Paper discussion

2nd IRIMA workshop:
Counting (and accounting) R&D and non-R&D intangibles, drivers of firm's innovation and growth
Brussels, 10 December 2013

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R&D from official statistics: trends and prospects

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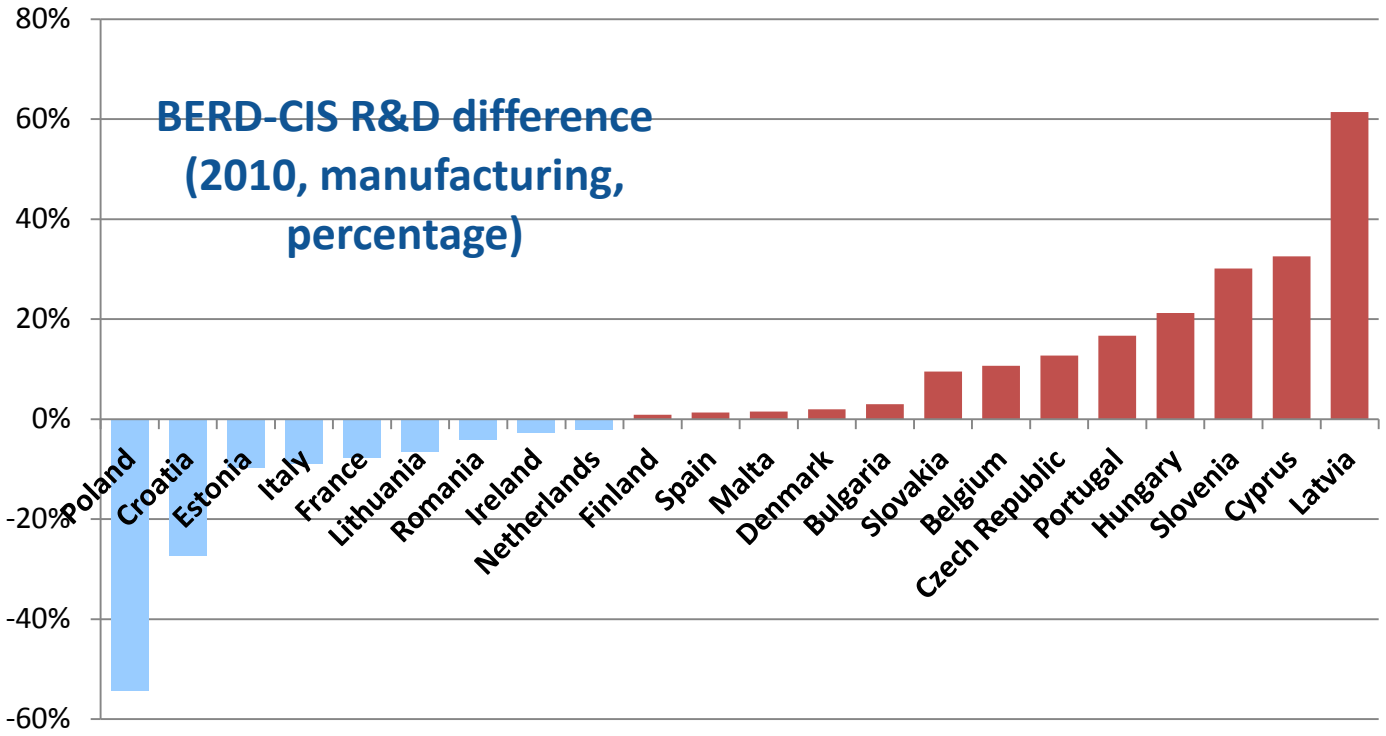
Italian National Statistics Institute

How do you explain the difference?

