



## 8<sup>th</sup> IRIMA Workshop

Industrial research and Innovation Monitoring and Analysis

# Corporate R&D and Innovation Value Chains: Implications for EU territorial policies

## BACKGROUND NOTE<sup>1</sup>

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### Context and main issues

Alongside the investments to boost innovation and competitiveness, the European agenda highlights the need to *go further and faster towards open innovation by opening up our research and innovation systems*<sup>2</sup>. In the 3 'O's framework – Open Innovation, Open Science, Open to the World – the first dimension<sup>3</sup> implies to better connect with (more) external actors in the processes of innovation generation, and to accelerate internal R&D and innovation along value chains (European Commission 2016b, 2014a).

Although open innovation practices are not a recent trend, the upgrade in speed and intensity of international R&D and innovation activities led by MNEs alters the scope of the openness of innovation activities. These changes are reflected for instance in the growth of international investments, transactions and collaborative R&D contracts and a greater geographical scope in knowledge generation and sourcing. After the international fragmentation of manufacturing processes, and the more recent extension to services, these shifts mark a third stage in the deepening of the value chain<sup>4</sup>. The global sourcing extends towards upstream and more knowledge-intensive activities, i.e. the functional deepening (De Backer 2016, European Commission 2014b, De Backer et al 2013).

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<sup>2</sup> See the speech of Carlos Moedas, Commissioner for Research, Science and Innovation at [http://europa.eu/rapid/press-release\\_SPEECH-15-5243\\_fr.htm](http://europa.eu/rapid/press-release_SPEECH-15-5243_fr.htm)

<sup>3</sup> The term was coined by Henry Chesbrough (2003) who provides an original analysis of the emergence of the new paradigm based on open innovation practices. See also European Commission (2016a).

<sup>4</sup> The concept of (global) value chains refers to the increasing geographical fragmentation (at worldwide scale) of the full range of activities that firms engage in to bring a product to the market, from conception to final use (i.e. including design, production, marketing, logistics, distribution and support to customers) (See OECD 2013, Gereffi et al 2005).

This extension of corporate RDI networks has come with the development of new organisational and innovation models. The way companies open their innovation processes and link into these networks with external actors and offshore places has been the focus of recent works on global (open) innovation networks (G(O)IN) (e.g. Liu et al 2013, Ernst 2009, OECD 2008a, Economic Intelligence Unit 2007). Their development would result from the rapid development of global value chains (GVCs), global production networks (eg. Coe et al 2008) and an increasing reliance on open innovation models by MNEs. The literature on GVCs has focused on the international break down of production and the governance and organizational features of these networks (OECD 2013, Gereffi et al 2005 for GVCs), while the survey-based and taxonomic works on GINs have greatly enhanced our knowledge about the different types of networked organisation of firms (intra- and inter-firm networks).

The 8<sup>th</sup> IRIMA workshop takes stock of these new realities. As part of the activities undertaken under the IRIMA Work package 3 - *Analysis of firms global value chains* -, the workshop builds upon prior evidence on the internationalisation of R&D and innovation in MNEs<sup>5</sup> (among others, Dachs et al 2014, 2012, Iammarino and McCann 2013, Moncada-Paterno-Castello et al 2011, OECD 2008b). It aims at further advancing our knowledge on how corporate R&D and innovation activities and networks operate as a part of global value chains (GVCs) and how these trends might call for new policy responses. In this later respect, a crucial element is to understand how the main industrial actors, particularly those with activities in key knowledge intensive sectors break up, organise and decide the location of their R&D and innovation activities and how these are connected to global innovation networks and systems. In this perspective, the 8<sup>th</sup> IRIMA workshop opens up the reflection on **the emergence of global R&D and innovation value chains**<sup>6</sup> - *whereby firms would increasingly break up their knowledge generation, R&D and innovation activities into smaller chunks (sub-functions and/or tasks) across international networks of actors and places in order to create and bring innovations into the market*. Key issues in this context are:

- i. What are the patterns and rationales underlying the decisions of firms to further break up (or not) their corporate R&D and innovation processes into sub-functions or activities across international networks of actors and places?
- ii. How do these emerging patterns of knowledge and technology sourcing and generation relate to the GVCs and production-related networks?
- iii. Which differences can be observed across industries and between manufacturing and services industries?
- iv. How do these dynamics interact with and impact on the economic, industrial and technological systems within and across European territories?

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<sup>5</sup> See also Thursby and Thursby (2006), Zanfei (2001), the IRIMA works including, for instance, The EU Industrial R&D Investment Scoreboards, The EU Surveys on R&D Investment Business Trends, Montresor and Vezzani 2015, Dernis et al 2015 at <http://iri.jrc.ec.europa.eu/home> as well as previous IRIMA workshops (see <http://iri.jrc.ec.europa.eu/workshops.html>).

<sup>6</sup> Further labelled Global Innovation Value Chains (GIVC)

- v. How do the current territorial policies, promoting at the same time, the place-based development of innovation capabilities and the upgrade of the EU industry in the global value chains and innovation networks, should be adapted to respond to these new corporate trends?

