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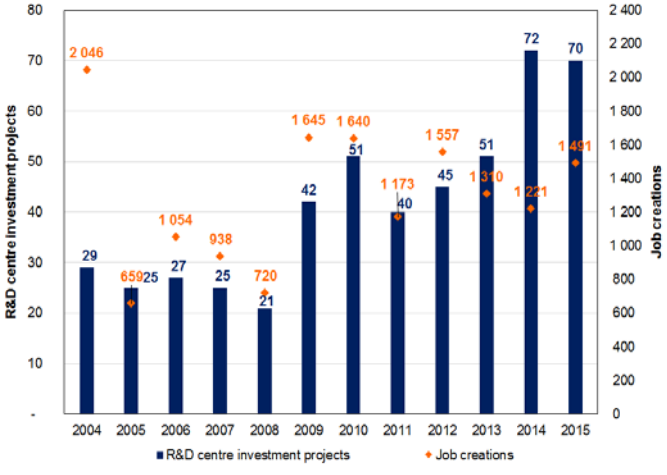
France and the internationalisation of business R&D

- The tendency towards international expansion of the value chain over the past three decades has gradually spread to research and development (R&D) activities, formerly located close to decision making centres. The trend appears to be stabilizing in most European countries, though it is impossible to say whether this slowdown is cyclical or structural. One channel for internationalisation is foreign direct investments in R&D centres, which are mainly created in the major emerging economies of Brazil, Russia, India, China and South Africa (BRICS).
- France is playing an active part in R&D internationalisation. There has been an increase in cross-border R&D expenditures, both by French firms locating their R&D abroad and by foreign firms setting up research centres in France.
- The economic literature has pinpointed three main reasons for firms to locate their R&D abroad: to make it more cost-efficient, to tailor products to local markets, and to acquire new knowledge.
- The factors determining a firm's choice of location vary greatly according to its strategy. Choosing where to locate R&D depends both on the nature of those activities (notably the level of technology and closeness to commercial applications) and on countries' comparative advantages. Accordingly, the bulk of R&D activities based in emerging economies consist of the experimental development phases needed to adapt products to the local market, whereas the activities located in advanced economies mostly involve high-tech and upstream research.
- Among European countries, France can make itself more attractive. In view of its comparative advantages, it should give priority to measures aiming at attracting R&D activities at the technological frontier (highly skilled labour force, a network of innovation clusters, top-flight public research and efficient transfer of public research results to firms). The measures France has taken through the clusters "Pôles de compétitivité", as well as the Invest for the Future Programme (PIA), are all part of an excellence-based approach focused on higher education, research, innovation and technology transfer from public research.

Number of foreign R&D centre investment projects in France and associated jobs created between 2004 and 2015



Source: Business France, "The International Development of the French Economy - 2015 Annual Report on Foreign Investments in France". Business France data are sourced from the Annual Report for France, established in 1993, which provides a summary of all foreign investment projects, listing confirmed projects and detailing the number of jobs that each project generates. It provides detailed statistical analysis by business sector, business activity, investment type, source country and host region.

MINISTÈRE DE L'ÉCONOMIE
ET DES FINANCES

1. Business R&D has internationalised since the 1990s but the trend seems to be levelling off

1.1 Different channels for R&D internationalisation

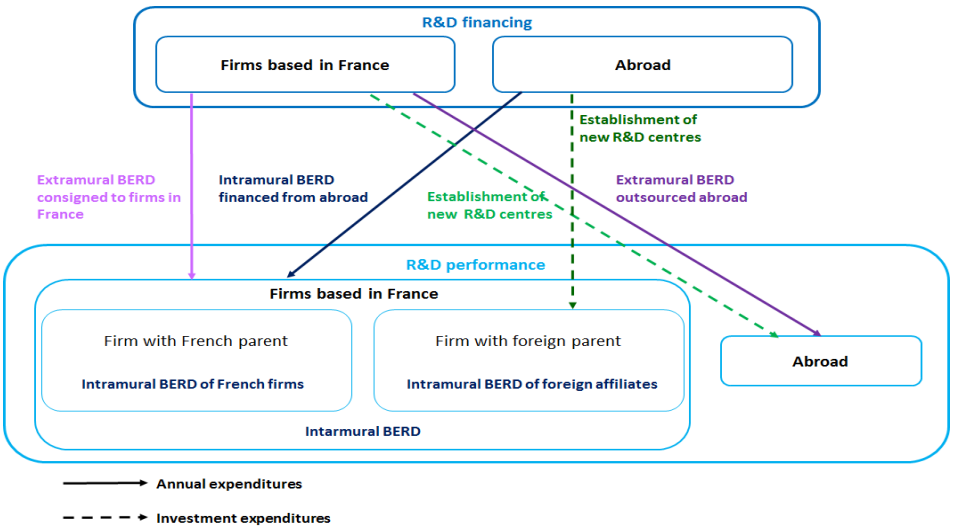
To bring their innovation strategies to fruition, firms seek out the most attractive geographies and partners for their R&D activities. In consequence, R&D internationalisation can follow different paths:

