

**4<sup>th</sup> IRIMA WORKSHOP  
INDUSTRIAL RESEARCH AND INNOVATION  
MONITORING AND ANALYSIS**

**Leading R&D investors and the European manufacturing industry**

**29 January 2015**

**Background Paper<sup>1</sup>**

*Based on company data collected from public accounts or obtained via dedicated surveys, the Commission has been analysing patterns and trends in corporate R&D and innovation activities for more than ten years<sup>2</sup>. The EU Industrial R&D Investment Scoreboard<sup>3</sup>, published annually since 2004, monitors top EU based R&D investing companies benchmarking them with top investors located in other parts of the world, trying to understand their contribution to the competitiveness of the EU economy. The Scoreboard is complemented by an annual Survey<sup>4</sup> on these top EU R&D investors, providing a forward-looking perspective and direct insights from companies on important issues such as location strategies and perception on the effectiveness of policy interventions aiming at supporting firm's R&D and innovation activities. Results of further research (undertaken on Scoreboard data and on other sources available, such as Community Innovation Survey and commercial databases) are published in a series of working papers and policy briefs<sup>5</sup>.*

*The objective of these activities is to support evidence-based policy development at European level and to accelerate innovation in the EU. The evidence collected has been exploited to provide insights on the global patterns and trends in corporate research and innovation activities and on their medium and long-term implications for the competitiveness of the EU.*

*During the fourth IRIMA Workshop that will take place in Brussels on 29 January 2015 we will aim at:*

- i) enhancing the understanding of large companies' practices and strategies in the organisation of R&D and the development of new technologies;*
- ii) obtaining feed-back from industrial representatives and from policy makers on the relevance of experts' research questions and results, and;*
- iii) identifying the key issues where further evidence is required to support the needs of both practitioners (companies) and policy makers.*

***The objective of this background paper is to set the scene for the contributions expected from the workshop participants.***

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<sup>2</sup> These activities have been carried-out in the context of a series of collaborative projects carried out by the European Commission's Joint Research Centre (JRC) - Institute for Prospective Technological Studies (IPTS) and the Directorate-General for Research and Innovation.

<sup>3</sup> <http://iri.jrc.ec.europa.eu/reports.htm>

<sup>4</sup> Ibidem.

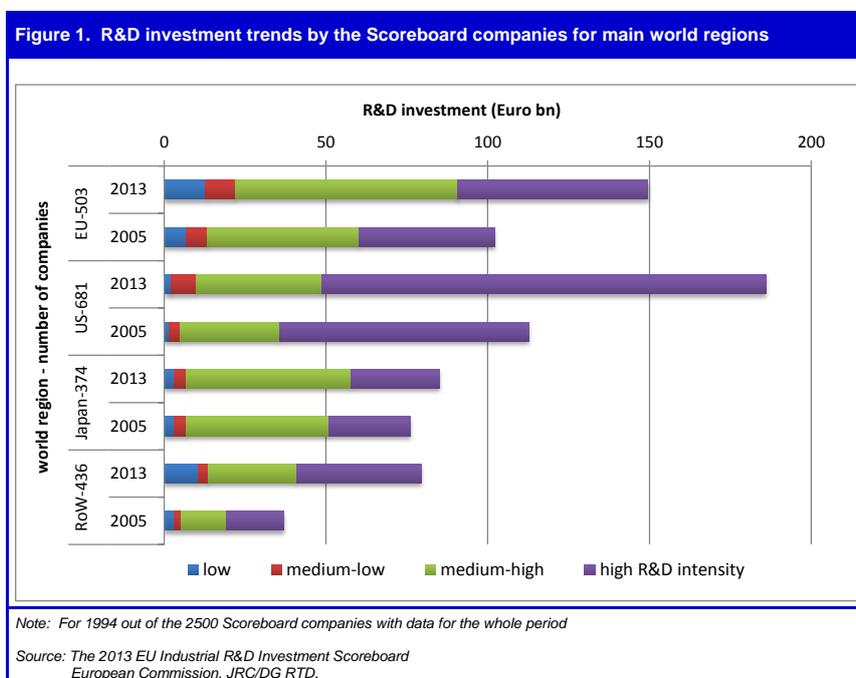
<sup>5</sup> <http://iri.jrc.ec.europa.eu/papers.htm>

