



## JRC POLICY BRIEF

# Technological drivers of R&D location

Mafini Dosso and Antonio Vezzani

December 2015

### Key messages

- » Countries' technological profiles shape the type of R&D activities they are able to attract
- » Country specialisation in emerging technologies plays a crucial role in attracting international R&D activities of the leading innovators worldwide

### 1. Policy context

The achievement of a long term knowledge-based growth requires continuous efforts into the development of R&D and innovation-driven activities. By strengthening their knowledge and innovative capabilities, countries would also become more attractive for long term and high scale investments, which are associated with more sustainable growth paths.

Among the technology-related factors that may render countries more attractive, a particular attention have been devoted to high opportunity technology fields such as emerging technologies (e.g. biotechnology or nanotechnologies). Indeed such technologies are believed to carry out the relevant potential to address grand societal challenges and to provide opportunities for the upgrading of the current industrial structures as well as for the creation of new industries.

However the role of such technologies for the international R&D location strategies has remained scarcely documented. More, there exist few empirical investigations on what makes a country technologically attractive.

### 2. Key conclusions

A dedicated JRC report on the factors driving the attractiveness of countries for international R&D investments shows that countries' technological

profiles shape the type of R&D activities they are able to attract.

Exploiting information on the international R&D locations of a sample of R&D-driven innovators, the study shows that they tend to search new technological knowledge in areas close to their current strengths, but up to a certain threshold. Indeed, a too distant knowledge would entail a greater commitment from companies to build up the necessary absorptive capabilities. However, the closer is the company's knowledge to that of the potential country, the higher will be the probability for redundancy, thus threatening the benefits deriving from international knowledge seeking.

Moreover, the report shows that a country specialisation in emerging technologies plays a crucial role in attracting international R&D activities of the leading innovators worldwide.

These findings have some interesting policy implications in connection to the specific nature of emerging technologies. These technologies often result from the combination of existing technologies to develop new inventions and methods. In addition, radical innovations stem from the (re)combination of mature and emerging technologies from different domains. In order to promote the development and exploitation of emerging technologies, countries can take complementary actions: (i) favouring technological cross-fertilization by creating multidisciplinary environments that facilitate the

*This brief is based on the JRC Technical report: "Top R&D Investors and international knowledge seeking: the role of emerging technologies and technological proximity", Dosso M. and Vezzani A., JRC95168.*

### Quick guide

The use of *patents* as a proxy for the location of inventive activities of companies refers to the country residence of the inventor(s).

*Emerging technologies* are identified on the basis of the sudden and persistent increase in patent applications pertaining to specific technologies (OECD - STI Scoreboard, 2013).

The *technological advantage* of a country in emerging technologies is the ratio between its patent share in these technologies and the world share in the same technologies.

*Technological proximity* between companies' and countries' technological profiles measures how "correlated" are the distribution of patents filed by a company across technological classes and the same distribution of a given country.

exchange and integration of different knowledge areas (or supporting multi-technology projects); (ii) investing into the development and training of specific human capital and resources by encouraging interdisciplinary higher education; (iii) establishing the conditions to favour the entry of young innovative firms and entrepreneurial initiatives in areas related to emerging technologies; (iv) supporting the commercialization and diffusion of products incorporating these emerging technologies [demand side]. These actions will foster the upgrading of the industrial structure and facilitate the creation of new industries.

### 3. Main findings

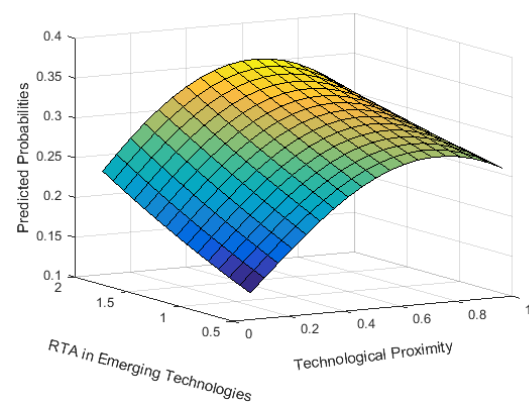
Our analysis makes use of the 2013 EU Industrial and R&D Investment Scoreboard, which provides annual data on the top 2000 R&D investors worldwide, accounting for about 80% of the world's business investment in R&D (JRC-IPTS 2013). The patents filed by these companies at the US Patent Office (USPTO) have been retrieved from the PATSTAT database in the framework of a JRC-OECD joint project.