- harnessing foreign technologies or competencies through trade and the purchase of patents or licences;
- entering into R&D cooperation agreements with firms on a global scale;
- locating R&D activities abroad by
  - outsourcing, i.e. entering into a contract for R&D ordered to a foreign company independent from the originator, or
  - insourcing, i.e. carrying out R&D in a foreign affiliate.

The latter path has been subject to the most systematic statistical monitoring. R&D outsourcing can be measured through specific R&D expenditures and greenfield investments in creating R&D centres (Figure 1). There are three types of business R&D expenditures to examine:

- Intramural business enterprise expenditure on R&D (intramural BERD), covering R&D activities carried out in the business sector by firms in their home country. This includes current expenditure (R&D wage bill and operating expenses) and capital expenditure (equipment procurement for domestic R&D work, real-estate transactions). Two subsets of intramural BERD partially capture R&D internationalisation:
  - intramural BERD of foreign affiliates, corresponding to the R&D performed by these affiliates in the national territory, either on their own behalf or under contract with another firm,
  - intramural BERD financed from abroad (by companies, international bodies or foreign governments), which measures R&D expenditures made on foreign behalf in the national territory (in a domestic firm or in a foreign affiliate based in the national territory).
- Extramural business enterprise R&D expenditure (extramural BERD) corresponds to R&D expenditure financed by a firm but carried out by another entity, outside that firm, through subcontracting and contributions to international bodies. R&D internationalisation can be measured by extramural BERD outsourced abroad, linked to payment for an R&D service made by a home-based company (a domestic firm or foreign affiliate) to a company abroad (a foreign third company or a foreign-based affiliate). However, this metric does not include research result transfers – for example, through the sale of intellectual property rights – which do not give rise directly to payment for the R&D service.

Figure 1 : Measurable factors of R&D internationalisation



Source : DG Trésor.

Foreign direct investments(FDIs) in R&D structures, measured through greenfield investment, evidence the increase in foreign-based production capacity. In this paper we do not examine acquisitions of R&D centres or of corporate groups with R&D activity[1].

Accordingly we use these four metrics – extramural BERD outsourced abroad, intramural BERD financed from abroad, intramural BERD of foreign affiliates and R&D greenfield FDIs – to take stock of R&D internationalisation. There are several hurdles, however. In particular, data are unavailable or not cross-country comparable and there is a lack of aggregated data, for example at European level. Only an overarching view of these indicators delivers a general view of R&D internationalisation.

(1) Cross-border mergers and acquisitions are ignored in this paper because the related investments are not as large as those for greenfield FDIs. (According to the UNCTAD 2015 World Investment Report, cross-border greenfield FDI across all sectors was twice as large as the expenditure on cross-border M&A, i.e. $696 billion in 2014 versus $399 billion). Furthermore, cross-border M&A investments are motivated to some extent by financial considerations rather than by strategic decisions for locating R&D activities.

1.2 The EU is participating in the worldwide R&D internationalisation phenomenon

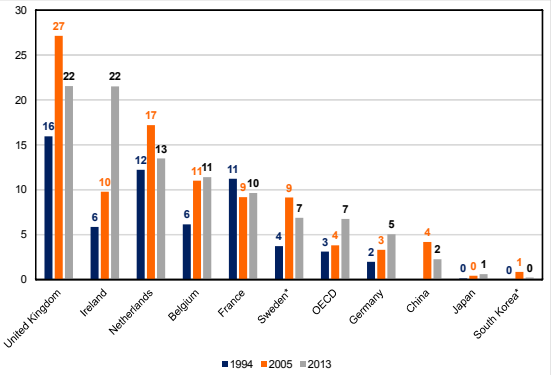
1.2.1 R&D expenditure data show that R&D internationalisation has intensified worldwide, chiefly through affiliates

The proportion of intramural BERD financed from abroad has risen by an average 4 percentage points across the OECD since 1994.

The pattern is not the same in every country, however. There has been a sharp increase among small countries such as Belgium and Ireland, which are naturally more open to global financial flows, but the pace has been slower in Germany and France and has actually slowed in emerging economies like China, probably because these countries' domestic markets and firms have expanded (Chart 2).

This indicator also varies considerably depending on the year. The United Kingdom, for example, shows a negative 4-point difference between 2005 and 2007.