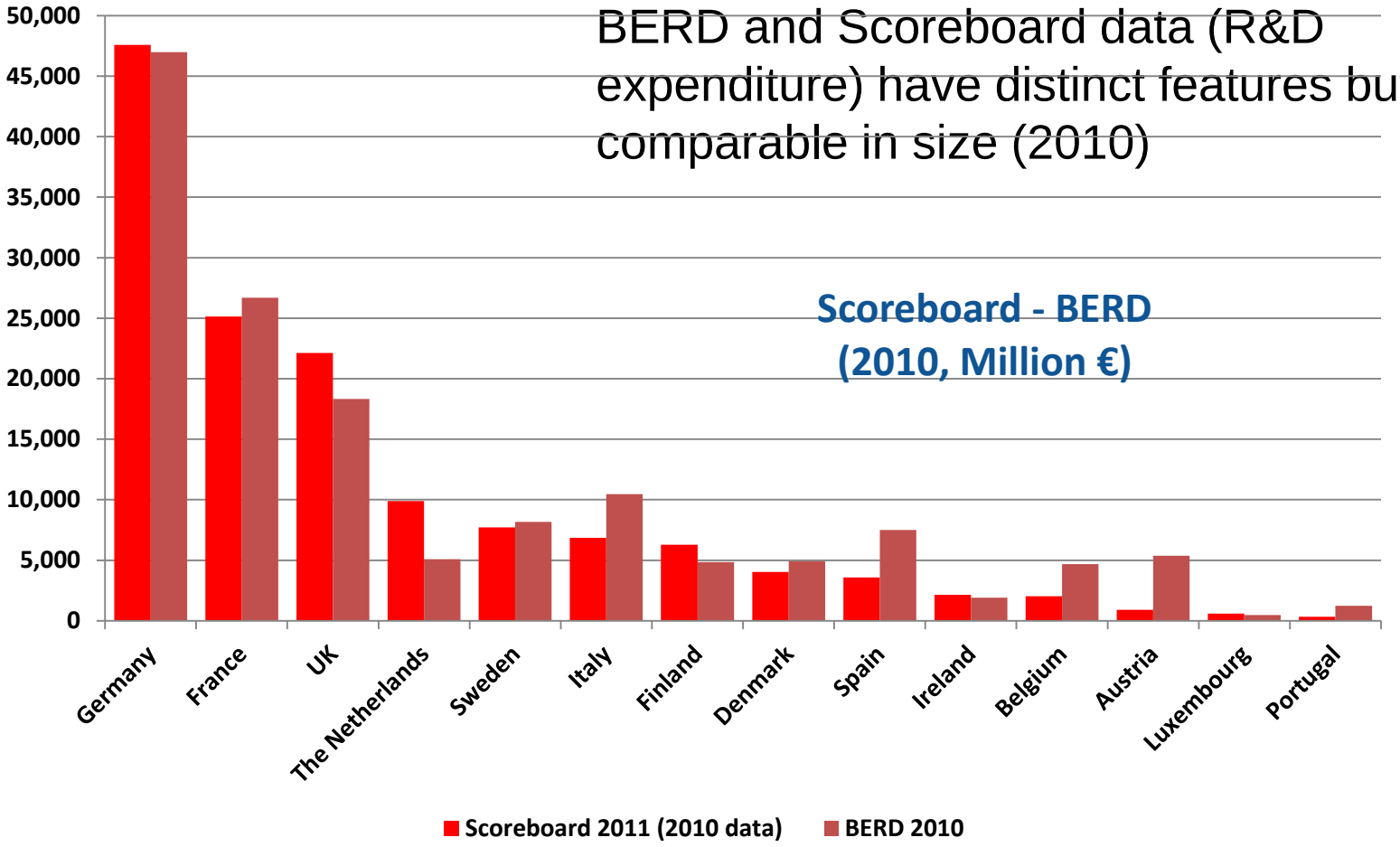
R&D statistics: sources

- **BERD** (Frascati), Annual, all NACE industries, no size threshold
- **CIS** (Oslo), selected NACE industries, 10 employees or more, sample



Does it mean that most of the R&D is performed in the home country of the MNE?

R&D statistics: sources



BERD and Scoreboard data (R&D expenditure) have distinct features but are comparable in size (2010)

Scoreboard - BERD (2010, Million €)

Less questions to increase response rate?

Re-engineering and synchronisation (3)

- Less methodological harmonisation («output», rather than «input» approach)
- Merging of surveys will be encouraged: SBS+R&D, CIS+R&D, multi-purpose surveys, etc..
- Adoption of the business registers as a legal requirement (no clear how to deal with public/non profit units).
- Statistical units: Enterprise as a rule, but «matching issues» with SBS (LUs) data or AFA/FATS (MNEs) data not yet settled.
- Less flexibility allows to use specific units / classifications.

Merging of R&D surveys with other surveys not recommended: why ?

