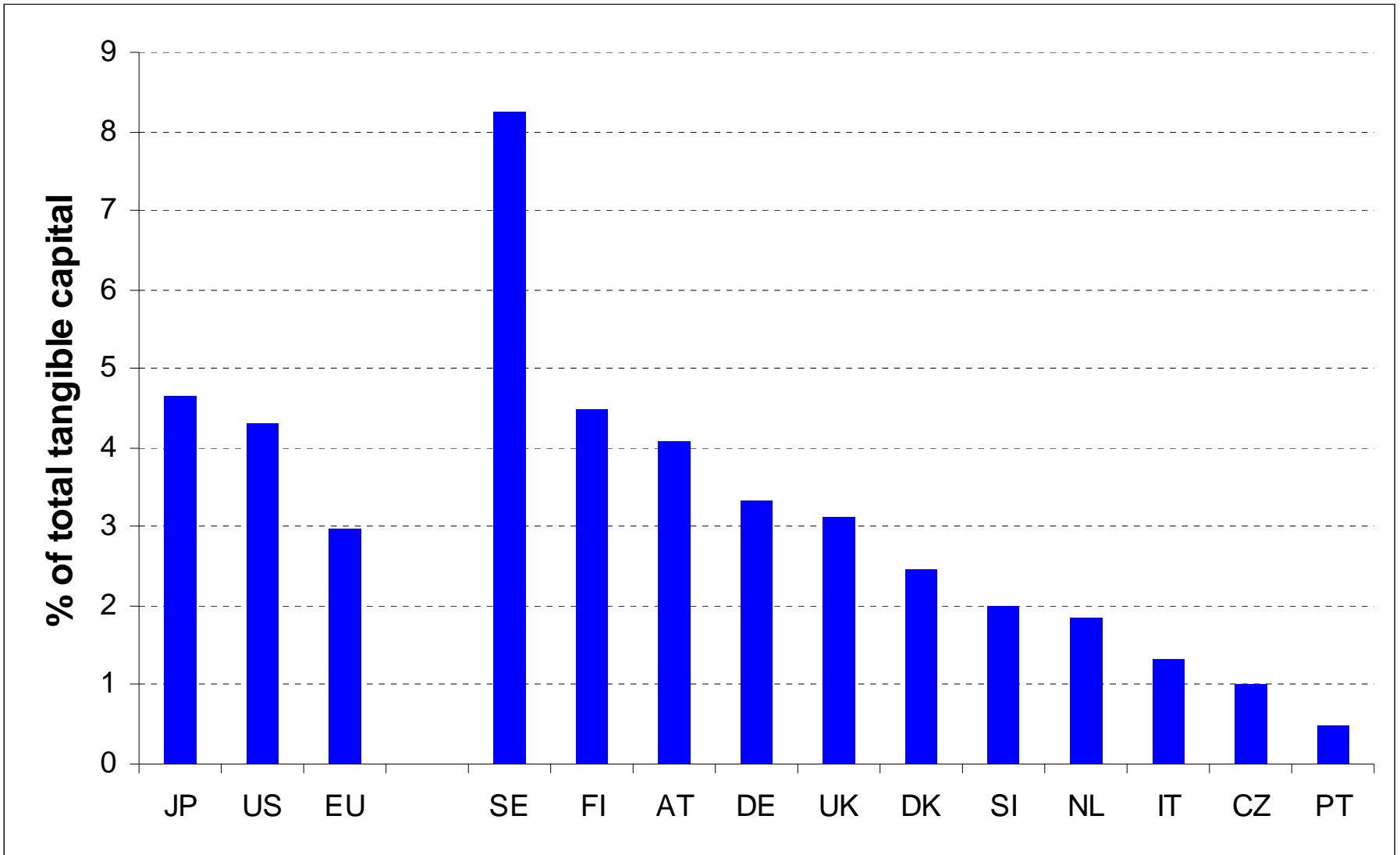
R&D capital intensities



R&D capital stock (in % of industry's