Acknowledging that companies are increasingly viewing R&D and innovation processes as value chains, this workshop aims at bringing further evidence on this more systematic and integrated transterritorial approach to R&D and innovation and on its impacts. A keynote speech on the relationships between MNEs investments in innovation and GVCs will set the scene for the debates. The discussions will be structured around three sessions and a final policy round table.

#### *IRIMA Workshops – pro-memoria*

To obtain feed-back from policy-makers, industry representatives and experts about how the IRIMA analytical activities are best serving their needs, and can continue to do so, particularly in terms of:

- Providing empirical evidence to support policy-making: Europe 2020 and the 3% R&D investment intensity target. Focus on key measures under the Innovation Union and Industrial policy flagships, including support to the design and implementation of new financial support instruments (under Horizon 2020 and Cohesion Policy, mainly). Emphasis is also placed on providing evidence for the most recent EU policy agenda on promoting investment as a means for generating jobs, increasing productivity and strengthening economic recovery.
- Offering information and benchmarking tools for companies.

#### *IRIMA Work Package 3 - Analysis of firms' value chains : main objectives*

The WP3 builds up on earlier analyses undertaken within the IRIMA on the internationalization of corporate R&D and innovation and its impacts and interplay with home and host countries' economies. The first works have allowed, among other, to better characterize the international technological and innovation profiles of the world's top R&D investors exploiting data related, for instance, to their international patenting activities, inventors' location and foreign direct investments in R&D, M&A, etc.

#### **Its main objectives are:**

- ♦ Assess the competitive position of leading EU top corporate R&D spenders in the global value chains of representative products and services in key strategic knowledge intensive industries.
- ♦ Get a better picture of the geographical distribution of the value-added and jobs generated by relevant multinational companies operating in these key strategic knowledge-intensive sectors.
- ♦ Assess the contribution of these companies to the accumulation of knowledge base capital in the EU economy via their investments in R&D and other intangible assets and via the creation of local ecosystems nurturing other companies and knowledge generators.
- ♦ Investigate the factors determining the location of these companies' investments on intangibles assets and how such decisions affect their global competitive position and performance.

## I. The break-up of corporate R&D and innovation activities at the global scale (*session 1*)

The rich literature on corporate R&D and innovation internationalization<sup>7</sup> confirms that firms are increasingly relying on geographically dispersed sources of knowledge<sup>8</sup>, though with a still strong local or regional concentration (Belderbos et al 2016). These trends are visible in the growing international research collaborations and contracting-out, IP transactions, foreign direct investment or mergers and acquisitions by MNEs. Through these means MNEs seek to exploit and augment the knowledge and competences developed in their home country. The emerging patterns of corporate R&D location have been associated with the interplay of several factors which relate to the firm – investments, skills, know-how, organizational competences, knowledge capital, networks – , the industry – R&D intensity, scale economies, differentiation – and the home and host countries – market size, labour market features, tax and regulatory environment, IPR system, scientific, technological and human resources, ICT infrastructure, support to R&D activities – etc. The networked organisations of actors and offshore sites that have emerged with these developments are the analytical focus of several surveys and case studies on global innovation networks (GINs, e.g. Liu et al 2013, Ernst 2009, Economic Intelligence Unit 2007 and OECD 2008a for a review).

The analysis of the structure and geography of global innovation networks sheds light on the variety of intra- and inter-firm relationships that support the international knowledge and technology sourcing and generation, as well as the commercialization of new products and services. They reflect the way companies relate different functional internal groups and link to their external collaborators at a global scale (Liu et al 2013). These networks are typically asymmetric and hierarchical, as their organisation is dominated by few large MNEs. They rely on a variety of governance structures involving different mixes of formal and informal relationships. Besides the legal arrangements, knowledge sharing is the key mechanism underlying the functioning of such networks (Ernst 2009) and innovation their main aim. Their global reach is expected to differ across industries and depending on the characteristics of the knowledge bases (Liu et al 2013) and the need for co-locality for innovation creation. What these works also put forward is that the development of GINs is driven by relentless slicing and dicing of engineering, development and research (Ernst 2009). Thanks to the product and process modularity<sup>9</sup>, firms are indeed **breaking up their innovation processes into finer stages, activities or tasks across geographically dispersed and specialized R&D units**. Moreover, recent case studies in the co-location<sup>10</sup> literature also suggest

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<sup>7</sup> See 5

<sup>8</sup> See also the material and summary of the 3<sup>rd</sup> IRIMA Workshop on the Internationalisation of Corporate R&D and Innovation at <http://iri.jrc.ec.europa.eu/workshops.html>

<sup>9</sup> "Modularity refers to the structure of a product or process that is comprised of smaller subsystems that can be designed independently yet function together holistically" Vickery et al (2016)

<sup>10</sup> See the works on the co-location of R&D and manufacturing activities, for instance, European Commission (2014), Ramirez (2014), Buciuni and Finotto (2016), Ivarsson et al (2016)

finer grained analyses to get a more accurate representation of how companies refine and break down their R&D and innovation into sub-functions.