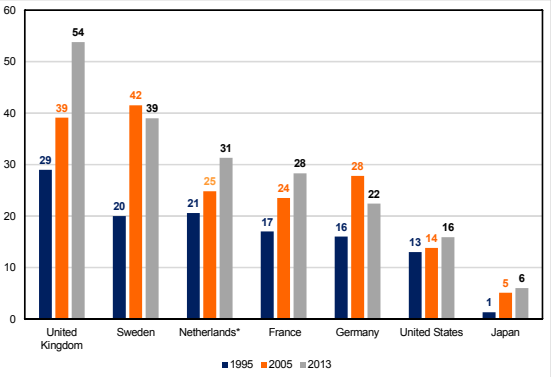
Chart 2: Share of intramural BERD financed from abroad in total host-country intramural BERD between 1994 and 2013 (%)



Sources: OECD, MSTI, DG Trésor calculations.

Intramural BERD of foreign affiliates has grown significantly worldwide, reflecting faster internationalisation. Between 1995 and 2013 the share of intramural BERD of foreign affiliates increased by 25 pts in the United Kingdom, 6 pts in Germany and 11 pts in France (Chart 3).

Chart 3: Share of intramural BERD of foreign affiliates in total host-country intramural BERD in 1995, 2005 and 2013 (%)



Sources: OECD, MSTI, DG Trésor calculations.

In the European Union (EU), foreign affiliates conducting R&D are often European firms. Eurostat data on manufacturing[2] show that for a European country, intramural BERD of EU affiliates is nearly 50% of total intramural BERD of foreign affiliates (46% in 2011 for the United Kingdom, 45% for Germany in 2013). In 2013 the figure is as high as 75% in France.

1.2.2 Advanced-economy participation in R&D internationalisation was broadly stable between 2007 and 2014

Greenfield FDIs for R&D, design and engineering projects in advanced economies have been stable since 2007. Data from fDi Markets show that the total number of these FDI projects originating from the EU and the United States (US) was relatively stable between 2007 and 2014, with an annual average of 196 for the US and 113 for the EU. The amount invested per project also stabilised at some €24 million for the EU and €25 million for the US. This levelling-off can also be seen in the total number of FDI projects (whether for R&D or not), which amounted to an annual average of 6,071 for the US and 7,827 for the EU, encompassing all types of investments. Nonetheless, it is impossible to determine whether the trend is due to structural or cyclical factors.

1.2.3 The BRICS have benefited the most from R&D FDIs, but the EU has a much balanced FDI account than the US in terms of R&D flows

The 2013 *EU Industrial R&D Investment Scoreboard* analyses greenfield FDIs[3] to determine how the world's top 1,500 companies in terms of R&D investment locate and reorganise their industrial R&D globally. Intra-EU flows are excluded.

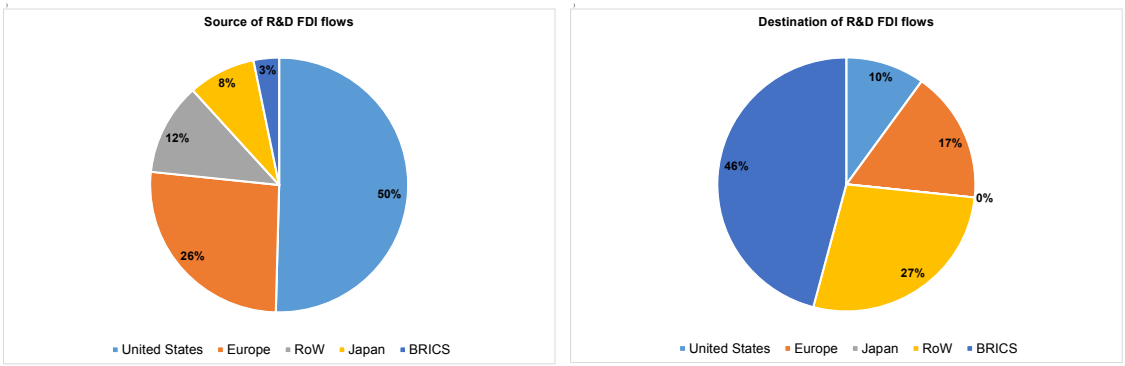
The BRICS and the EU emerge as the most attractive regions for R&D FDIs. The majority of R&D projects are aimed at the BRICS, which account for 46% of total capital investment, and at the EU, which attracts 17%. Furthermore the US, the EU and Japan are the main originators of R&D projects (Charts 4).

Comparing R&D inflows and outflows, figures show that the EU has a most balanced account than the US between 2003 and 2012, with outflows slightly higher than inflows. The marked difference between the two regions does not show up in total all-sector FDIs, and both show an imbalance in favour of outflows (more than 10% of net outflows by number of projects).

