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Catching up on technology:
a prospective analysis

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The Lisbon process

- "has become a catchword for an objective, a strategy and a method" (An Agenda for a Growing Europe)
- "how the use of structural indicators and other analytical tools for assessing progress on Lisbon strategy could be strengthened" (Spring 2003 European Council)
- "Research and development spending is essential for improving production technologies and raising growth." (Commission's Communication on Structural Indicators)
- "All policies need to be based upon a vision of the future." (Commissioner Busquin, Preface 3rd European Report on Science & Technology Indicators: towards a Knowledge-based Economy)

The objectives

- to increase the competitiveness of the European economy
- to ensure the sustainability of higher economic growth
- to increase the participation in the labour force
- to reduce regional disparities in employment

But how to achieve these objectives when

- quantitative targets are only set for EU averages
- there is no joint setting of national instruments
- national budget deficits < 3% of GDP
- funding through EU is limited

The Open Method of Co-ordination

is an attempt to approximate the co-ordination of instruments by dialogue and exchange of information in areas where EU competence is limited (e.g. employment and social affairs, education, research)

aims at the identification of best practices among the Member States ("benchmarking") and their adoption by the other countries

Up to now has led to

- the mushrooming of quantitative indicators
- agreement on a few intermediate targets such as on R&D spending (to be raised to 3% of GDP)

The structural indicators

The structural indicators proposed for the Spring Report 2004	
Indicators	**Country coverage**
1. GDP per capita	Full coverage[1]
2. Labour productivity	Full coverage
3. Employment rate*	Full coverage
4. Employment rate of older workers*	Full coverage
5. Spending on human resources (public expenditure on education)	15 MS + 12 ACC
6. Research and Development expenditure	15 MS + 11 ACC
7. Information Technology expenditure	15 MS + 11 ACC
8. Convergence of interest rates	Not applicable (measured by the variation across available countries)
9. Long-term unemployment*	Full coverage
10. Regional cohesion (dispersion of regional employment rates)	12 MS + 6 ACC[2]
11. Greenhouse gases emissions	Full coverage
12. Energy intensity of the economy	Full coverage
13. Volume of transport	15 MS + 11 ACC

* Indicators disaggregated by gender

[1] "Full coverage" means data are available for all 15 Member States (MS) and all 13 acceding and candidate countries (ACC).
[2] Calculated using NUTS2 regions and hence not applicable for 3 MS and 6 ACCs.

Lisbon strategy targets

	Structural indicator	Target/Aim/Benchmark
Economic background and Employment	Real GDP growth	3% on average
	Total **employment rate**	**70% in 2010**
	Public balance	0/+ medium term
	ICT expenditure	
	Level of Internet access	100% for schools by 2003
Innovation and Research	Science and technology graduates	Better recognition of qualifications
	- male	Substantial increase in per capita spending on human resources
	- female	
	GERD (gross expenditure on R&D)	**3% of GDP** by 2010 incl. BERD at 2% of GDP

Deeper analysis needed

1. On the interrelations and linkages between the variables:
- the contributions of education, R&D and ICT spending to GDP and labour productivity growth
- the impact of economic growth on energy use, transport and greenhouse gas emissions

2. On the time it takes for changes in education and technology to have an effect on economic growth

3. On the potential use of technology for
- the development of skills required from the labour force
- breaking the link between higher economic growth and greater waste

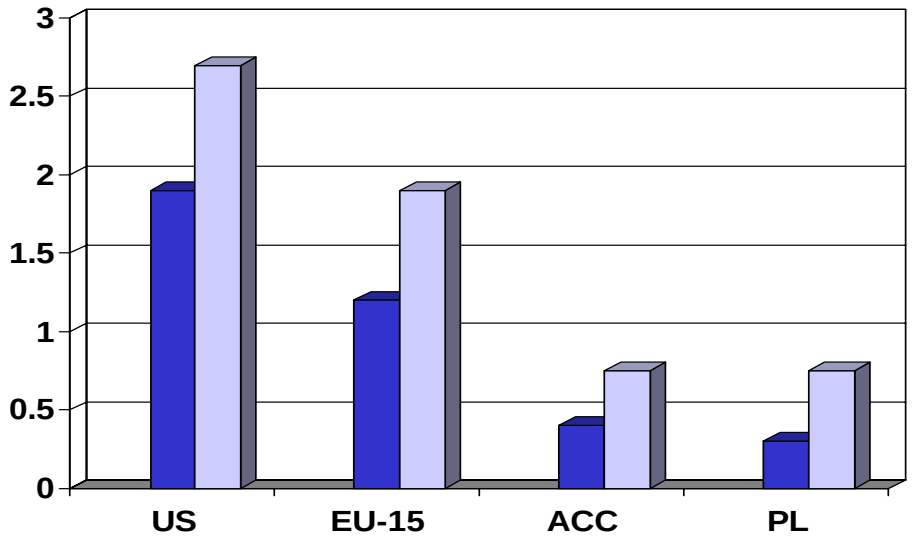
Some empirical evidence (1)

1. On education (De la Fuente & Ciccone, 2002):
   For a typical OECD country

- human capital formation accounted for 22% of the observed productivity growth over 1960-90
- **45%** of the **productivity differential with the OECD average** can be explained by differences in the human capital stock
- the private return to an additional year of schooling (ys) is between **6.5 and 9%** (flexible labour markets), fully reflected in higher wages
- with social returns this can increase **to 11%**, if the ys not only help to operate but also to advance (the use of) technology

2. It takes 10-20 years for average ys to be increased and have its full impact in raising the skills of the labour force