The contributions in this session acknowledge these new trends and prompt the discussions about the break up of corporate R&D and innovation activities across different territories and systems. The first presentation focuses on the on-going cases study of the IRIMA II project on the geographical and organizational patterns of corporate R&D and innovation across GVCs and their interactions with home and host-countries' economies and policy initiatives. The second paper brings in alternative methodological tools and approaches to better map the patterns and dynamics of R&D flows across countries. Finally, they raise key issues related to the assessment of the geographical location of R&D investments.

## **II. Global value chains and global innovation value chains: differences and interdependencies** *(session 2)*

While the empirical evidence on the global value chains is becoming abundant (OECD 2013), we know much less about how global R&D and innovation processes are broken down around the existing GVCs, global production and innovation networks. Yet recent research in the strand of colocation suggest that the answer may lie in the cross functional interdependencies between innovation and production activities (Buciuni and Finotto 2016, Ivarsson et al 2016). The existence of product, process or industry specific interdependencies questions the common thought according to which the offshoring of R&D and innovation activities would unfold as the result of prior waves of production offshoring. Indeed, the few empirical works suggest that the degree of colocation or need to collocate is industry-specific (a higher colocation probability can be expected in for instance engineering industries with high costs complex problems and systems) and also depends on the knowledge intensity, the pace of technological change, the rate of product innovation or length of the product life cycle, the type of R&D and manufacturing activity, as well as the stage of development of the product (for instance, colocation is more likely for the first stages of radical product development project) (Belderbos et al 2016, Buciuni and Finotto 2016, Ivarsson et al 2016, European Commission 2014b, Ketokivi and Ali-Yrkkö 2009).

According to the latters, these elements impose different kinds of information processing and problem solving needs, thus implying interfunctional interdependence (Ketokivi and Ali-Yrkkö 2009). Following the aforementioned works, such interdependency is likely to be found at the sub-activity level. In a nutshell understanding which sub-activity are more sensitive to colocation implies setting up finer grained analysis of R&D, innovation and manufacturing processes.

The presentations in this session tackle these issues and contribute to our understanding of the interplay between innovation and manufacturing sub-activities

and the networks that shape GVCs and GINs. Finally, they raise issues about the limitations of analyses of R&D and innovation internationalization based on the broad R, D, innovation and manufacturing categories to examine how GVCs relate to the break up of R&D and innovation activities across existing global networks.

### **III. Innovation value chains and local innovation (eco)systems: relevant insights for (territorial) innovation policies? (session 3)**

The evolutions in the geography of corporate R&D and innovation networks has major implications for the sustainability of local innovations ecosystems, the development of regional clusters and the rise and decline of world technological and industrial hubs (see for instance, European cluster observatory report 2016, Sachwald 2008). As MNEs seek to source and exploit their knowledge and technology, they act as nodes linking several innovation systems, and thus different actors – universities, research centres, government agencies, innovation intermediaries, researchers and engineers – across various territories. A main implication is that the current global innovation systems and networks are shaped by the interplay of MNEs' characteristics and strategies on the one hand, and the home and host locations' research, innovation capabilities as well as the market and technological opportunities offered therein. The interactions with MNEs and global corporate-led innovation networks open up several opportunities for localized learning, capabilities upgrading and innovation *via* face-to-face interactions and knowledge spillovers. Also, large R&D investors can have a key role in the emergence and dynamics of local innovation systems (see Dosso et al 2015<sup>11</sup> for a discussion on the topic). Furthermore, depending on the absorptive capabilities, (actors located in a) regions or countries may enhance their participation to global innovation value chains. In this respect, not only their absorptive capabilities and innovativeness of innovation systems would matter, but also their organizational, institutional and industrial features (Chaminade and Plechero 2014, Tödting et al 2011)

The contributions in this session acknowledge these interdependencies. They discuss their possible implications for the design of place-based innovation policies promoting the development of local innovation capabilities, and at the same time the upgrading into global R&D and innovations value chains.

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<sup>11</sup> This policy brief has been issued following the 4<sup>th</sup> IRIMA workshop on “Leading R&D investors and the European manufacturing industry”. The related presentations by companies representatives and the summary report are available at <http://iri.jrc.ec.europa.eu/workshops.html>

## Open policy questions

The day will be concluded by a policy round table where policymakers, experts from research and high education and industry representatives will discuss the policy relevance of the evidence presented and ideas on how to bring forward the research agenda to support policy-making in addressing these new realities.

The round table will focus on “Upgrading in global innovation value chains: challenges for the EU R&I territorial policies”. Few key issues that could be addressed include:

- Which additional evidence is needed to better understand the impacts of global innovation value chains on national, regional and local innovation systems?
- Which are the policy implications of the fact that some manufacturing activities need to be co-located with R&D and innovation activities?
- How can EU, national and local innovation systems better exploit the opportunities offered by the international R&D and innovation activities of MNEs?
- Which reforms are needed to increase the participation of local firms into global innovation value chains in order to increase the share of high-value industrial segments of the European economy?

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