



**THIRD IRIMA WORKSHOP  
INDUSTRIAL RESEARCH AND INNOVATION  
MONITORING AND ANALYSIS**

**Internationalisation of Corporate R&D and Innovation**

**5 June 2014**

**Issues Paper**

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*Based on company data collected from public accounts or obtained via dedicated surveys, the European Commission has been analysing patterns and trends in corporate R&D and innovation activities for the last ten years. The EU Industrial R&D Investment Scoreboard<sup>1</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, aiming to understand their contribution to the competitiveness of the EU economy. The Scoreboard is complemented by an annual Survey<sup>2</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 supporting firms' 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>3</sup>*

*The objective of these activities is to support evidence-based policy development at European level and to accelerate innovation in the EU. The purpose of this paper is to set the scene for the discussions to be held during the third IRIMA Workshop that will take place in Brussels on 5<sup>th</sup> June 2014.*

***The Internationalisation of Corporate R&D and Innovation is one of the priority topics to be addressed during 2014-2015 as part of the IRIMA research activities. Participants will be expected to provide feed-back on the pertinence and policy relevance of the research questions identified for this topic and to signal any missing areas where further empirical evidence would be needed. The list of research questions is presented at the end of this paper.***

<sup>1</sup> <http://iri.jrc.ec.europa.eu/reports.htm>

<sup>2</sup> Ibidem.

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

## Context and Policy Relevance

While internationalisation of corporate R&D and innovation activities is not new, its speed and extent have increased in recent years in response to increased global competition, technological change, and the availability and costs of skills (Abramovsky et al. 2008, Moncada-Paternò-Castello et. al., 2011; European Commission, 2012; European Commission 2013a, Siedschlag et al. 2013, Veugelers, 2013).

Multinational enterprises (MNEs) are the main drivers of this growing internationalisation of R&D activities and the emergence of global innovation networks which include own R&D facilities abroad, collaborations with external partners and cross border mergers and acquisitions (M&A). In addition to the traditional role of foreign R&D affiliates in diffusing technology and supporting local manufacturing operations, outward R&D investment is increasingly motivated by tapping into worldwide centres of knowledge and sourcing innovation globally (OECD, 2008).

The increasing internationalisation of corporate R&D and innovation has implications for future economic growth and EU R&I policy (Siedschlag et al. 2013; Ruane and Siedschlag, 2013). Successful reorganisation of European firms and integration in international global value chains may determine how firms adjust to increased global competition. Innovative enterprises integrated in global production and innovation networks are likely to drive the European innovation-based growth in the next decade (Sachwald, 2013; Veugelers, 2013). Global innovation networks lead to a larger base of knowledge and technologies and contribute to matching the demand for innovation and supply of science and technology. Given the effects of global innovation networks on national and regional innovation systems, it is crucial that R&I policies are designed in an international context.

Well documented market and systemic failures lead to underinvestment in R&D and innovation. In addition, the recent financial crisis has amplified capital market imperfections which have impacted on R&D investment and innovation, particularly in the most severely affected countries (European Investment Bank, 2013). In relation to the internationalisation of R&D and global innovation networks, an example of market failure is the lack of perfect information about all possible location choices for outward R&D investments. In addition, the lack of well-developed networks between the different actors of the innovation systems justifies policy intervention to facilitate international linkages and external technology sourcing. The financial crisis has amplified information asymmetries and investors risk aversion associated with international investment in R&D.

