

# EU's challenges in innovation based growth sectors

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# CHALLENGES

High expectations for innovation to bring us back to a sustainable growth path

*BUT*

**Europe has consistently failed to exploit its potential for innovation-based growth, despite a series of innovation policy strategies and targets**

## Some bits of evidence

- In the **Innovation Union Scoreboard**, the EU scores consistently behind the US. China is very quickly improving
  - [Latest numbers for 2015 from Eurostat on R&D intensity:](#)
    - The EU R&D intensity level remains unchanged at 2.04% of GDP (in 2014, it was 2.03%)
    - China (with 2.05% in 2014) overtook the EU in R&D intensity
- Europe's gap relative to the US holds across almost all components of innovation capacity (**systemic deficit**)
- On **science**, the EU has caught up in quantitative terms with the US. In quality terms, the EU is catching up, but only very slowly, and mainly thanks to small pockets of excellence in specific sub-fields. Europe still has few world class institutes that excel in multiple and broader fields.
- **Business R&D intensity** remains far below that in the US, South Korea and Japan and even China

## Challenges continued

- Under fiscal consolidation pressures, the post-crisis trend has been for less **public spending on R&D**.
  - This is the case especially in the weaker, innovation-lagging countries that were under fiscal pressure, resulting in an **increasing intra-EU divide in public R&D spending**.

# Diagnosing EU's innovation deficit

The nature of EU's industrial structure is a major reason for the persistent business R&D investment deficit/divide:

## a deficit in the capacity for creative destruction

- EU fails to specialize in innovation based growth sectors
- EU misses « yollies » in high-growth sectors

**Innovation Based Growth Sectors:** sectors which (i) have an R&D intensity above average, (ii) an R&D growth rate above average and/or (iii) an above average share of young companies among its leading innovators.

*aerospace, biotech, computer hardware&services, health care equipment & services, internet, pharmaceuticals, semiconductors, software, telecom equipment.*

**Yollies:** young companies who have made it into the R&D scoreboard of world leading innovators

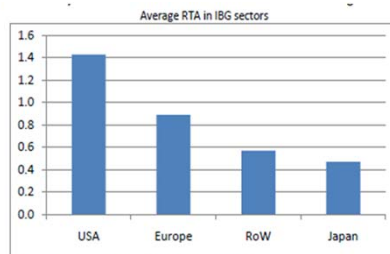
*Amazon, Google, Microsoft, Qualcomm, Amgen...*

# Europe's corporate R&D fails to specialize in innovation based growth sectors

## Specialisation in "Dynamic" Sectors

RTA indices

	EUR	US
<i>Aerospace &amp; defence</i>	1,5	1,13
<i>Biotechnology</i>	0,32	2,2
<i>Computer hardware &amp; Computer services</i>	0,08	1,39
<i>Health care equipment &amp; services</i>	0,7	1,86
<i>Internet</i>	0	2,54
<i>Pharmaceuticals</i>	1,27	1,16
<i>Semiconductors</i>	0,5	1,72
<i>Software</i>	0,51	2,05
<i>Telecommunications equipment</i>	1,38	1,09
<b>All IBG sectors</b>	<b>0.89</b>	<b>1.43</b>



Source: Bruegel and World Bank, on the basis of IPTS R&D Scoreboard data.

## Specialisation in "Classic" Sectors

RTA indices

Industrial machinery	1,84	0,24
Industrial metals	1	0,3
Electrical components & equipment	1,56	0,18
Fixed & Mobile telecommunications	1,53	0,2
Chemicals	1,31	0,64
Automobiles & parts	1,26	0,58

Note: RTA are calculated as the share of the region in total sectoral R&D relative to the share of the region in overall R&D. A RTA value higher than 1 reflects that the region is technology specialized in this sector. Japan and RoW are not reported because of too few observations when disaggregating to individual sectors. Innovation based growth sectors are bold and in italics.

Source: Bruegel and World Bank, on the basis of IPTS R&D Scoreboard data.