Frascati Manual 7.0 (methodology)

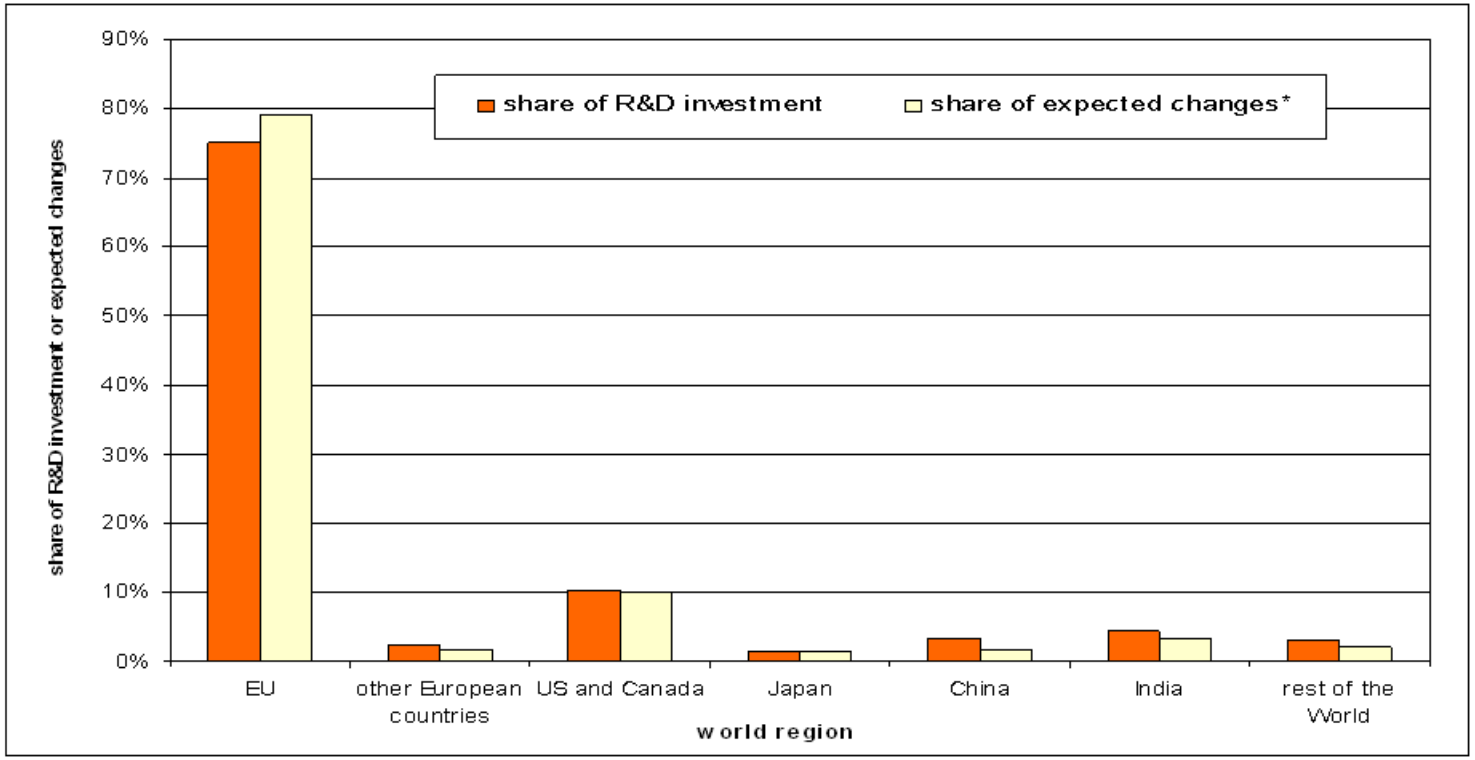
- ***2013-2014 revision process still under development***.
- Definition of R&D: the criteria to be used to discriminate R&D from non-R&D activities and to split-up R&D into basic, applied research and experimental development will be simplified and made explicit.
- Harmonised approach to identify the R&D-performing units (statistical units) but some flexibility allowed (registers not available in all countries).
- Use of administrative data acknowledged but not recommended.
- Merging of R&D surveys with other surveys not recommended.

