

## ***IPTS Steering Workshop on "Industrial Research and Innovation"***

***Date: 14-15 June 2012***

***Venue: JRC-IPTS Room A30 1<sup>st</sup> floor***

### ***SUMMARY***

#### ***Introduction***

The main aim of the Workshop was to present and discuss, with a group of selected experts in the field, the research activities that the IPTS group working on "Industrial Research and Innovation" (IRI) is planning to carry out in the course of 2012 and 2013 in the context of the Industrial Research and Innovation Monitoring and Analysis project (IRIMA). This is a project implemented in cooperation with the Directorate General for Research and Innovation (DG RTD).

For this purpose, the IRI team presented its research plans (including relevant policy and research questions, data sources and methodologies) and sought feed-back from the group on each of the three topics agreed with DG RTD for the next two years, namely:

- Topic 1: Business R&D and innovation investments and firm's economic performance.
- Topic 2: The role of intangibles (beyond R&D investments) in the innovative performance of firms.
- Topic 3: Technological profile and innovation patterns of European top R&D investors.

This summary presents the main messages received from the experts. This feed-back will be taken into account in the finalisation and implementation of the research plans to be agreed with DG RTD in the context of the IRIMA project. These research plans will be confronted and discussed with policy makers, representatives from the industry and other experts during a follow-up workshop to be organised in Brussels in September 2012.

## ***1. Productivity and employment***

### ***1.1. IRI approach***

The objective is to build on the existing body of IRI's research concerning the positive effect of R&D investments on productivity at firm level and the ultimate impact on growth and employment at a more aggregated level. Evidence shows that there is no compelling reason for "erga omnes" support but additional analysis is needed to support the identification and design of policy instruments that, by stimulating levels of R&D investments, could support the performance of particular types of companies.

For this purpose, emphasis will be put on the differences across types of companies (e.g. large versus small, young versus mature). Sector specific approaches and comparisons should be taken with care as standard sectoral statistical classifications fail to keep up with the rapid changes in the structure of economic activities and the processes of vertical integration.

### ***1.2. Workshop Feed-back***

#### ***The sectoral and geographical boundaries of R&D analysis (in particular, with respect to the Scoreboard (SB) companies)***

- SB companies are in general large conglomerated companies, with subsidiaries active in more than one sector, and therefore their industry specification could be difficult to define. Accordingly, sectoral analysis and comparison between sectors have in this case less explanatory power.

- Recent studies show a lot of heterogeneity in firms' innovation inputs and outputs within sectors (Vivarelli). Therefore, more relevant and interesting than sectoral studies would be the analysis of the heterogeneity of the R&D impact on productivity and employment within particular sectors, using quintile regression studies. Getting a better picture of these differences and of the underlying reasons would be very relevant to support the identification and development of differentiated policy instruments targeting different types of companies.

- In addition, sectoral aspects in R&D analysis should be linked to geographical ones. Comparative analysis of similar companies located in different regions would be interesting for better understanding how specific local conditions (including policy interventions, labour and product market legislations, access to finance etc.) affect differences in innovation performances. In particular, studying how location affects R&D investments impact on firm's productivity and employment appears a priority (Ortega, Cincera, Patel).

- "Tracking" R&D investments in European multinational corporations (MNC), and looking for evidence about R&D outsourcing and FDI is also important, especially towards China, India and Brasil, where R&D has been growing faster than in Europe over the last years. The extent to which this process creates "R&D headquarters" vs. the MNC headquarters is important to identify the actual innovation capabilities of European companies and to design policies in order to foster them (Leoncini).
- The analysis of high R&D-intensive sectors should be accompanied by that of "emerging sectors", which are expected to produce new technologies, with high potential for product innovation. KETs are crucial in this last respect. European policies could have an important role here, as targeting these emerging sectors could give Europe an important "first-mover" advantage in technologies with rapidly evolving cycles, whose returns increase and cumulate over time, offering an opportunity window to forge ahead (Leoncini).

### ***R&D and innovation in fast growing firms***

- Recent studies show that, when innovative, young and small firms have superior growth performance, both within and outside the EU. Their analysis is thus important, in particular in order to understand to which extent the different industrial demography between EU and the US explains the EU-US productivity gap (Santarelli, Vivarelli).
- The actual identity of these fast growing firms however needs to be statistically refined: for example, it is suggested to revisit the scope and definition of the population of companies to analyse: from the concept of New Technology Based Firms –NTBF- (1977) to Young Innovative Companies (EC, 2008 – State Aid Bloc Exemption Regulation definition) to a broader and more generic possible definition of Small Young Companies (same as YICs, but non necessarily R&D intensive) (Santarelli, Vivarelli).
- Recent evidence, at least in certain science-based sectors and in certain European countries, show that the superior innovation performance of YIC, in particular in terms of product innovations, is not significantly driven by their R&D. Should thus innovation policy keep targeting mainly R&D in these sectors? Should instead a more explicit (product) innovation target be considered? (Santarelli)
- The actual capacity of YIC to create employment should be considered also by looking at the quality of job they eventually create: are YICs actually able to create a sustained flow of 'technological' jobs? Have these jobs the proper mix between generality and specificity to enable these firms to actually contribute to economic growth? Recent evidence from Italy suggests this might not be the case (Leoncini)