The 4<sup>th</sup> IRIMA Workshop is set against the background of the 2014 edition of the ‘*Industrial R&D Scoreboard*’, which analyses the R&D investments and financial data of 2500 leading companies around the world, who collectively account for around 90 % of world business R&D. The Scoreboard was published last 4<sup>th</sup> December 2014<sup>6</sup>, alongside with the 2014 “EU Survey on Industrial R&D Investments Trends” (ninth edition), which provides more qualitative and prospective information on the R&D investments and location factors of EU companies.

The general scene will be set by means of a keynote speech delivered by a high-profile academic expert. The main issues of the workshop will then be addressed in two thematic sessions and a round table, in which companies’ representatives, scientific experts and EC policy makers are expected to contribute.

*Session 1 – Understanding R&D investment decisions in strategic industrial sectors*

In 2013, the world top 2500 R&D investors continued to increase their investment in R&D (4.9%), well above the growth of net sales (2.8%). This remarkable resilience of the R&D investments in a context of economic uncertainty hides important variations across world regions and industries. Overall the 633 EU companies increased their R&D investments by 2.6% in 2013, although well below the world average (4.9%) and the increases of their main competitors from the US (5%, 804 companies) and Japan (5.5%, 387 companies). The poor R&D growth performance of EU companies in relevant high-tech sectors such as Pharmaceuticals & Biotechnology (0.9%) and Technology Hardware & Equipment (-5.4%) weighed down the total average R&D increase of the EU sample.



<sup>6</sup> The reports and the Commission press release, factsheet and infographic can be found online, at <http://iri.jrc.ec.europa.eu/scoreboard14.html>.

The overall amount invested in R&D by EU based companies in high R&D intensive sectors<sup>7</sup> represents 43.3% of the amount invested by their US counterparts and the gap between the two company samples is increasing with time (see Figure 1). The EU Scoreboard sample shows a relative specialisation in medium-high R&D intensive sectors, with the automobiles and parts sector accounting for one quarter of the R&D invested by the EU-633 Scoreboard companies in 2013. Automobile companies based in Europe invest 5.4% of their annual sales in R&D, above the R&D intensity shown by their US (3.7%) and Japanese (4.9%) counterparts.

Apart from explaining a large portion of the EU business R&D gap, this structural difference in the samples of top leading R&D investors can bear relevant consequences in terms of their employment and economic growth potential. Indeed, the evidence shows that leading global R&D innovators in key high R&D intensive sectors such as ICT, biotech and medical equipment (all sectors in which the European economy is lagging behind), grow faster and create more jobs (also in times of economic downturn) than leading companies in other less knowledge intensive sectors. Indeed, for the period 2005-2013, the employment increase observed for the set of EU companies (18.9%), is led by increases in high R&D-intensive sectors (40.1%) and medium-high sectors (25.1%).

An analysis of the main financial indicators over 2002 and 2011 of a sample of more than 900 top R&D investors showed that high-performance companies (in terms of sales, employment and R&D growth, as well as profitability) were concentrated in the ICT (semiconductors, software, telecom) and health (pharma, biotech, healthcare equipment) sectors. The highest average net sales growth in that period corresponded to high performers operating in the pharma and biotech sector, but it was in the software & computer services sector where high performers showed the highest levels of profitability (close to 30%).

