# Dynamics of innovation in low R&D-intensive sectors

## 1. *Scientific objectives*

This proposal aims at building scientific competence within the IPTS by investigating:

- Innovation in low R&D-intensive sectors and the associated spill-over effects;
- The link between innovation in these sectors and some of its determinants, especially private R&D investment;
- The direct and indirect impact of innovation in low R&D intensive sectors on business (e.g. profitability and market share) and macroeconomic performance (e.g. productivity, growth, employment and competitiveness);
- The comparison of the economic effects of innovation in low R&D-intensive sectors and in high R&D-intensive sectors.

The expertise acquired is of high strategic relevance the understanding industrial structures and will allow for a better picture of the role of R&D and innovation in sectors where European industry is strong, thus cross-fertilising ongoing EC policy initiatives on R&D investment and innovation.

## 2. *Rationale and strategic relevance*

Studying innovation in low R&D-intensive sectors is important mainly for two reasons.

**First**, there is a lack of knowledge on private R&D and innovation in low R&D-intensive sectors. Conventional thinking considers that high R&D-intensive sectors are the main drivers of the knowledge-based economy and therefore, most of the attention of technology policy is focused on those sectors. However, a number of recent studies demonstrate the need to reassess the importance of low R&D-intensive sectors for economic growth and employment and the role of R&D and innovation on those sectors.

For one, low R&D-intensive sectors play a big role in competitiveness and employment in the EU, bigger than in other economies such as the US (Sandven & Smith, 2005)[12]. Moreover, the literature suggests that while innovations in low R&D-intensive sectors are at least as economically relevant as in the high R&D intensive sectors (Mairesse & Mohnen, 2004).

**Second**, R&D intensity is often used as an indicator to establish whether a company or sector is high or low-tech (e.g. by the OECD). However, these terms are not interchangeable – a firm can be high tech but acquire its technological sophistication through the purchase of technology (with R&D embodied in it) and therefore report a very low R&D intensity. Moreover, many incemental innovations, which have significant economic effects, are simply not captured by indicators of R&D intensity

[1] The 2004 EU Scoreboard reveals that the US's advantage in terms of overall R&D intensity is due to a combination of high sector weights and high R&D intensities in IT hardware and, to a lesser degree, also in Pharma & biotech and Software & computer services.

[2] See also the EU-funded PILOT (Policy and Innovation in Low-Tech) project, http://www.pilot-project.org/.

(Leydesdorff & Fritsch, 2005). This study will seek to address those shortcomings and contribute to the formulation of an alternative taxonomy which better captures the creation and use of knowledge in a company or sector.

For these reasons, it is necessary to better understand the dynamics of innovation in these sectors, especially the relationship between private sector R&D and innovation, and between innovation and economic performance (at a business and macro level). This project seeks to fill these gaps and can benefit from the results coming from the current activities of the IRI Action. In turn, the proposed research will broaden and deepen the knowledge in the core area of SERA Unit's work.

The project will give JRC-IPTS expertise in this relatively unexplored area, and put the institute in the position to contribute in a significant way to key initiatives within the Commission, namely the 3% Action Plan, the forthcoming EC Communication on Research and Innovation[3] and the re-launch of the Lisbon Agenda. Because of its strategic importance and the lack of knowledge, this subject will probably be one of the relevant areas of investigation in FP7. Through this exploratory research, the IPTS will be able to join the best investigation teams and consortia, build strategic in-house expertise, and be in the in a better position to receive financial support from potential clients.

## *3. Approach and methodology*

Innovation is not always related to a new or substantially changed technological goods, services or processes. Examples of non-technological innovation are the creation and management of intellectual[4] and social[5] capital by companies. Innovations lead to spillovers by transferring knowledge through information contained in the product itself, and through the diffusion of information among staff and the mobility of human resources between firms, sectors and regions.

The proposed work will investigate the linkages of private R&D, innovation, and economic performance to and from three sectors: (i) steel & other metals, (ii) textile and (iii) construction & building. The approach will also include investigating knowledge transfers between these three sectors and other sectors. These selected sectors have a strong role for the European economy, especially compared to the US and Japan[6]. It is of critical importance to understand the impact of innovations on businesses and the economy in order to strengthen Europe's capacity for competitiveness and employment in the face of increased competition from emerging economies (e.g. China and India).

Further the expenditure in R&D and the economic impact of innovation between the three selected sectors and one or two service sectors (e.g. General Retailers, Leisure & Hotels, Media & Entertainment, Finance, and Support Services, but not ICT sectors, which are already largely studied), which are of great importance to the European economy[7], will be compared.

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[3] "More Research and Innovation: Investing for Growth and Employment: A Common Approach"

[4] Intellectual capital can be defined as intellectual material which is not on the balance sheet of the organisation and which has been formalized, captured and leveraged to produce a higher valued asset. This can range from the skills and knowledge of staff, to the added value that the brand or reputation brings, through to patents, management of competencies and research activities (AICA, 2000; EC 2005).

[5] The simplest definition of social capital is 'the social resource that is embodied in the relations between people.' (Spellerberg, 2001),.

[6] See The EU Industrial R&D Investment Scoreboard (2004)

[7] The services sectors now accounts for over 70% of employment and value added in OECD economies.

## *4. Work plan and research methods*

The work to be undertaken for this project will include:

a) A literature review in order to define basic terms, seek a better taxonomy to represent the technology intensity of sectors and validate the choice of the proposed research methods;
b) An analysis of input and output flows in sectors, in order to distinguish the contributions of private R&D investment to innovation in low R&D-intensive sectors from the knowledge input (a flow) derived from intellectual and social capital (the human capital stock). The analysis will use a 'knowledge transfer matrix' and an input-output model, and will result in more appropriate taxonomies and more comprehensive production functions;
c) An economic analysis of the direct (directly related to innovations within the sector) and indirect (acquired, sold or transferred innovation from and to another sector) impact of innovation on business and macroeconomic performance in low R&D-intensive sectors and its comparison with and high R&D-intensive sectors. This work will be performed through cross-section analysis based on panel data (country by country). Data used for this analysis will be gathered and structured from the work described in points b) and d).
d) A statistical examination of the contribution of private R&D investment to innovation in low and high R&D-intensive sectors. Several innovation output measures, for example obtained from panel data analyses (own compilation), survey results (IRIM Survey, Community Innovation Survey), annual reports (publicly available), databases (e.g. Thomson ONE) and other statistical sources (Eurostat, OECD), will be used in order to analyse the effects of R&D intensity on the various innovation indicators.

## *5. Timing and deliverables*

The project is expected to last 24 months in total. There will be an interim report of the activity's results during the first year (Autumn 2006) and a final deliverable at the end of 2007.

## *6. JRC-IPTS Contacts*

Hector Hernández (tel. +34 95 448 8292 e-mail: Hector.Hernandez@cec.eu.int .),
Action Leader: Pietro Moncada Paternò Castello (Pietro.Mocada-Paterno-Castello@cec.eu.int)

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