By contrast, net flows of R&D FDIs for the BRICS are positive, with 43% of net investment inflows. To some extent, this may be because these countries rely more heavily on foreign capital for their R&D projects, and not only because they are attractive destinations for setting up R&D centres.

(2) EU Foreign Affiliate Statistics (FATS) data for 2011 and 2013.
(3) Investment data are sourced from fDi Markets; no details are given about how these data may have been processed or restated.

Chart 4: Inflows and outflows of FDIs in R&D by region between 2003 and 2012 (% of total world investment)



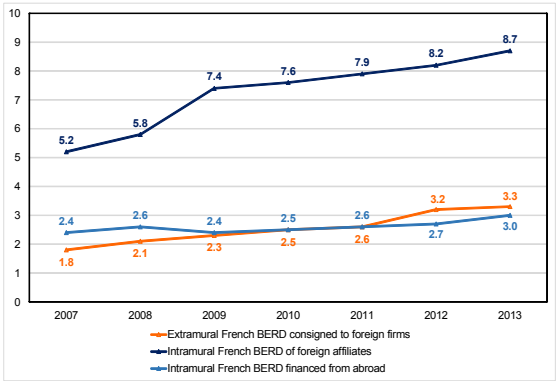
Rest-of-the-world ("RoW") includes, inter alia, the Asian Tigers, South Asia and Latin America.

Source: The 2013 EU Industrial R&D Investment Scoreboard.

1.3 France plays an active part in R&D internationalisation and hosts R&D activities of foreign firms

Patterns of intramural BERD of foreign affiliates based in France are a telling indicator of internationalisation. Since 2007 these expenditures have grown by 9% on annual average (Chart 5); in 2013 they accounted for 28% of total intramural BERD. This may mean that France has become a more attractive destination for foreign firms' R&D[4]. The foreign affiliates conducting the most R&D in France are from the EU (74% of foreign affiliates intramural BERD), and from the US (16%).

Chart 5: Extramural BERD consigned to foreign firms, intramural BERD of foreign affiliates, intramural BERD financed from abroad in France (€ billion)



Source: R&D survey, DG Trésor calculations.

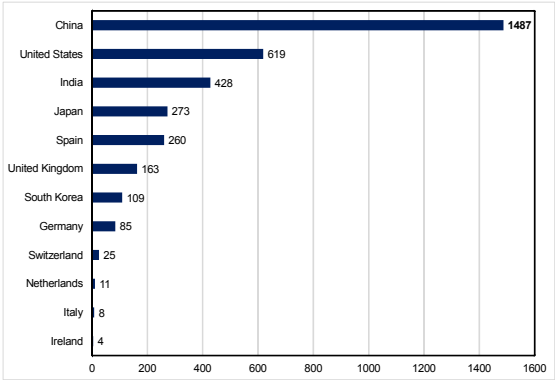
The R&D survey looked at 11,000 legal entities conducting intramural R&D activities in France. Firms under dual French and foreign ownership are considered affiliates of a French group if the French holding exceeds 50%. Firms which declare belonging only to a foreign group are considered affiliates of that group, regardless of the level of ownership. The firm has the same nationality as the majority shareholder.

Moreover, the number of R&D centres set up in France has increased constantly, from an annual average of 25 between 2004 and 2008 to 53 between 2009 and 2015 (Chart 1). These investments created 1,491 jobs in 2015. The largest foreign investors are the EU (which accounts for 43% of foreign investments, with Italy and Germany as the biggest contributors), followed by the US, Canada and Switzerland, which respectively originated 24%, 9% and 8% of foreign investments in R&D activities in France in 2015.

1.4 French companies also locate some of their R&D activities abroad

Extramural BERD consigned to foreign firms jumped from €1.8 billion to €3.3 billion between 2007 and 2013. This R&D was offshored mainly to other EU countries, which accounted for 56% of foreign-consigned R&D spending (amounting to €1.8 billion in 2013)[5].

Chart 6: French greenfield investments in creating new R&D centres abroad between 2007 and 2014 (€ billion)



Source: fDi Markets, DG Trésor calculations.

fDi Markets is a database that tracks investment flows published in the press, broken down by function, particularly R&D, engineering and design centres. It has several drawbacks, particularly as regards R&D investments, which may be strategic and are not always disclosed to the media. fDi Markets is based on the Financial Times newspaper, which provides excellent coverage of the English-speaking countries but can be less exhaustive for other countries.

Between 2007 and 2014 French companies set up a total of 130 R&D, design and engineering centres outside France, chiefly in Asia (China, Japan, India) and in the US (Chart 6), investing a total of €3.5 billion. However, these data cannot be compared directly with Business France data on the formation of R&D centres in France[6].