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<sup>7</sup> Sectors are split into four groups according to the R&D intensity (calculated as R&D over net sales) of the sector worldwide:

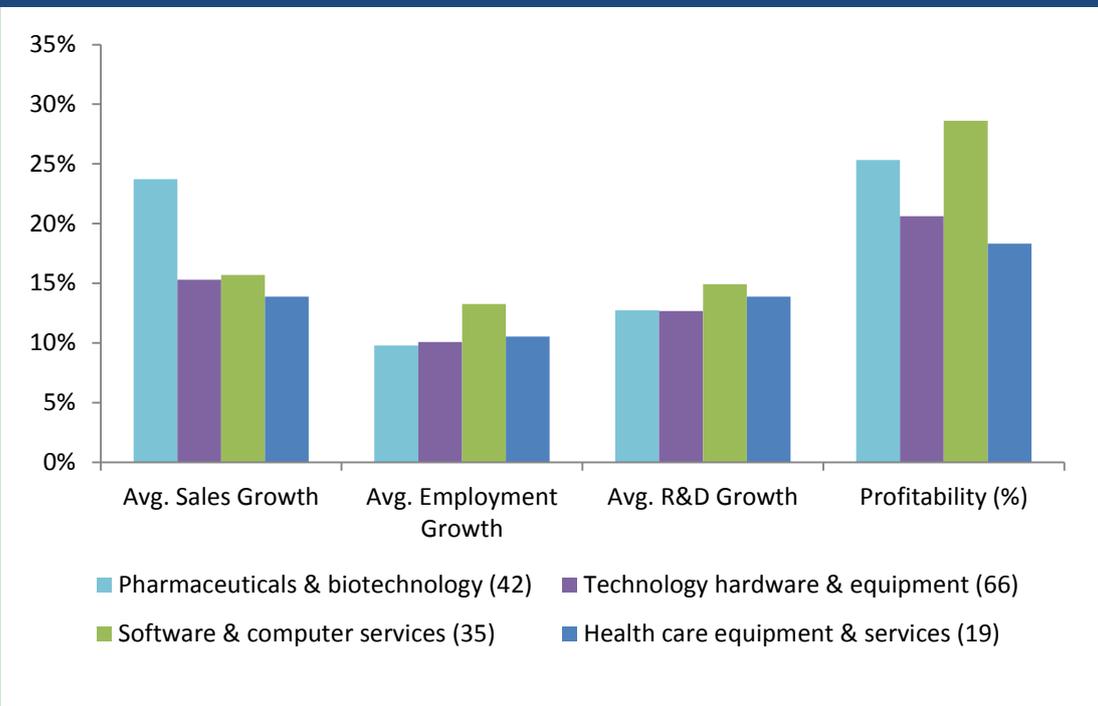
High R&D intensity sectors (R&D intensity above 5%) include e.g. Pharmaceuticals & biotechnology; Health care equipment & services; Technology hardware & equipment; Software & computer services; Aerospace & defence.

Medium-high R&D intensity sectors (between 2% and 5%) include e.g. Electronics & electrical equipment; Automobiles & parts; Industrial engineering & machinery; Chemicals; Personal goods; Household goods; General industrials; Support services.

Medium-low R&D intensity sectors (between 1% and 2%) include e.g. Food producers; Beverages; Travel & leisure; Media; Oil equipment; Electricity; Fixed line telecommunications.

Low R&D intensity sectors (less than 1%) include e.g. Oil & gas producers; Industrial metals; Construction & materials; Food & drug retailers; Transportation; Mining; Tobacco; Multi-utilities.

**Figure 2: High-tech industries' performance indicators– Average annual growth rates (2002-2011)**



*Source: The 2012 EU Industrial R&D Investment Scoreboard, European Commission.*

*Note: Numbers in brackets refer to the number of firms in the respective sectors.*

This evidence shows the importance for the European economy of increasing the number and the size of their leading R&D investors operating in knowledge intensive sectors. A better understanding of the growth determinants of these companies and on the factors influencing individual's and companies' decisions to invest into new high-tech ventures, should help policy makers to identify measures aiming at promoting the growth of innovative companies based in Europe and in attracting and retaining in Europe more foreign direct investments from global international players.