# EU less young firms among its leading innovators than US

## US

world rank	Name	Industrial sector (ICB-3D)	R&D 2013 (€million)	R&D 3 years growth (CAGR-3y, %)	R&D intensity (%)	Employees 2013	Employees 3-years growth (CAGR-3y, %)
3	MICROSOFT	Software & Computer Services	8252,5	8,0	13,1	128000	12,5
4	INTEL	Technology Hardware & Equipment	7694,1	17,3	20,1	107600	9,3
8	JOHNSON & JOHNSON	Pharmaceuticals & Biotechnology	5933,6	6,1	11,5	128100	4,0
9	GOOGLE	Software & Computer Services	5735,6	28,1	13,2	47756	25,1
11	GENERAL MOTORS	Automobiles & Parts	5220,8	1,1	4,6	219000	2,7
12	MERCK US	Pharmaceuticals & Biotechnology	5165,0	-6,2	16,2	76000	-6,8
15	PFIZER	Pharmaceuticals & Biotechnology	4750,2	-11,2	12,7	77700	-11,1
17	FORD MOTOR	Automobiles & Parts	4640,7	8,6	4,4	181000	3,3
18	CISCO SYSTEMS	Technology Hardware & Equipment	4563,8	2,6	13,4		
22	IBM	Software & Computer Services	4088,9	3,5	5,7	431212	0,3
23	ELI LILLY	Pharmaceuticals & Biotechnology	4010,8	4,2	23,9	37925	-0,4
24	ORACLE	Software & Computer Services	3735,0	4,5	13,5	122000	4,0
25	QUALCOMM	Technology Hardware & Equipment	3601,6	24,9	20,0	31000	21,0
31	GENERAL ELECTRIC	General Industrials	3444,3	4,8	3,3		
35	APPLE	Technology Hardware & Equipment	3244,9	35,9	2,6	80300	19,9
38	AMGEN	Pharmaceuticals & Biotechnology	2960,6	12,2	21,9	20000	4,8
40	BRISTOL-MYERS SQUIBB	Pharmaceuticals & Biotechnology	2705,4	1,6	22,8	28000	1,2
44	EMC	Technology Hardware & Equipment	2355,2	12,5	14,0	63900	9,6

## EU

1	VOLKSWAGEN	Automobiles & Parts	11743,0	23,3	6,0	572800	18,7
10	DAIMLER	Automobiles & Parts	5379,0	3,5	4,6	274616	1,8
13	BMW	Automobiles & Parts	4792,0	20,0	6,3	110351	5,0
14	SANOFI-AVENTIS	Pharmaceuticals & Biotechnology	4757,0	2,7	14,4	112128	3,3
16	ROBERT BOSCH	Automobiles & Parts	4653,0	6,8	10,1	279739	0,4
19	SIEMENS	Electronic & Electrical Equipment	4556,0	2,4	6,0	367000	-3,2
21	GLAXOSMITHKLINE	Pharmaceuticals & Biotechnology	4154,3	-2,5	13,1	99817	0,4
27	AIRBUS	Aerospace & Defence	3581,0	5,1	6,0	144061	5,8
28	ERICSSON	Technology Hardware & Equipment	3484,8	0,1	13,6	114340	8,2
29	NOKIA	Technology Hardware & Equipment	3456,0	-11,2	14,7	55244	-25,3
32	FIAT	Automobiles & Parts	3362,0	20,2	3,9	225587	4,1
34	BAYER	Pharmaceuticals & Biotechnology	3259,0	0,5	8,1	113200	0,5
37	ASTRAZENECA	Pharmaceuticals & Biotechnology	3202,8	0,9	17,2	51500	-5,5
39	BOEHRINGER INGELHEIM	Pharmaceuticals & Biotechnology	2743,0	3,8	19,5	47492	4,0
43	ALCATEL-LUCENT	Technology Hardware & Equipment	2374,0	-3,6	16,4	62311	-7,9
46	SAP *72	Software & Computer Services	2282,0	9,7	13,6	66572	7,6

Source: EC-IPTS R&D Scoreboard; Colored Firms are born after 1975

## Yollies and EU's Innovation deficit

	EU	US
Share of Yollies in number of region's leading innovators	23%	51%
Share of Yollies in region's leading R&D	7%	35%
R&D intensity of Yollies	4%	10%
R&D intensity of Ollies	3%	4%
Share of the region's Yollies in Innovation Based Growth Sectors	62%	84%
R&D intensity of Yollies in Innovation Based Growth Sectors	13.9%	12.6%

Sources: Authors' own calculations, the 2008 EU Industrial R&D Investment Scoreboard, EC, JRC/DG RTD