(4) However, this indicator is sensitive to the relocation abroad of corporate headquarters which were previously based in France.

(5) The R&D survey does not give more precise data on the destination country.

(6) On the issue of creating R&D centres in France, there are substantial differences between the data from Business France (556 R&D, design and engineering centres created between 2007 and 2014) and that from fDi Markets (125 centres). Furthermore, since the quality of coverage of fDi Markets data varies depending on the country, inflows and outflows for establishing R&D centres in France are not directly comparable.

2. What are the challenges of R&D internationalisation for France?

2.1 International development of R&D activities spans a wide range of business strategies

The economic literature offers three main explanations for internationalisation of business R&D (Dunning, 2000[7]):

- efficiency seeking: firms endeavour to base R&D activities in countries with the most favourable cost/benefit ratios, i.e. where researchers' productivity-adjusted wages are the lowest;
- market seeking: firms aim to establish a sales presence in new markets and sell their innovations by matching local needs. To sell a product, it is often necessary to tailor the underlying technology to the native environment or preferences (Pearce & Papanastassiou, 1999[8]). Since setting up an R&D infrastructure entails high fixed costs, there is less incentive to choose a country with an underdeveloped market;
- knowledge seeking: firms try to acquire new knowledge or skills that are not available on their domestic market.

This list is not exhaustive, since other non R&D-related factors such as the global presence of a multinational enterprise (MNE) may also be considered.

2.2 The factors determining the location of a firm's R&D activities are strategy-dependent

Empirical research shows that each of the above strategies involves a specific choice of geographical location that is determined by countries' comparative advantages in terms of R&D.

Von Zedtwitz and Gassmann (2002)[9] conducted a survey and interviews to identify the R&D location rationales of 81 MNEs with 1,021 research units. They conclude that the location determinants differ significantly depending on whether firms pursue market-seeking or knowledge-seeking strategies. For market seekers, choice of location is determined by demand-side factors like market size and sales potential, as well as by the logistical advantages that encourage local development, including proximity to customers and suppliers. For knowledge seekers, the choice is governed mainly by the excellence of the research ecosystem and the availability of highly skilled labour.

More recently, Hollenstein (2009)[10] used panel data from Swiss MNEs to identify a more detailed typology of their R&D internationalisation strategies and the related location determinants (Table 1). In addition to market-seeking and knowledge-seeking strategies, the author identifies an efficiency-seeking strategy based on optimising R&D by choosing locations in low-cost countries with an ample supply of specialised staff.

These various strategies also apply to different types of R&D. According to Von Zedtwitz and Gassmann (2002), companies have an incentive to locate fundamental upstream activities, especially basic and applied research[11], in countries with an ecosystem offering skilled labour and generating externalities such as top-flight universities, innovation centres and clusters. In doing so, they are following a knowledge-seeking strategy. By contrast, they locate the downstream phases of their business (a part of their experimental development activities[12]) primarily in areas with the most business opportunities, in accordance with a market-seeking strategy.

It is important to note that empirical research, whether based on econometric studies or on surveys, suggests that cost-related factors like labour costs and public support for R&D are a secondary consideration when choosing where to locate R&D. For example, only 16% of the Swiss firms surveyed by Hollenstein (2009) consider cost-related issues to be a "highly important" determinant for R&D location (Table 1), while a recent OECD study[13] on 5,000 R&D FDI flows between 2003 and 2011 suggests that cost factors matter mainly when MNEs are hesitating between different destinations with similar non-cost conditions for firm location.

Moreover, not all scientific fields are impacted to the same extent by R&D internationalisation. As Le Bas and Sierra (2002)[14] point out, some sectors are more open than others to internationalisation since the difficulty of codifying knowledge – notably cognitive skills and some abstract concepts – can hinder its transfer from one country to another.

(7) Dunning J. H. (2000), "The eclectic paradigm as an envelope for economic and business theories of MNE activity", *International Business Review*, 9(2), 163-190.

(8) Pearce R. & Papanastassiou M. (1999), "Overseas R&D and the strategic evolution of MNEs: Evidence from laboratories in the UK", *Research Policy*, 28(1), 23-41.

(9) Von Zedtwitz M. & Gassmann O. (2002), "Market versus technology drive in R&D internationalization: Four different patterns of managing research and development", *Research Policy*, 31(4), 569-588.

(10) Hollenstein H. (2009), "Characteristics of foreign R&D strategies of Swiss firms: Implications for policy", In T*he New Economics of Technology Policy*, D. Foray eds., Ch. 19.

(11) According to the Frascati Manual, basic research includes experimental or theoretical research work undertaken mainly to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. Applied research is original investigation undertaken in order to acquire new knowledge and directed primarily towards a specific, practical aim or objective.