Complementary evidence from the EU R&D Survey shows that, overall, important drivers of R&D location include the quality of the knowledge base (e.g. quality of R&D personnel), the knowledge-sharing opportunities, the proximity (to other company sites, technology poles and incubators, and suppliers), the intellectual property rights (IPR) (e.g. enforcement conditions, protection costs and registration delays), and the demand for innovation.

Taking stance from these empirical observations, the **first session** of the workshop aims at getting from representatives of leading R&D investing companies more insights on their strategic R&D investment decisions. The possible set of questions to address includes:

### ***R&D Investments***

- To what extent your R&D investments are set year to year or fixed over a longer time period? How do you decide the allocation of your R&D investments between short-term and long-term projects?
- What is the most important financial source for your annual R&D investment? (Cash-flow vs capital vs debt vs public support.).

### ***R&D Location***

- Where are your main R&D centres located?
- What are the main factors driving your R&D location decisions?
- To what extent R&D and manufacturing location decisions are linked?
- What are the main differences in the factors driving your R&D and manufacturing location decisions?
- In your opinion, what would make Europe a more attractive place for your R&D projects?

### ***R&D networks***

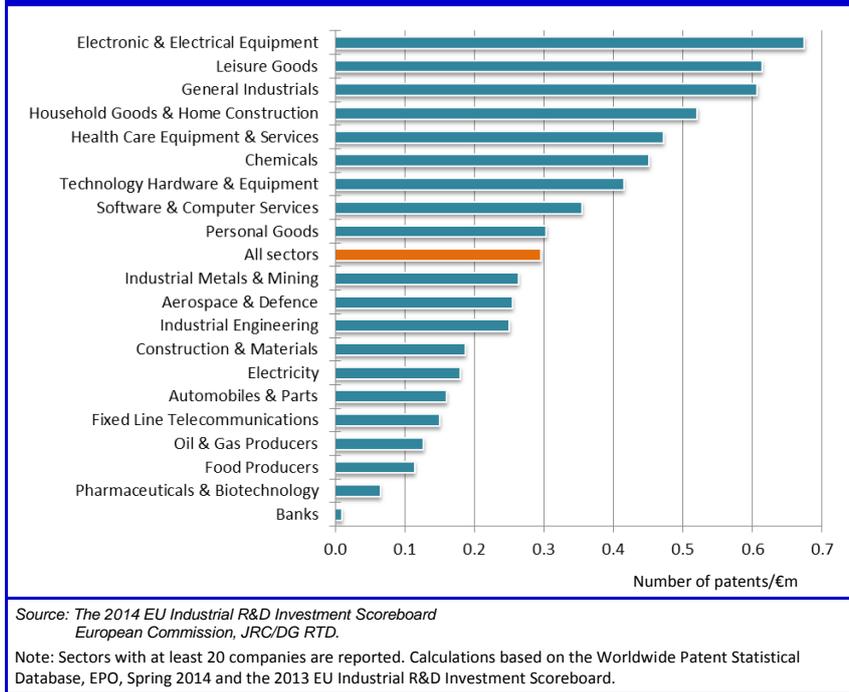
- To what extent do you share the costs of R&D with your suppliers (and customers)?
- To which extent do you rely to R&D subcontractors or external contractors?
- What is the role played by SMEs, universities and public research centres in these respects? Does geographical proximity plays an important role in selecting R&D partners and providers?
- In your opinion, what would make Europe a friendlier environment for R&D collaboration?