### *R&D and beyond*

- Investments in R&D are affected by the entrepreneurial climate of the industries they are undertaken, especially as far as the entrepreneurs' attitude towards uncertainty is concerned. The analysis of entrepreneurship in high-tech sectors and that of the differences between countries/regions is thus important. Analysis of EU specificities, such as fragmentation (Zimmerman), is particularly relevant. In the same respect, the idiosyncratic characteristics of the European markets for venture capital with respect to the US ones should be carefully investigated, along with the new kinds of pre-commercial procurement that are emerging in Europe, in which a number of companies develop in competition new solutions for mid- to long-term public sector needs, by sharing their risk at market conditions (Leoncini).

- In a system-failure perspective, the private returns to R&D should be considered along with their "social returns": R&D investments by clusters of firms have a crucial role for regional/local development. Issues of social capital and open innovation become relevant in this context. Looking at differences between manufacturing and services is useful also in this context (Ortega, Kamp).

- The analysis of the productivity and employment impact of R&D should take the issue of R&D spillovers more rigorously into account. In particular, the actual role of international R&D spillovers should be disentangled in order to eventually bridge innovation policies with internationalisation supporting policies (Cincera, Vivarelli).

- A deeper investigation of the obstacles for firm's innovation outputs could provide a different perspective on the actual importance of supporting companies' R&D investments (Savona). On the other hand, the collective nature of innovation inputs, implied by the search of "social innovations" and by the adoption of open-innovation strategies, requires policy makers to target R&D investments by companies along with their innovation cooperation with other business and research partners (Leoncini).

- The analysis of innovators should be integrated with that of the large number of companies, mainly SMEs, which are not innovators in Europe. The analysis of their different technological patterns could be interesting to understand the actual weight of R&D for innovation and economic performance (Azagra-Caro).

## ***2. “Non-R&D” innovation drivers***

### ***2.1. IRI approach***

This topic has its roots in previous IRI research activity that has demonstrated that beyond R&D, training, marketing and design do affect European firms' innovative performance. The general aim of this strand of research is to investigate the actual impact that non-R&D, intangible resources have on European firms' ability to innovate. The reason of this interest is due to the fact that investing in intangibles creates a firm-specific knowledge of a tacit and not easily transferable nature, which in turn sustains a firm's specific competitive advantage. Two main lines of research will be investigated. The first focuses on the role of human capital, skills and competences/capabilities for firms' innovation, whereas the second will focus on the innovation impact of other "softer" company drivers, such as creativity, design and, more in general, the organizational capital of the firm.

### ***2.2. Workshop Feed-back***

#### ***From intangibles to “non-R&D” innovation drivers***

- There seems to be a research-policy need for a more operational account of the role of intangibles for innovation, and in particular a gap to bridge between the micro-industry and the macro investigation of intangibles. The IRI analysis on intangibles might be useful to improve the definition of intangible investments and expenditures at company level and might also help to bridge the gap between micro and macro evaluation (Perani).
- The IRI approach to intangibles should also control for the possibility that intangibles could become so policy induced to create strong distortions in the market. Evidence about the non-satisfactory effects produced by policies supporting training in some countries (e.g. Italy) provides an example in this respect. Collecting counter-factual evidence is important to address this issue: would the investments in human capital and skills be done were they not subsidised? (Leoncini)
- The CIS-approach to intangibles reveals some limitations in providing information about the actual role of non-R&D drivers for innovation. It might be safer to limit its use to the analysis of intangibles as "moderating" the innovation impact of R&D, or the economic impact of innovation (Perani).
- An innovation approach to intangibles remains however important, but mainly for the purpose of looking at the issue of complementarities between R&D and non-R&D drivers as well as the issue of substitution between types of expenditures (e.g. R&D versus marketing) (Vivarelli, Ortega, Perani).

- As for R&D, also for the other intangible drivers, their analysis could benefit from that of innovation output more than of the relative inputs (i.e. investments). For example, looking at marketing innovation rather than (or in addition to) marketing expenditures for innovation could provide a more effective perspective about the role of intangibles (Savona).

### ***Non-R&D innovation drivers between policy and data***

- In the standard (growth-accounting) analysis of intangibles, different intangibles reveal different policy-sensitivity (cf. work at the OECD). As some of them appear relatively more-policy neutral, policy-based innovation analysis of intangibles should consider to focus on a sub-set of the former: e.g. marketing, design, training (Nolan).