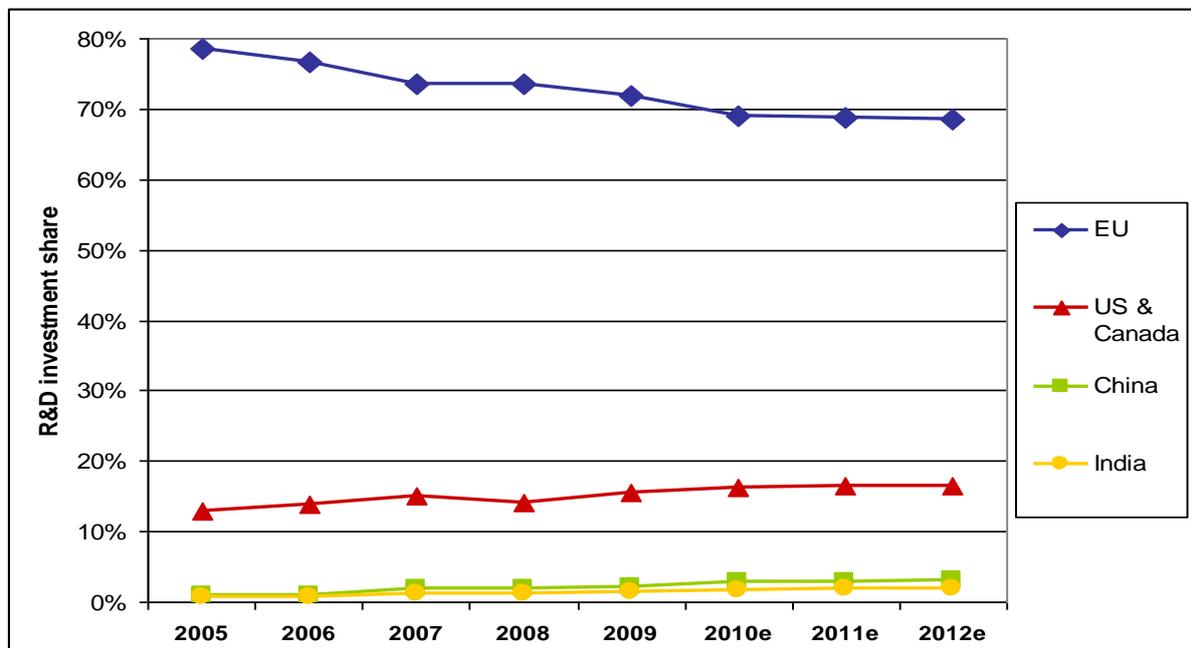
While there has been a growing interest and evidence on determinants and impacts of the internationalisation of corporate R&D and innovation (see for example OECD, 2008; Moncada-Paternò-Castello et. al., 2011; European Commission, 2012), systematic evidence to inform European R&I policies is still limited.

## Evidence on Increasing Internationalisation of R&D Activities

Corporate R&D and innovation activities have become increasingly integrated in global production and innovation networks.<sup>4</sup> Bilateral EU-US R&D internationalisation plays a prominent role in this respect, accounting for about 2/3 of all R&D expenditure of foreign-owned firms in both regions. In absolute terms, overseas R&D expenditure of US firms in the European Union more than doubled between 1994 and 2008.

At the same time, an increasing amount of outward R&D investment in recent years from EU based top R&D investors has gone to emerging economies, in particular to China and India. Interestingly, a survey of time-series trends of large R&D performers in 2009 has shown that these longer term trends indicate companies' participation in growth opportunities outside the EU, but not an erosion of the R&D base (see Figure 1 below).

Figure 1: R&D investment shares of 63 companies between 2005 and 2012 (estimate)



Note: Data are weighted by R&D investment and after elimination of outliers.

Source: European Commission (2013b).

Recent evidence on foreign direct investment (FDI) projects reveals that the EU plays a major role in the international economy both as the main source and destination of knowledge intensive FDIs:<sup>5</sup>

- 22% of the total number of FDIs in R&D are located in the EU, while the US receives only 8 % of R&D projects.
- Six out of the ten countries with the highest number of international projects are European.

<sup>4</sup> European Commission (2012).

<sup>5</sup> See European Commission (2013b).

- The EU attracts more technology-intensive projects than resource-saving investments compared to the other economies.
- FDIs in R&D are concentrated mainly in the three sectors of Technology Hardware and Equipment, Automobiles & Parts and Pharmaceuticals & Biotechnology.

### Boosting International Investment in R&D: What Matters?

A well-established literature on the drivers for the internationalisation of MNEs' R&D activities (Dunning and Narula, 1995, and Kuemmerle, 1997) has led to the distinction between two sets of forces:

- *Demand-pull forces* or home-based exploiting (HBE) activities: foreign R&D laboratories adapt technologies and products developed at home to local market conditions (regulations, standards, consumer tastes), eventually providing technological support to local subsidiaries.
- *Technology-push forces* or home-based augmenting (HBA) activities: foreign R&D laboratories are needed in order to tap into knowledge and technology sources in centres of scientific excellence located worldwide.

The above discussed trends were due to changes in the R&D internationalisation behaviour of R&D, for which in addition to HBE and HBA, other factors have gained in importance. These additional factors include: (i) public support for R&D activities; (ii) the strength and scope of the IPR system; (iii) the quality of the technological infrastructure; (iv) the macro economic and political stability as well as other framework conditions. Furthermore, reasons to choose a particular location vary by the type of activity or unit. Locating an activity with stronger "Research" focus is usually based on other reasons than locating one with a stronger "Development" component (Table 1).