(12) The Frascati Manual defines experimental development as systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.

(13) Belderbos R., Sleuwaegen L., Somers D. & De Backer K. (2016), "Where to Locate Innovative Activities in Global Value Chains: Does Co-location Matter?", OECD Science, *Technology and Industry Policy Papers*, No. 30, OECD Publishing, Paris.

(14) Le Bas C. & Sierra C. (2002), "Location versus home country advantages in R&D activities: Some further results on multinationals' locational strategies", *Research Policy*, 31(4), 589-609.

Table 1: Motives for performing R&D at foreign locations by type of R&D strategy (percentage share of firms assessing specific motive as highly important)

	R&D strategies				All firms (N=156)
	Knowledge-seeking		Market-seeking	Efficiency-seeking	
	Knowledge acquisition strategy focused on the public research (N=39)	Knowledge acquisition strategy focused on the private sector (N=37)	Market seeking strategy (N=56)	R&D cost optimisation strategy (N=24)	
Supporting local production/sales	26	30	**61**	29	40
Geographic proximity to leading universities	**67**	5	21	0	26
Geographic proximity to highly innovative firms (networks)	44	**59**	16	29	35
Transfer of knowledge and technology to the domestic headquarter	28	**59**	13	0	26
Ample supply of R&D personnel	**64**	30	11	**71**	38
Low R&D costs	38	10	4	**79**	16
High government support for R&D	26	0	9	13	12

Source: Hollenstein (2009).

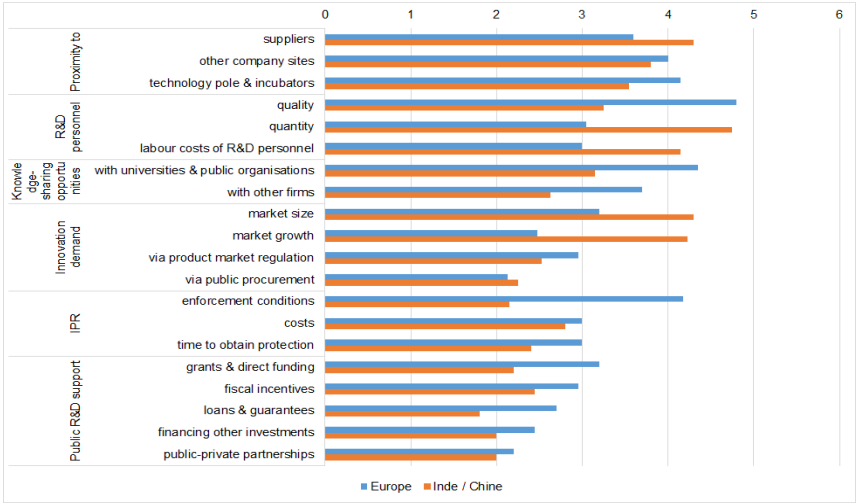
Note: N is the number of companies surveyed.
Key takeaway: 61% of firms with a market-seeking R&D strategy consider that supporting local sales/production is a highly important motive in their R&D location strategy.

2.3 Advanced and emerging economies have different advantages and ought to attract different types of R&D activities

According to a European Commission study[15] on a sample of 172 European MNEs, the comparative advantages for R&D in the EU in general, and in France in particular, are significantly different from those in emerging countries. Decisions to locate R&D in emerging countries are probably motivated by cost factors and market-seeking concerns whereas in advanced economies, including France, the location driver is knowledge-seeking: firms endeavour to take advantage of excellent research, intellectual property protection, opportunities for cooperation with public universities and clusters. Which means that market seeking is less important. This situation can mitigate the risk that French-based R&D activities will be offshored to emerging countries.

That finding is corroborated by comparing the R&D attractiveness factors for a subset of 11 industrial firms having R&D activities both in Europe and in India and/or China (Chart 7).

Chart 7: Attractiveness of European countries versus China and India for R&D location



Note: The statistics are based on a sample of 11 companies with R&D activities in China or India, and in Europe (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Netherlands, Poland, Portugal, Sweden, Slovenia, Spain, United Kingdom).
The question is phrased: "How attractive are these two countries in terms of the following factors? Please rate on a scale from 1 (low very attractiveness) to 5 (very high attractiveness) and leave not-applicable factors blank".

Source: European Commission (2013).

