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2 Editorial. Returns to education**Innovation and Technology Policy****4 R&D Spending, Economic Growth and Employment**

While increasing R&D spending may facilitate the advent of the knowledge society, with its expected benefits in terms of competitiveness and high quality employment, suitable labour, education, fiscal and monetary policies also need to be considered.

Environment**13 Clean Technologies in Europe: Diffusion and Frontiers**

Clean technologies can help de-couple negative environmental impacts from economic growth and so have an important role to play in achieving sustainable development goals.

Innovation and Technology Policy**23 The role of Macro Targets and Micro Incentives in Europe's R&D Policy**

In order to promote the knowledge economy and boost competitiveness, the European Union has set itself the target of devoting three per cent of GDP to research by 2010. Lessons drawn from US experience point to the importance of micro-level incentives and corresponding complementary policies.

Environment**33 Global Experience in Long-Term Water Assessments: Lessons for the New European Water Policy**

There are currently very few long-term studies of water dynamics and water management in Europe. In the context of the recent European Water Framework Directive, a variety of approaches to global water assessment can offer useful insights.

Information and Communication Technology**41 Applying ICTs to Public Participation in Enhancing the Urban Environment**

At present ICTs are mainly being used by local authorities as a way of sending information to citizens. However, they also offer interesting possibilities for interactive citizen participation, which may enable improvements in the quality of the urban environment to be achieved.

data samples must be taken into account, wage effects must not be confused with returns to education, etc.

An interesting methodological innovation were the studies conducted in the nineties by Ashenfelet and Krueger (1994), Rouse (1999), and others in which they studied returns to education for twin brothers and sisters. In these studies, and for the US, the overall rate of return to investment in

education is still roughly around 10 percent. An area which calls for further analysis and research is the production of convincing and converging estimates of social rates of return, which go beyond private ones (and their summation across the population), including social benefits not appropriable by a single individual - externalities, spillover effects. They are hard to identify and harder to measure. Here more work can be done to help inform policymaking in the area.

Note

1. George Psacharopoulos and Harry Anthony Patrinos, "Returns to Investment in Education: A Further Update", World Bank Policy Research Working Paper 2881, September 2002, JEL codes: C13, J31 (which includes a full bibliography on the issue).

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Study on the Impact of Technological and Structural Change on Employment

The study commissioned by the Committee on Employment and Social Affairs of the European Commission examined the role of technology in the economy of the EU and its impacts on employment. The study is titled "Study on the Impact of Technological and Structural Change on Employment: Prospective analysis of the EU economy" (EUR 20258). The IPTS applied a combination of qualitative and quantitative analysis in collaboration with the European Science and Technology Observatory (ESTO) network and the assistance of the IPTS High Level Economist Group (HLEG) comprising Nobel prize winner Robert Solow and professor William Branson, David Ulph, Jean Jacques Laffont and Christian von Wittmann. A major aim of the work in this study was the Technology and Employment Maps of the EU, which identified the main emerging technological developments and their potential impact on employment. The potential impact of these technologies on productivity growth and employment has been estimated using theoretical and empirical evidence. These estimates were used as input for two established simulation models in order to quantify the impact of these technological developments in terms of economic growth and employment under various alternative policy scenarios.

The study reinforces the argument that technological development stimulates economic growth and employment in the EU. Technology policy can be one of the keys for achieving the objectives of economic, social and environmental policy, and a valuable instrument in achieving the "Knowledge-based Society", as defined at the Lisbon Summit.

The findings of the study suggests that a limited increase in R&D spending can lead to a significant increase in GDP and employment levels, provided that certain complementary measures are taken. Since new technologies are often accompanied by structural changes, concerted efforts are necessary in order to exploit the full potential of new technology and ensure that all regions share in the benefits. In particular, policy measures in the areas of education, training, laws and regulations, and incentives for innovation and investment are of crucial importance. The study addressed the following basic questions concerning the impact of technological development and structural change on employment over a 20 year time-horizon:

- Which sectors will offer high growth potential and quality jobs?
- Which sectors will have a significant impact in those sectors?
- What skills will be required to match the needs of those sectors and technologies?
- What is the impact of emerging technologies on the organization of work and job profiles?
- What is the impact of selected innovation and technology policy strategies under different policy scenarios?

The study was analysed under four alternative policy-driven scenarios. Each scenario represents a different approach to technology policy that led to different results for economic growth and employment at the national and regional level.

1.1.1. Current policy scenario

"Current policy" scenario: Innovation and RTD expenditure follows current patterns and the expected change of GDP, Productivity growth per sector and region is in line with OECD projections.

"Targeted technology policy" scenario: The increase in innovation and RTD efforts is concentrated on selected technologies (electronics, telecommunications, genetic engineering, nanotechnology, robotics & space applications). The affected sectors that demonstrate high productivity growth mainly include electronic equipment, services, high-tech equipment, transport equipment and chemicals.

"Regional technology policy" scenario: The increase in innovation and RTD efforts is concentrated on regions that are currently showing strong performance, taking regional specialization into account. Efforts are concentrated on research fields pertinent to advanced materials, nanotechnology, energy and ICTs. The affected sectors include chemicals, equipment manufacturing, transport, services, transport and communication services, food industry and services.

"Uniform technology policy" scenario: Innovation and RTD spending increases uniformly across all technologies and sectors. Each sector increases its productivity growth in proportion to its use of emerging technologies.