R&D Expenditure – Business and Total



Sweden, Finland
Approx. 3.5% of GDP

Slovenia, Czech Republic
1.5% of GDP

Greece, Spain and
Portugal < 1% of GDP

R&D spending in EU-15+ACC needs to be increased by 1% of GDP, mainly in the private sector

But production trends are towards services and small businesses in which much less is spent on research and product development than in manufacturing

Some empirical evidence (2)

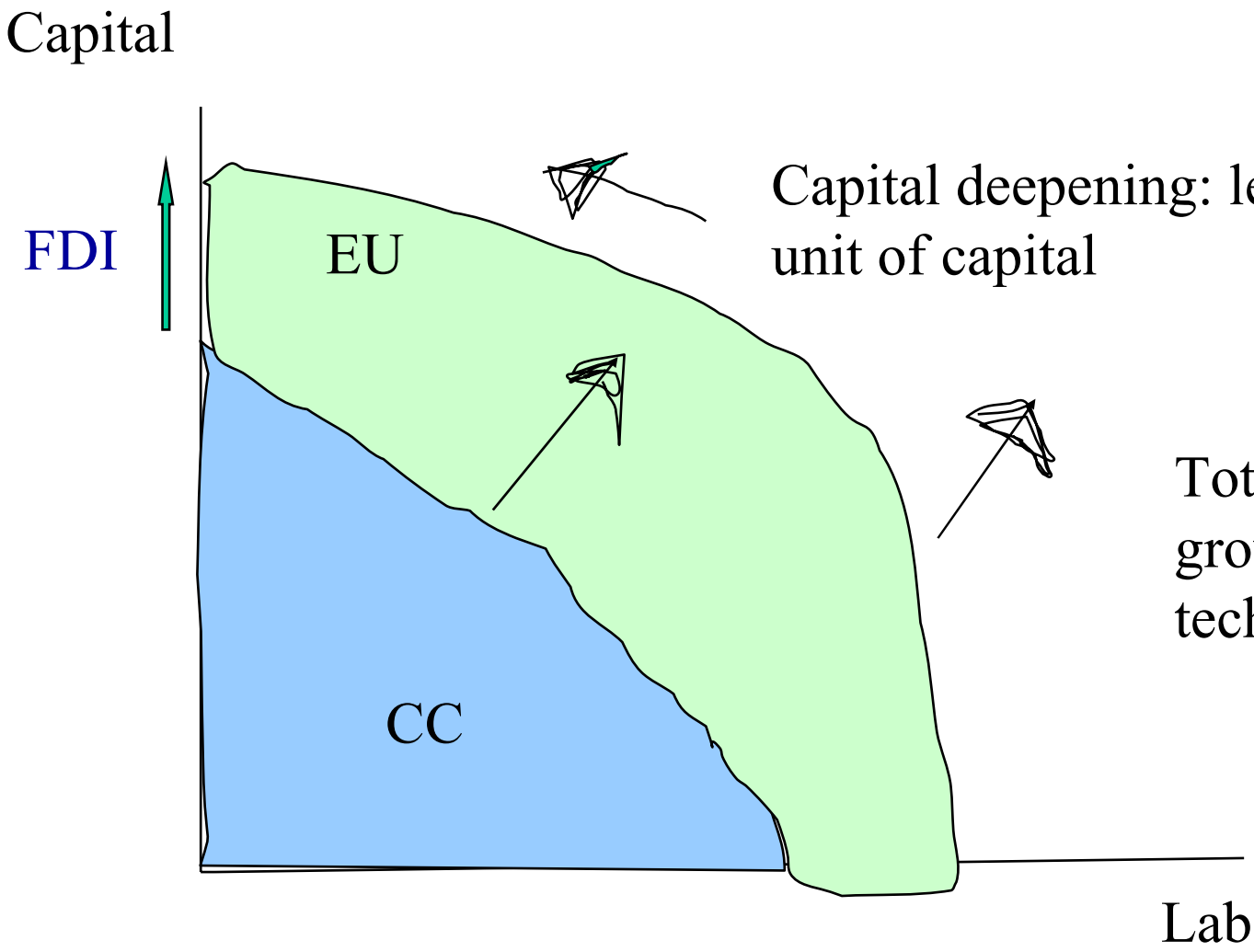
1. On R&D (Bassani & Scarpetti, OECD, 2001):

- an increase in business expenditure on research and development (BERD) by 0.1% of GDP (cf. EU-15 average of 1.2% of GDP) could **raise GDP per capita by 1.2%** in the long run (or boost output per capita growth persistently by 0.3-0.4%)
- an increase in public expenditure on R&D tends to have a negative impact on GDP growth unless offset by a BERD increase

2. Aghion et al (2003): **the proportion of the population that is highly educated** is a significant determinant of growth in countries that are catching up with technology

3. It takes 4-5 years for R&D efforts to have their full impact on economic growth

Production frontiers



Capital deepening: less labour per unit of capital

Total factor productivity growth: non-embodied technical progress

Conclusions

1. National R&D efforts are not among the most significant determinants of success in catching up economies

2. Spending directed at raising human capital (education, health) probably has a greater impact in countries that are far from the technology frontier; EU funding alleviates national budgetary constraints

3. Publicly funded research has no measurable impact on growth but is needed for product safety reasons and environmental concerns

4. In a global market with and increasingly rapid information flows and greater labour mobility it will become more difficult for individual companies to reap the benefits of R&D; there is a tension between intellectual property protection and stimulating entry and exit

5. Innovative activities should be stimulated by tax credits, an encouraging regulatory environment and the availability of venture capital