Econometric studies into the effects of R&D internationalisation seem to confirm the complementarity between R&D activities carried out in emerging economies and in developed countries. D'Agostino *et al.* (2013)[16] took a sample of 221 regions from 21 OECD countries and examined the offshoring of R&D activities to six emerging economies (Brazil, Russia, India, China, Singapore and Taiwan). The authors show that R&D activities in emerging countries are targeted on sectors with low-to-medium technology content whereas those in developed countries focus on high-tech sectors. This suggests complementarity in the international organisation of R&D. As in the case with global trade in goods and services, microeco-

(15) European Commission (2013), "The 2013 EU Survey on Industrial R&D Investment Trends", JRC-IPTS.
(16) D'Agostino L. M., Laursen K. & Santangelo G. D. (2013), "The impact of R&D offshoring on the home knowledge production of OECD investing regions", *Journal of Economic Geography*, 13(1), 145-175.

nomic studies tend to show that countries benefit from internationalising their R&D if the activities carried out abroad complement home R&D activities and if the intensity of these domestic activities is sufficient to ensure that firms can appropriate and disseminate the results obtained abroad (Box 1).

Box 1: Economic literature review on the benefits of R&D internationalisation

The classical theory of international trade describes the gains accruing to countries that specialise in producing goods for which they have comparative advantages, resulting in more efficient production at global level and in each country. That analysis can be extended to R&D. As with trade, countries theoretically benefit from concentrating on R&D activities in which they have a comparative advantage and, as a quid pro quo, importing other R&D assets. Furthermore, R&D internationalisation can encourage the spread of R&D externalities and limit the risk of duplication in knowledge production.

In the economic literature, the effects of R&D internationalisation are measured both by the repercussions of R&D investments abroad on the home country and by the consequences for beneficiary countries. In the latter case, the effects are broadly positive and direct, since R&D investments increase the beneficiaries' knowledge stock and hence their productivity. The effects for the home country are indirect and harder to ascertain because there are uncertainties about whether firms are able to repatriate and appropriate foreign-produced knowledge and also about the degree of substitutability between R&D activities based abroad and those at home.

Empirical research suggests that R&D activities are generally beneficial, though the magnitude of potential gains is still unclear. At the macroeconomic level, Coe *et al.* (2009)[a] have analysed the effects of foreign R&D capital stock (measured by the average of trading partners' R&D capital stocks weighted by trade intensity) on total factor productivity for a sample of 22 countries for the 1974-2004 time period. Their results show that the foreign R&D capital stock has a positive impact on domestic productivity; and that the impact increases in line with the country's degree of trade openness[b] since the experience gained through trading and exposure to foreign products lowers the cost of repatriating foreign technology. The authors also find that technology spillovers increased sharply for most OECD countries during the 1980s. Castellani and Pieri (2013)[c] examined sectoral flows of R&D in FDI from 262 European regions to countries worldwide; they found that the number of MNEs' R&D projects located abroad increases, ceteris paribus, with home region productivity, regardless of the destination of FDIs (with the exception of India).

Microeconomic studies tend to show that the gains derived from internationalisation depend heavily on the conditions in which R&D investments are made, notably the technology gap between the home and host countries and the type of R&D activities in question. Belderbos *et al.* (2014)[d] demonstrate that the returns to the home country from R&D activities located abroad can exceed those from domestic R&D, on two conditions. First, the foreign-based activities must complement those in the home country[e]. Second, it is vitally important to maintain sufficient R&D intensity at local level so that the results from foreign-based R&D can be appropriated and disseminated. Shimizutani and Todo (2008)[f] show that R&D activities located abroad do not have a significantly positive impact on the domestic company's productivity unless the purpose of foreign location is to acquire new knowledge. By contrast, foreign presence has no impact if the aim is to adapt a product to local conditions[g]. Nieto and Rodriguez (2011)[h] examine how offshoring R&D activities can affect innovation. Observing a panel of Spanish companies between 2004 and 2007, they find that when R&D investments are made internally by setting up a subsidiary, they have a greater impact on domestic innovation than they do if the R&D work is outsourced to a foreign company. The authors put these differences down to lower monitoring costs and higher appropriation costs in the latter case.