- Access to data on intangibles at company level is a major challenge in this area. The collection of data on intangibles already declared in some company accounts should be further exploited, in the context of the Scoreboard in particular. As it happened in the past for R&D investments, changes and harmonisation in the rules of corporate financial reporting for listed companies might help in the future, although these processes take very long.

- Policies for intangibles could benefit from a closer inspection of the companies which apparently use them more effectively, such as YICs. For example, the different reliance on intangibles between European and US YICs (link with first topic) would be very interesting to explore (Nolan).

### ***Specifying innovative intangibles***

- Highlighting the importance of intangibles linked to marketing, design and branding will be interesting as well as making the link with on-going work on creativity (DG EAC and DG ENTR). Analysing the impact of “business models” on the innovation performance/success will be very relevant (Kamp).

- When analysing marketing expenditures, it would be important to disentangle between market research and advertising.

- On the analysis of human capital and training, analysing the role of companies for vocational training would be interesting (more relevant than universities). In any case, isolating data on firm’s training expenditures that are directly devoted to innovation remains a challenge (Santarelli).

### ***3. Technological and innovation patterns***

#### ***3.1. IRI approach***

The main issues at stake in topic 3 are the technological profiles and the innovation patterns of European companies. In brief, taking stock of the analysis of the R&D and non-R&D investments European companies undertake for innovation (Topic 1 and Topic 2, respectively), this topic aims at investigating which are the technological competences (mainly proxied by their patent portfolios) that they become able to master because of these investments, and the strategic behaviours (e.g. in terms of company innovation cooperation and vertical integration with KIBS) through which they turn these investments into actual innovation.

The proposal is to start from the Scoreboard, integrating it with other consistent data sources (in particular, about the patents of the SB companies), in order to investigate the technological portfolios of the European companies, and compare it with that of non-European ones. The analysis of their innovation patterns will in addition be based on CIS data and on other data sources (e.g. Input-Output tables and ANBERD data) at the sectoral level.

#### ***3.2. Workshop Feed-back:***

##### ***Technological profiles and patent portfolios***

- The analysis of the technological profile of companies proxied by patent data is very relevant and should be used for comparisons between regions (EU vs US), to see for example the differences in the sources of knowledge (location of companies and location of patents/inventors) and to see if the degree of internationalisation of inventions is related to the innovation capacity of the firms. Developing an indicator to measure the geographical diversification of technologies and inventions of SB companies would be interesting (Patel).

- The explanatory power of patent data in investigating the technological profiles of European companies (the SB ones, in particular) should be considered with extreme care, and possibly be integrated with R&D data at the subsidiary-level. Still it remains the most reliable sources of information at the moment (Patel).

- Efforts should be intensified to decompose the European big companies (the top R&D spenders in the SB) into subsidiaries (working with their ownership structures), and to obtain R&D data from their national firm registers, even if this could require obtaining anonymous information for that scope (Cozza). The actual nature of the relationship between parent companies and subsidiaries should be also carefully investigated. In many

cases, what appears a cost-driven fragmentation of the process is in fact a conscious international division of labour between the more and the less 'value added' segments of the R&D activity (Leoncini).

- The analysis of the technological profile of SB European companies can be undertaken also in longitudinal terms. The occurrence of mergers and acquisitions over time, and the shifting effect this can have on patents across different companies, can be accommodated by adopting different approaches. For example, by interpreting the longitudinal analysis as a sequence of snapshots, and by referring to country- continental-level analysis, or by tracking and codifying the changes occurred in the names of the companies and linking them to company events with the use of company reports. Some exploratory work has already be done on both points, both within and outside IPTS (Cozza, Schoen)

### ***Innovation patterns, at the micro and meso level***

- The analysis of innovation cooperation between firms can benefit from that of the barriers to innovation too. In particular, the analysis of the cultural and linguistic barriers between the innovative firm and their external knowledge sources can provide insights about how to make the open innovation mode more effective. Also for this reason, the investigation of the effects of geographical proximity should be taken into serious consideration, possibly with the help of spatial econometrics techniques (Savona).

- The analysis of innovation cooperation should also be extended to that between science (e.g. universities and research centres) and technology (business partners), in particular at the geographic level. In some countries and regions, long-distant cooperation has actually been shown to be more important than local cooperation to acquire brand-new knowledge, with high innovation impact. However, in some countries and regions, it is the other way round: local cooperation is more important than long distant cooperation. Why are there these differences? (Azagra-Caro).

- The analysis of the technological profiles and patterns of the European manufacturing companies should be carried out by considering the permeability they reveal with respect to knowledge providers based in services, and the blurred boundaries that separate manufacturing from services, and KIBS in particular (Savona), because of their vertical integration in production (Savona).

- The analysis of business services (and KIBS in particular) and of its relationship with manufacturing should be done focusing on demand side determinants (such as regional specialisation patterns, services demand by local businesses) and on their outputs, in order to identify relevant innovation barriers (Savona).