output), EU, 2005

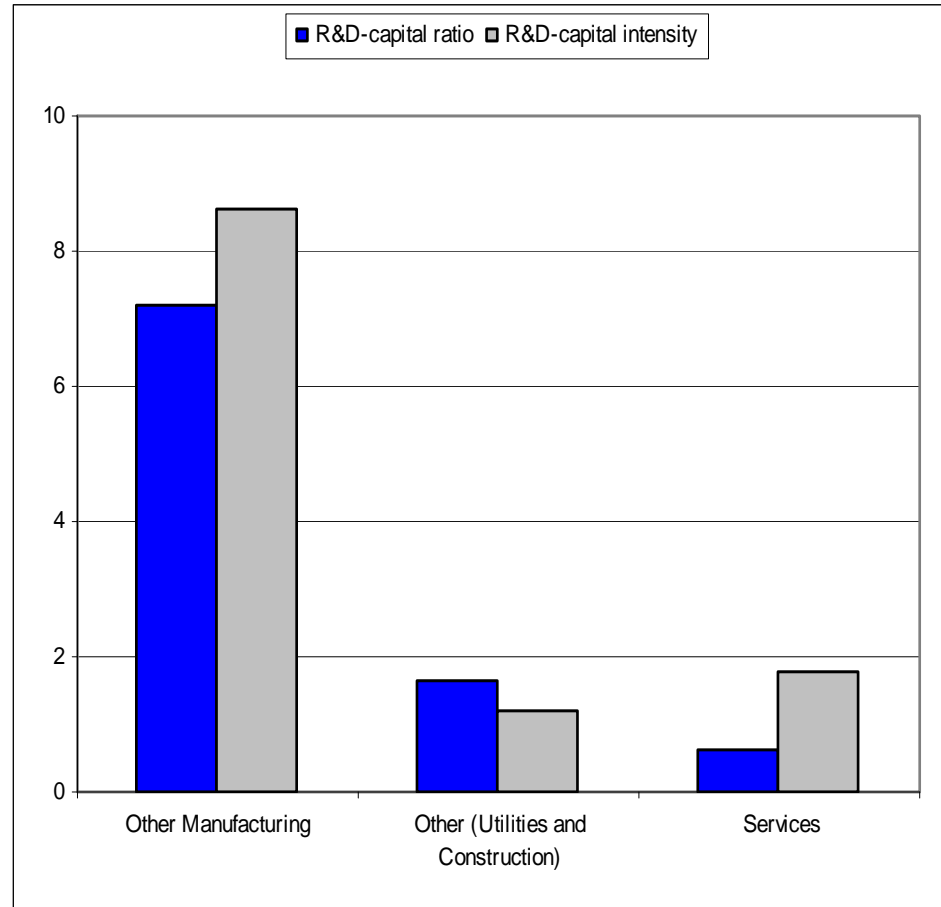
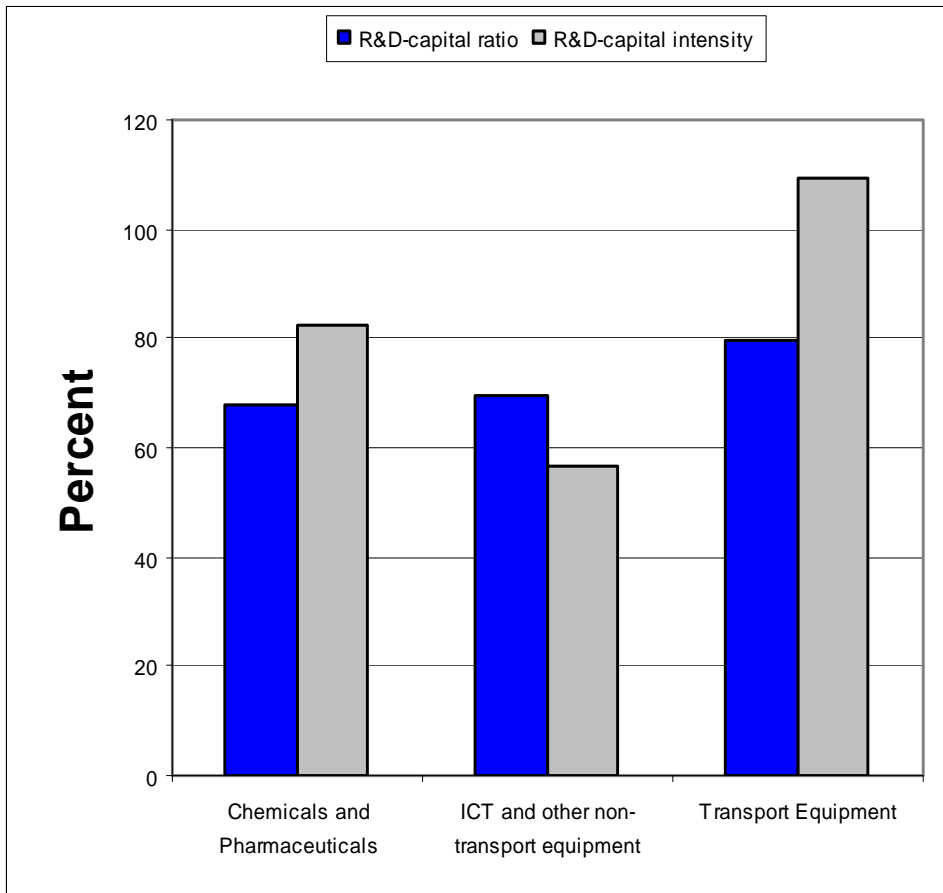


