

## SIGNIFICANT BUSINESS R&D GROWTH IN 2016

### In This Issue

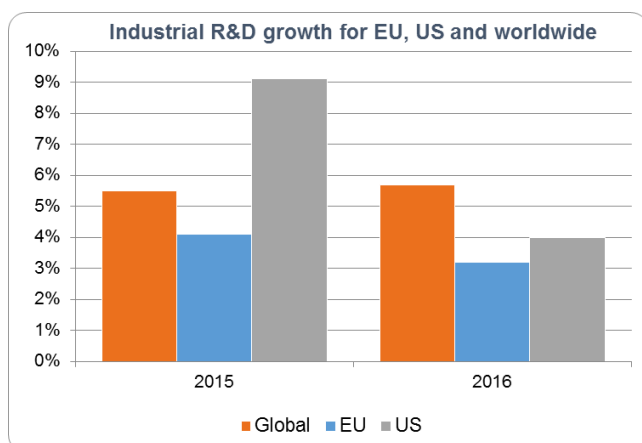
- This document shows first estimates on territorial R&D funded by the business sector, based on recent R&D and patent data from a representative sample of worldwide companies from the EU R&D Scoreboard (see the Annex).
- R&D funded by the business sector increased in the EU by 3.2%, below the 5.7% global rate and the US R&D growth (4%).
- As in the previous year, the worldwide growth of industrial R&D in 2016 was driven by ICT related industries
- Among the three EU largest countries in term of industrial R&D investment, Germany showed higher growth rates than France and the UK. However, only France recorded a better performance for 2016 compared to the previous year.

### 1. Worldwide industrial R&D grows in 2016

The global R&D funded by the business sector increased by 5.7% in 2016 to €839bn, scoring a performance slightly higher than that of the previous year (5.5%).

In the EU, the industrial R&D grew at lower rate, 3.2% to €170bn; this represents a slowdown compared to the performance recorded in 2015 (4.1%).

The industrial R&D in the US increased by 4% to €336bn, also slowing down significantly the R&D investment growth rate of 2015 (9.1%)



### 2. Growth driven by increases in ICT industries

As in the previous year, the worldwide growth of industrial R&D in 2016 was driven by ICT related industries; in particular by ICT services (8.6%), but also ICT producers (5.0%), see table 1 on the next page.

The EU shows a particularly good performance in ICT producers industries where the industrial R&D increased at the significant rate of 11.4%, while in the ICT services the EU shows similar performances than the US (7.6%).

Investment in R&D continued to grow in Automobiles and related industries (4.1%), but at a lower pace than that of ICT industries. The EU strengthened its position in Automobiles industries where R&D grew by 7.1%, a rate higher also than that for the US (5.7%).

R&D in Health related industries increased moderately in 2016 (3.7%). In these industries the EU scored lower R&D investment performances (3%) compared both to the global figure (3.7%) and the US one (3.9%).

Global R&D in Aerospace & Defence industries increased at the same pace of that in Health related

Industrial Sector	Global (%)	EU (%)	US (%)
ICT services	8.6	7.6	7.4
ICT producers	5.0	11.6	7.8
Automobiles	4.1	7.1	5.7
Health industries	3.7	3.0	3.9
Aerospace & Defence	3.7	-6.5	13.4
Industrials	2.1	-3.2	6.8
Chemicals	-2.9	-1.4	-5.4
Others	9.2	5.9	-6.1

**Table 1:** Industrial R&D annual growth in 2016 for the EU, the US and worldwide

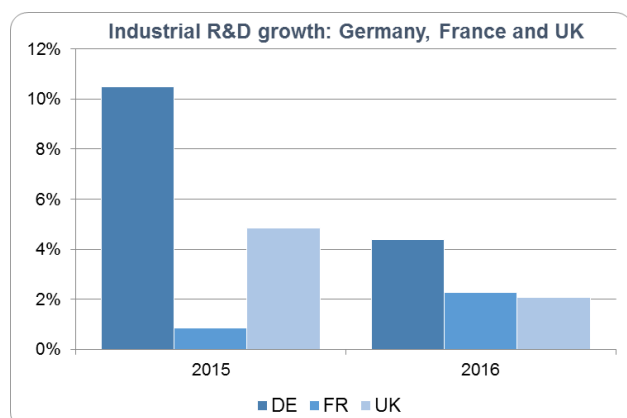
industries (3.7%); however showing a strong contrast by world region: the EU recorded a significant decrease in R&D investment (-6.5%) while the US showed an outstanding performance (13.4%).