**Table 1: Reasons to locate 'Research' and 'Development' in a particular location**

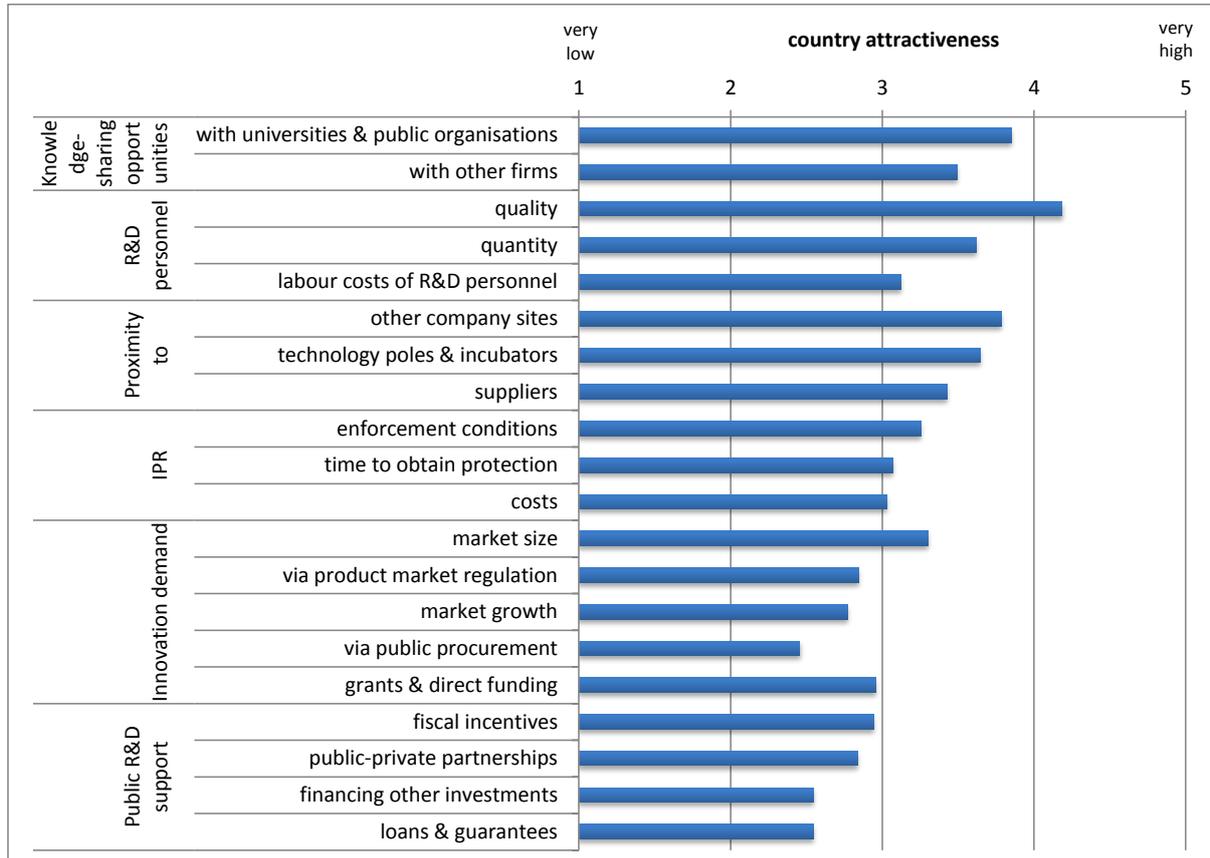
Reasons to locate 'Research'	Reasons to locate 'Development'
Proximity to local universities and research parks	Local market requirements
Tapping informal networks	Global customers request local support
Proximity to centres-of-innovation	Customer proximity and lead users
Limited domestic science base	Cooperation with local partners
Access to local specialists/recruiting	Market access

Source: von Zedtwitz and Gassmann (2002).

Evidence from company surveys confirms these more recent types of location factors for R&D activities. A recent survey (European Commission 2013c) showed that, for the countries where companies have the largest volumes of R&D activities, the respondents state that knowledge-sharing and collaboration opportunities with universities and public research organisations, quality and quantity of R&D personnel in the labour market, proximity to other company sites, and innovation

demand in terms of market size make these countries attractive. Labour costs of R&D personnel, innovation demand via product market regulation and public procurement were not as relevant for R&D attractiveness. The type of factors which make an R&D location attractive and their order is very similar along the European Commission studies performed during different years. Figure 2 summarises this evidence.

Figure 2: Determinants of the attractiveness of R&D locations\*



\* The two countries with the highest volume of R&D activities

Source: European Commission 2013c, page 24.