The technological proximity between a company and a given country has a significant effect on the probability of locating R&D investments in this country, but the effect is non-linear: from a certain threshold the probability of location starts decreasing (10% of observations lies on the decreasing part of the curve).

Ceteris paribus and controlling for technological proximity, companies show a higher probability to locate R&D activities in countries with higher technological advantages in emerging technologies. However, the attraction effect of emerging

technologies fades away with higher levels of technological proximity.

These findings are illustrated in the figure below. It reports the predicted location probabilities for different values of technological proximity (right axis) and countries technological advantages in emerging technologies (left axis). The figure illustrates the inverted-U relationship between technological proximity and a company's location decision discussed above.



### 4. Related and future JRC work

Due to their inherent properties, a commitment into the development of emerging technologies requires a holistic approach to innovation policy. Such approach should build upon the existing territorial capabilities and resources.

More research is needed to improve the earlier detection of emerging technologies and to understand the conditions for their development within specific places. The JRC will monitor the development of emerging technologies and the dynamics of R&D internationalization within global value chains.

### Disclaimer

*The views expressed in this Policy Brief are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.*

This Policy Brief is issued in the context of the **Industrial Research and Innovation Monitoring and Analysis (IRIMA)** project, carried out by the European Commission's Joint Research Centre (JRC) in collaboration with the Directorate General for Research and Innovation. IRIMA produces empirical evidence and analysis on the contribution of industrial R&D to the growth and employment of the European economy. The IRIMA Policy Brief series aims at presenting the results in a way that promotes policy discussion and debate, focusing on the main empirical evidence gathered and on its relevant implications for policy-makers, at EU and Member States level. More information, including activities and publications are available at: <http://iri.jrc.ec.europa.eu/home>

## European Commission

Joint Research Centre  
Institute for Prospective Technological Studies

### Contact information

Address: Edificio Expo. c/ Inca Garcilaso, 3. E-41092 Seville (Spain)

E-mail: [jrc-ipts-secretariat@ec.europa.eu](mailto:jrc-ipts-secretariat@ec.europa.eu)

Tel.: +34 954488318

Fax: +34 954488300

<https://ec.europa.eu/jrc>

<https://ec.europa.eu/jrc/en/institutes/ipts>

### Legal Notice

This publication is a Technical Report by the Joint Research Centre, the European Commission's in-house science service. It aims to provide evidence-based scientific support to the European policy-making process. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of this publication.

JRC98311

Spain: European Commission, Joint Research Centre, 2015

© European Union, 2015

Reproduction is authorised provided the source is acknowledged.

Europe Direct is a service to help you find answers to your questions about the European Union

Freephone number (\*): 00 800 6 7 8 9 10 11

(\* Certain mobile telephone operators do not allow access to 00 800 numbers or these calls may be billed.

A great deal of additional information on the European Union is available on the Internet.

It can be accessed through the Europa server <http://europa.eu/>.

### How to obtain EU publications

Our priced publications are available from EU Bookshop (<http://bookshop.europa.eu>), where you can place an order with the sales agent of your choice.

The Publications Office has a worldwide network of sales agents.

You can obtain their contact details by sending a fax to (352) 29 29-42758.

2015 – 2 pp. – 21.0 x 29.7 cm

### Abstract

We discuss the link between corporate R&D internationalization strategies and the countries' technological specialisation. Technological proximity and a country specialisation in emerging technologies are key technological determinants for the location of foreign R&D investments of MNCs. These results imply that countries' technological profiles shape the type of R&D activities they are able to attract. Important policy implications reside in the fact that emerging technologies often derive from the use of existing technologies for new purposes and that radical innovations stem from the (re)combination of mature and emerging technologies from different domains are presented. Accordingly, countries willing to attract R&D-based investments should facilitate the cross-fertilization of existing and new fields and industries.



### JRC Mission

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.

*Serving society*  
*Stimulating innovation*  
*Supporting legislation*