R&D-capital to tangible-capital ratio, 2005



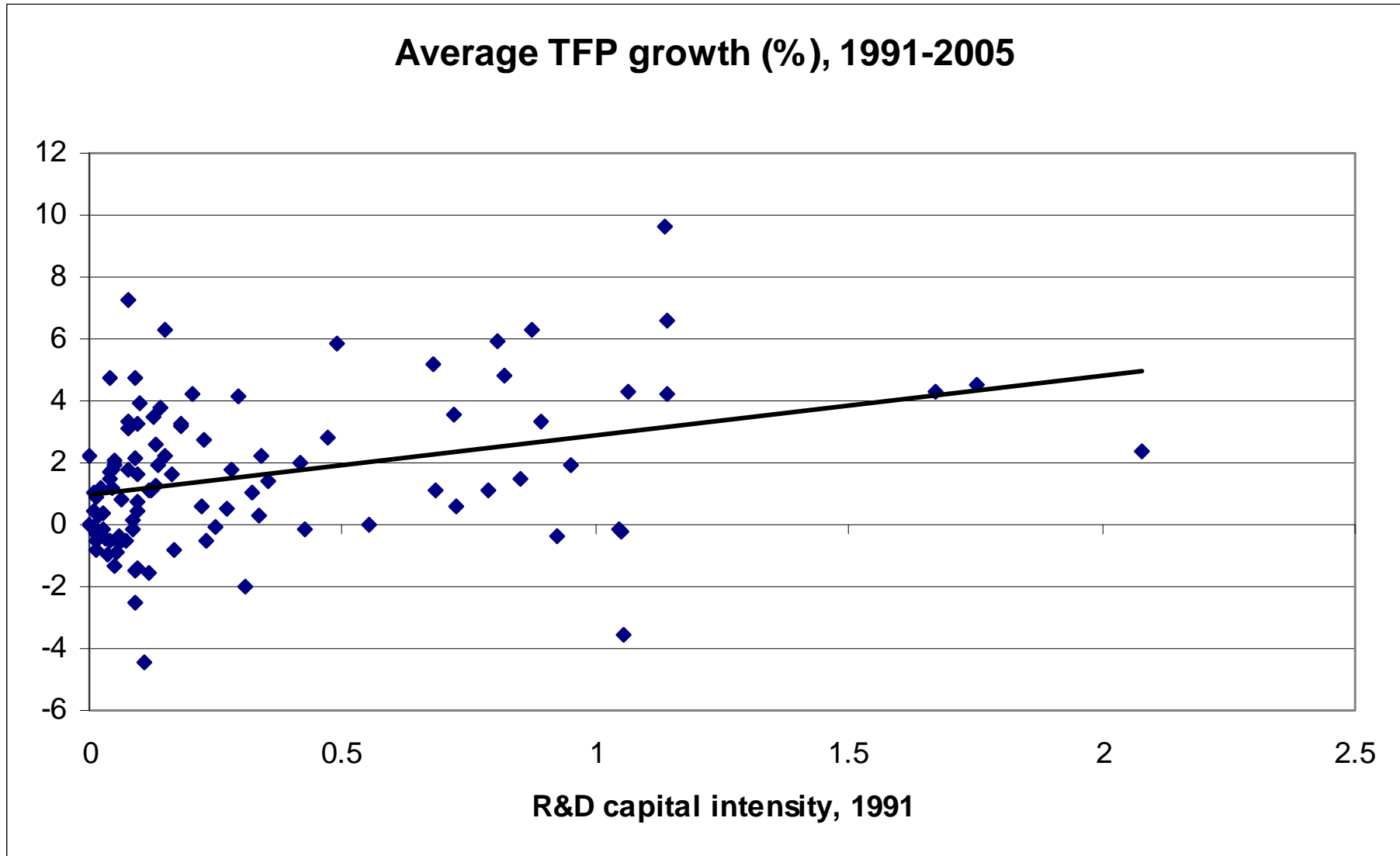


R&D capital intensities and R&D capital ratios, EU, 2005





Connection between R&D capital and productivity



Summary and implications



- ❖ R&D capital stocks are important
- ❖ EU lags behind US and Japan in business R&D
 - Need strong and *sustained* increase in R&D spending
- ❖ Tremendous diversity in R&D capital stocks within the EU
 - No clear sign of convergence over time
- ❖ Positive connection between R&D capital and TFP growth
 - ➔ Include R&D capital in production function estimations



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