Existing econometric evidence on the determinants of the location choice of international investment in R&D identifies both demand (market access and market potential) and supply-side (factor prices) motivations. While the traditional role of foreign R&D investment has been demand-driven, linked to adapting products and services to local market conditions, knowledge-sourcing has become an important supply-driven motivation for investing in R&D internationally (Ambos 2005; Belderbos et al., 2008; Siedschlag et al., 2013). The importance of various determinants of the location choice and type of R&D investment differ in advanced and emerging economies. While both research and development activities are performed in advanced economies, in emerging economies, the predominant R&D activities are development and design (Shimizutani and Todo 2008).

Most existing econometric studies identify determinants of the location choice of foreign direct investment in R&D in a single country set up (for example, Frost 2001; Iwasa and Odagiri 2004; Ambos 2005; Ito and Wakasugi 2007). In contrast, Siedschlag et al. (2013) use a multi-country set up methodology to identify factors that matter for the attractiveness of inward investment in R&D in

the European Union. In addition, this analysis considers EU regions as alternative locations which accounts for the heterogeneity of locations within countries. Finally, correlations among location alternatives due to unobserved location-specific characteristics are accounted for. These methodological improvements lead to unbiased estimates.

The research results indicate that, on average the probability to locate in an EU region increased with agglomeration economies from foreign R&D activities, and the region's knowledge base measured by human capital, proximity to centres of research excellence and the research and innovation capacity.

The determinants of the location choice of R&D activities by multinationals vary depending on the country of origin of the foreign investor. The region's innovation capacity measured by patent intensity and business R&D expenditure intensity as well as the presence of centres of research excellence were important for the location choice of R&D activities by European as well as North American multinationals. Location choices by European and North American multinationals differ: while government R&D expenditure intensity increased the probability of location of R&D activities by European multinational, it had no significant effect on the location of R&D activities by North American multinational firms. In comparison to European multinationals, the effects of patents intensity and proximity to centres of research excellence were stronger in the case of North American multinational firms.

### **Policy Implications**

Existing empirical evidence suggests the following *priority areas for future EU R&I policy*:

- Assist innovative enterprises to get access to finance to internationalise their R&D, collaborate with external partners and implement foreign technologies;
- Enable and foster the emergence of cross-border centres of research and innovation excellence;
- Enable and foster innovation linkages between services and manufacturing enterprises to facilitate an efficient integration in global innovation networks;
- Increase the attractiveness of European regions and countries to foreign investment in R&D by strengthening the knowledge base of regions and by facilitating the formation of innovation clusters and networks;
- Facilitate harmonising national regulations and standards to support the diffusion of knowledge and innovation across borders such as an international system of intellectual property rights.

## Research Questions on Internationalisation of Corporate R&D and Innovation

IRIMA 2014-2015

### 1. Outward investment in R&D by European firms

- What are the broad sectoral and geographical patterns and trends of outward investment in R&D by European firms (including greenfield foreign direct investment and foreign mergers and acquisitions)?
- What determines the decision of European firms to invest in R&D abroad (in other European and non-European countries) and which types of enterprises are more likely to offshore R&D?
- What determines foreign acquisitions by top R&D investors and what impact do they have on their R&D investment and innovation?
- What impact does outward investment in R&D have on parent firm innovation, productivity and employment?
- What impact has the financial crisis had on the outward R&D investment?
- What are the implications for EU R&I policies in minimising costs and reaping the benefits of outward investment in R&D?

### 2. Inward foreign investment in R&D in Europe

- What are the broad sectoral and geographical patterns and trends of inward foreign investment in R&D in Europe including greenfield investment and M&A?
- What is the impact of inward foreign investment in R&D on firm innovation, productivity and employment in the host country ?
- Are there innovation and productivity spillovers from foreign investment in R&D?
- How do national and international technological specialisation of source and host locations impact on inward foreign R&D investment?
- What impact has the financial crisis had on the inward foreign investment in R&D in the European Union?
- What are the implications for EU R&I policies in increasing the attractiveness of Europe to inward foreign investment in R&D?

### 3. External technology sourcing and international co-operation for innovation

- What is the extent of external technology sourcing and engagement in international collaborations for innovation?
- Which types of firms are more likely to engage in international co-operation for innovation?
- Are domestic firms with international co-operation for innovation more successful with respect to innovation outputs?
- What impact has the recent financial crisis had on patterns of international co-operation for innovation?
- What are the implications for EU R&I policies in minimising costs and reaping the benefits of international co-operation for innovation?

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