This result is particularly worrying for the EU considering the importance of this sector in the recent "White paper on the future of Europe".

### 3. The top 3 EU countries show mixed R&D performance

Among the three EU largest countries in term of industrial R&D investment, Germany showed higher growth rates than France and the UK, however, only France recorded a better performance for 2016 compared to the previous year.

In particular, in Germany, industry R&D grew by 4.4% to about €73bn, but recording a growth performance much lower than that of 2015 (10.5%).



Also in UK the pace of growth of industrial R&D investment slowed down from 4.8% in 2015 to 2.1% in 2016.

In France industry R&D investment grew in 2016 by 2.3% to €28bn, more than double of the R&D grow recorded in the previous year.

Also looking at industrial specific performances, large differences among these countries arises. The growth of investment in R&D for 2016 in Automobiles and related industries was particularly high for France (8.5%) and good for Germany (6.3%), while UK experienced a drop in R&D investment in this sector (-4.3%).

On the other hand, the UK shows a countertrend in Aerospace and defence compared with the EU and the other two main R&D players. In the former country, R&D investments increased by 5%, while they decreased by 3.1% in France and by 8.2% in Germany.

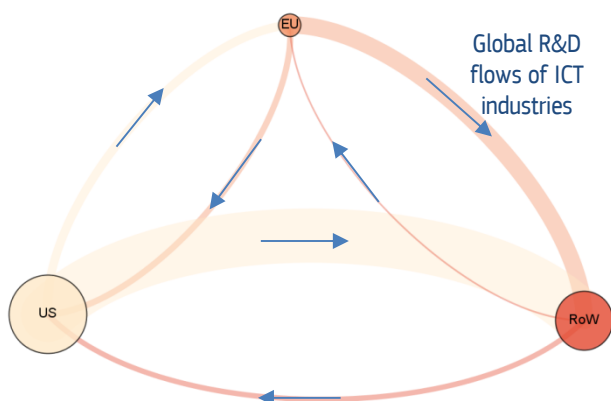
In ICT related industries, the UK performs particularly well in ICT producers industries, scoring a 15.4% increase in R&D investments (7.7% for Germany and 5.3% for France), while Germany outperforms its EU counterparts in ICT services with a growth rate of 10.9% (7.1% and 7% for France and UK, respectively).

Finally, France experienced a very high increase in R&D investments in Chemical industries (10.9%); a

figure opposite to the negative performance of this industry on the global scale (see table 1).

## 4. Cross-border R&D investment

As shown in the 2016 edition of the [EU R&D Scoreboard](#) top companies invest about three quarters of their R&D in the same economic area where the headquarters are located, although with a high degree of heterogeneity across industrial sectors and countries.



The R&D investment performed in the EU by ICT industries is much smaller than that in the US (€35bn versus €98bn), however most of R&D activities (€128bn) of this sector are performed in other countries (RoW).

This is mainly due to the particularly large R&D investments flowing from the US towards the rest of the world (fat line in the middle of the chart).

Indeed, a large R&D share of US and EU headquartered companies is performed abroad (39% and 44% respectively), with about one third flowing towards other economies.

Analysing differences in R&D internationalisation across different industries represent an important prerequisite for designing effective policy and anticipating its effects.

## Annex - Data sources and methodology

The 2016 estimates of R&D funded by the business sector are obtained correlating past territorial business R&D expenditures (BERD: latest BERD figures provided by Eurostat and OECD databases - June 2017) with R&D data from a representative sample of companies comprised in

the [EU R&D Scoreboard](http://iri.jrc.ec.europa.eu/scoreboard.html) (<http://iri.jrc.ec.europa.eu/scoreboard.html>).