## *Session 2 – Corporate R&D investments and key technologies*

Recent IRIMA evidence on the patents portfolio of the world top R&D investors has allowed a closer inspection of the technological content of the corporate R&D investments. The statistics show that, overall, Scoreboard companies account for about one third of the total patents at the European Patent Office (EPO) and the United-States Patent and Trademarks Office (USPTO) over the period 2010-2012. As shown in Figure 2 the ratio of patents to the R&D investment (i.e. the patent propensity) of the 2013 Scoreboard companies reveals important sector specificities. Similarly, the technological concentration of Scoreboard companies' patents exhibits significant inter- and intra-sector variations.

At the same time, the patent propensity observed for companies classified in the same industrial sector can vary substantially, as this depends on the individual technological profiles of companies, characterised by multiple degrees of specialisation/diversification. The sectors with the higher degree of technological specialisation are Technology and Hardware Equipment and Pharmaceutical and Biotechnology.

Figure 2. Patent Propensity of the 2013 Scoreboard companies by main industry



Further analysis of Scoreboard companies' patent portfolios could help in the future to improve its characterisation and to analyse their role in the development of important technologies. From a first analysis of the top 100 R&D investors, we observe that companies in the Chemicals, Electronic & Electrical Equipment, General Industrials and Pharmaceutical & Biotechnology sectors have the highest proportions of patents related to key enabling technologies (industrial biotech, nanotechnology, micro- and nano-electronics, advanced materials and advanced manufacturing technologies).

Starting from these initial observations on the patent portfolios of Scoreboard companies, the second session aims at a better understanding of the relationship between corporate R&D investments and the development of key technologies.

Under this topic, experts are expected to bring light on the following set of questions (non-exhaustive):

- What is the distribution between Research (not directly linked to specific products or process) and Development activities?
- How important are the following knowledge sources for the development of new technologies in your company:
  - Advances in scientific research
  - Technological advances from your industry
  - Technological advances from other industries (which?)
  - Non-profit and governmental institutions
- Which new technologies will be critical for you company?
  - In the short term (2-6 years)
  - In the medium-long term (7-10 years)
- To which extent these technologies will be critical also for other sectors? Which sectors?
- How is the EU industry positioned on the world scene with respect to these technologies?
  - What strengths does it have?
  - What weaknesses does it have?
- In your opinion, what could improve the position of the EU in the development of new technologies?

*Roundtable on framework conditions to boost EU industrial R&D investments*

As stated by the European Commission in the Annual Growth Survey 2015<sup>8</sup>, investment in research and innovation by Member States and regions can play a critical role in kick-starting sustainable growth. The efficiency and leverage with regard to private investment of such spending should be ensured through prioritisation of public investment, proper reforms to ensure the quality of research and innovation institutions, as well as of their policies and programmes, and through implementation of the necessary reforms to establish an investment-friendly environment.

As the home of the main world's leading innovative companies, Europe is in a privileged position to grasp the coming growth opportunities. An analysis of the middle-sized companies populating the bottom half of the EU 1000 sample of top R&D investors shows a substantial number of companies in high and medium-high R&D sectors with a healthy growth record of R&D and sales over the last years. The sectors of Software & Computer Services, Pharmaceuticals & Biotechnology, Industrial Engineering and Electronic & Electrical Equipment concentrate the largest number of good performers in this subsample. This evidence from the 2014 Scoreboard shows that the current population of top R&D investors could constitute a good basis on which to promote the necessary shift of the European industrial structure towards more knowledge-intensive sectors.

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<sup>8</sup> [http://ec.europa.eu/europe2020/making-it-happen/annual-growth-surveys/index\\_en.htm](http://ec.europa.eu/europe2020/making-it-happen/annual-growth-surveys/index_en.htm)

The round table aims at opening a policy-oriented debate between industry representatives, policy makers and experts on the most important actions to be implemented in the context of the above mentioned policy agenda in order to enhance the competitiveness of the EU industry. The discussions of the roundtable is expected to contribute to a better understanding of the main challenges faced by companies operating in strategic knowledge-intensive manufacturing sectors over the medium-long term, and to lead to a series of recommendations on the most prominent framework conditions to address in order to foster their R&D investments.

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