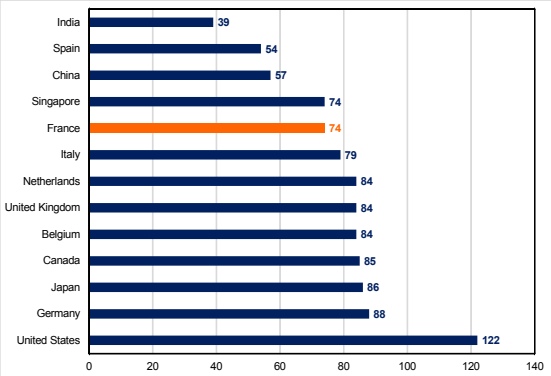
a. Coe D. T., Helpman E. & Hoffmaister A. W (2009), "International R&D spillovers and institutions", *European Economic Review*, 53(7), 723-741.
b. Voir aussi Lichtenberg F. R. & Van Pottelsberghe de la Potterie B. (1998), "International R&D spillovers: A comment", *European Economic Review*, 42(8), 1483-1491.
c. Castellani D. & Pieri F. (2013), "R&D offshoring and the productivity growth of European regions", *Research Policy*, 42(9), 1581-1594.
d. Belderbos R., Lykogianni E. & Veugelers R. (2008), "Strategic R&D location by multinational firms: Spillovers, technology sourcing, and competition", *Journal of Economics & Management Strategy*, 17(3), 759-779.
e. Foreign-acquired knowledge is supposed to swell the stock of home country knowledge. The returns to R&D located abroad increase if the country to which the activities are relocated has a higher level of technological research than the home country.
f. Shimizutani S. & Todo Y (2008), "What determines overseas R&D activities? The case of Japanese multinational firms", *Research Policy*, 37(3), 530-544.
g. Arvanitis and Hollenstein (2011) highlight a similar effect in their paper "How do different drivers of R&D investment in foreign locations affect domestic firm performance? An analysis based on Swiss panel micro data", *Industrial and Corporate Change*, 20(2), 605-640.
h. Nieto M. J. & Rodriguez A. (2011), "Offshoring of R&D: Looking abroad to improve innovation performance", *Journal of International Business Studies*, 42(3), 345-361.

2.4 France can become even more attractive for R&D activities

Adopting a similar approach to the one used to compare the attractiveness of Europe with China and India, the European Commission compared the attractiveness and location determinants of R&D centres in eight European countries. Finland emerges as the most attractive of these countries, followed by Germany. France ranks third, ahead of the United Kingdom and Sweden. The respondent companies said that European countries' R&D attractiveness depends mainly on the quality of research staff and the opportunities for collaborating with universities and public laboratories. Another important factor is the presence of clusters.

France and Spain stand out from other European countries in that the main attractiveness factor cited by respondents is the existence of public measures to support R&D. In France, the R&D fiscal incentives (chiefly the research tax credit "CIR") and subsidies reduce the average cost of a researcher by 25%, among the lowest in developed economies according to the French National Association for Research and Technology ANRT (Chart 8). However, these cost metrics do not take into account the productivity gap between researchers in different countries, even though this gap is probably narrow with in countries such as France, Germany, the United Kingdom, the US and Japan.

Chart 8: Average researcher cost in 2015 after incentives



Source: ANRT.

Note: 100 = Cost of a researcher in France without research tax credit (CIR) or subsidies.

Moreover, in all the European countries under consideration, few of the respondent companies mention buoyant demand as an attractiveness factor for setting up an R&D centre; France is no exception.

Although requiring cautious interpretation, these results suggest that France could make itself a more attractive R&D destination, provided it plays to its comparative advantages.

Accordingly, France should seek to attract knowledge-seeking R&D, rather than market-seeking or efficiency-seeking activities, since it is unable to compete with emerging economies as regards R&D costs and potential growth in domestic demand.

France must therefore focus on the quality of its innovation ecosystem instead of on cost factors. It should underline the excellence of its public research, the presence of world-level clusters, the efficiency of public research transfer mechanisms and, more generally, the availability of high-level skills. If France wants to bring in more foreign R&D centres, then public policies for R&D must be targeted first and foremost on these aspects of innovation policy. This strategy is reflected in the clusters "*Pôles de compétitivité*" set up during the past decade and in the steady focus on excellence – notably through the PIA – in higher education, research, innovation and public research transfer. On a broader level, France's R&D attractiveness has been enhanced by a series of measures to facilitate the entry of foreign researchers (notably the "talent passport" system introduced in 2016), improve the innovation ecosystem, notably by speeding up the "simplification shock" programme, and bolster the protection of intellectual property. From this perspective, cutting the cost of researchers even further would probably be ineffective in attracting more R&D centres. This is not a key determinant when selecting a location for R&D units specialised in producing new knowledge (see above). Moreover, compared with other European countries and the United States, France is already competitive in this regard thanks to the research tax credit (Chart 8)[17].

Marie-Anne LAVERGNE, Killian LEMOINE

(17) This does not cast doubt on the efficiency of the CIR because this tax credit is not intended to attract foreign R&D activities but primarily to subsidise positive research externalities and to make up for firms' underinvestment in the resulting R&D activities (see Cahu P., Demmou L. and Massé E. (2009), "The economic impact of the 2008 research tax credit reform" (*Crédit d'Impôt Recherche*), *Trésor-Economics* No. 50).

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Direction Générale du Trésor
139, rue de Bercy
75575 Paris CEDEX 12

Publication manager:
Michel Houdebine

Editor in chief:
Jean-Philippe Vincent
+33 (0)1 44 87 18 51
tresor-eco@dgtresor.gouv.fr

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