Company data applied, corresponding to the latest (2016) fiscal year, cover worldwide industrial R&D expenditures and main innovative industries, focusing on manufacturing and knowledge intensive services.

The main characteristics of the company data grouped by region/country and by industry are presented in tables A1, A2 and A3.

The correlation between BERD and company data is improved by using patent data to characterise the international location of R&D activities of parent companies and their subsidiaries (See JRC Report "Estimating territorial business R&D expenditures using corporate R&D and patent data" (<http://iri.jrc.ec.europa.eu/other-reports.html>)).

An estimation of the average cost of each patented technology in terms of R&D improves the allocation of companies' R&D investments across countries.

	EU	US	Japan	Other	Total
Number of companies	346	104	44	72	566
R&D in 2016 (€bn)	170.4	213.5	71.3	98.5	553.7
World R&D share in 2015 (%)	23.0	29.1	10.5	13.3	75.9
Region R&D share in 2015 (%)	85.0	75.5	73.2	66.4	

**Table A1:** Sample of top R&D companies extracted from the EU R&D Scoreboard dataset.

	Germany	France	UK
Number of companies	78	56	80
R&D in 2016 (€bn)	63.7	24.5	23.0
Country R&D share in 2015 (%)	90.9	86.0	82.3

**Table A2:** Breakdown of the sample of companies for top EU countries

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Industrial Sector	Sector classification ICB 3&4 digits	R&D in 2016 (€bn)	World R&D share within industry in 2015 (%)	EU's R&D share in 2015 (%)
ICT producers	Computer Hardware; Electronic Office Equipment; Semiconductors; Telecommunications Equipment; Electronic & Electrical Equipment	134.6	74.3	15.5
Health industries	Pharmaceuticals; Health-biotechnology; Health care equipment & services	125.9	79.3	22.0
ICT services	Computer Services; Internet; Software & Computer Services; Fixed Line Telecommunications; Mobile Telecommunications	64.2	74.8	7.2
Automobiles & other transport	Automobiles; Auto Parts; Commercial vehicles	114.4	90.8	28.4
Industrials	General Industrials; Industrial Engineering, Industrial Metals & Mining, Industrial Transportation	33.0	56.5	9.0
Aerospace & Defence	Aerospace; Defence	19.3	88.6	5.2
Chemicals	Chemicals	16.5	72.8	2.8
Other	Leisure Goods; Oil & Gas Producers; Banks and Financial Services; Construction & Materials; Food producers; etc.	45.8	60.9	9.9

**Table A3:** Industrial classification for the sample of companies extracted from the EU R&D Scoreboard dataset

**Note:** This is a reduced version of the ICB classification applied in the EU R&D Scoreboard.

For companies outside the Euro area, all currency amounts have been translated at the Euro exchange rates ruling at 31 December 2016 (see main currencies in Table A4).

Country	ISO code	unit/€
Australia	AUD	1.457
Brazil	BRL	3.435
Switzerland	CHF	1.073
China	CNY	7.326
Denmark	DKK	7.434
UK	GBP	0.857
Hungary	HUF	309.6
India	INR	71.63
Japan	JPY	123.15
S. Korea	KRW	1265.8
Saudi Arabia	SAR	3.953
Sweden	SEK	9.552
Taiwan	TWD	34.04
US	USD	1.054

**Table A4:** Euro exchange rates applied to companies based in different currency areas (as of 31 Dec 2016).

## Disclaimer

The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission. The numbers presented are estimations based on the methodology described above and may therefore differ from those on territorial business R&D expenditures (BERD), which are produced by national statistical offices, Eurostat or the OECD.

## Acknowledgements

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## 3. Read more

More information, including activities and publications, is available at:

- <http://iri.jrc.ec.europa.eu/>
- <http://ec.europa.eu/research/>
- <https://ec.europa.eu/jrc>

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