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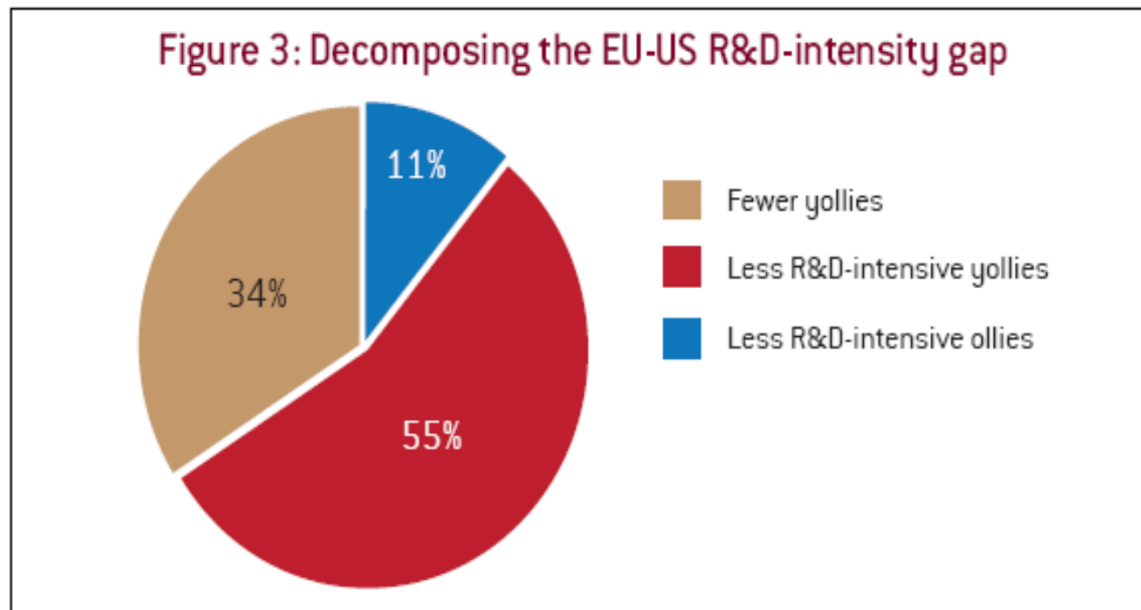
*aerospace, biotech, computer hardware&services, health care equipment & services, internet, pharmaceuticals, semiconductors, software, telecom equipment.*

**Yollies:** companies born since 1975 who have made it into the R&D scoreboard of world leading innovators

*Amazon, Google, Microsoft, Qualcomm, Amgen... LMS, Materialise*

## Missing Yollies matters critically for closing EU's R&D gap

The lower R&D intensity of EU Yollies is the largest factor responsible for the total EU-US R&D intensity gap



Sources: Bruegel/European Commission JRC-IPTS on the basis of the EU Industrial R&D Investment Scoreboard (European Commission, 2008).

# Why Europe is missing young innovators in innovation based growth sectors?

**A systemic problem:  
Lower returns from investing in innovation capacity  
Higher barriers to access resources for innovation**

- Risk-taking financial markets
- Higher (Re-)entry & exit costs
- Inflexible labour markets
- Segmented product markets
- Insufficient linking in “innovation system”
  - Industry science links
  - Large incumbents and small new entrants
  - Public Private partnerships
- Government policy
  - Funding
  - Regulation
- ...

- **Lower rates of return from Innovation**

- For every one euro invested in R&D, a US High Tech Yollie receives 20 cents in terms of additional generated output, c.p.
- For EU Yollies: 4 cents, non-significantly different from 0

Source: Cincera & Veugelers (2014); **Exploring Europe's R&D deficit relative to the US: differences in the rates of return to R&D of young leading R&D firms**, *Research Policy*



# The Policy Agenda

## WHAT WE NEED:

more focus on improving capacity for structural change through Schumpeterian creative destruction:  
*new leading firms (Yollies) in new markets;*

**Will the current emphasis on framework conditions**, -improving access to finance, improving access to skills, improving access to a large market and strengthening partnerships – although **necessary, be sufficient to address the specific barriers for development of new innovation based growth markets and firms** - access to *early risk* financing, access to *frontier science*, access to risk-taking *lead customers and complementary suppliers*, *specialized know-how and skills*?

**Evaluating/Monitoring –Evidence-on–Effects- in-Sectors” based policy approach**

**A close monitoring of emerging innovative markets**