Suggestions

- Location and specialization of R&D activities:
  - R&D surveys
  - subsidiaries
  - patents
  - …

R&D survey

R&D Investment by world areas of European scoreboard companies



Source: Cincera, Cozza and Tuebke (2010)

Subsidiaries

Average shares of subsidiaries in regions of European scoreboard companies

Industry	%EU27	%US-CA	%Asia-Pacific	%RoW
High tech	68%	13%	9%	9%
Medium tech	71%	11%	8%	10%
Low tech	78%	7%	5%	10%
All	71%	11%	8%	10%

Source: Cincera and Ravet (2011)

Subsidiaries

Top 20 % Subsidiaries in Asia-Pacific

Firm	ICB
James Hardie Industries	Construction & materials
Micronic Laser Systems	**Semiconductors**
Ilog	**Software**
FRIWO (ex CEAG)	**Telecommunications equipment**
BE Semiconductor Industries	**Semiconductors**
Anoto	**Computer hardware**
AVEVA	**Software**
EPCOS	**Electronic equipment**
ASM International	**Semiconductors**
Rio Tinto	Mining
Aixtron	**Semiconductors**
ASML	**Semiconductors**
SAES Getters	**Electronic equipment**
Oberthur Technologies	**Electronic equipment**
Novozymes	Biotechnology
Option	**Telecommunications equipment**
Manz Automation	Industrial machinery
Wavecom	**Telecommunications equipment**
ARM	**Semiconductors**
Tekla	**Software**

Electronic, semicond, softwares, computer, telecom

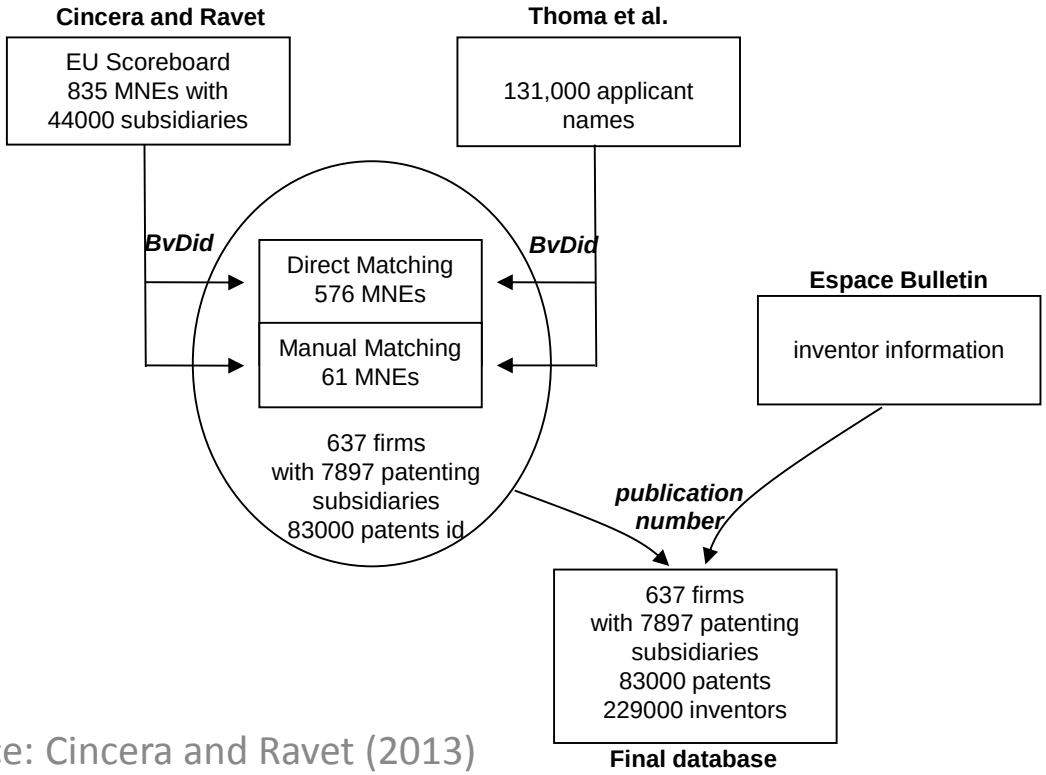
Top 20 % Subsidiaries in North America

Firm	ICB
Transgene	**Biotechnology**
Flamel Technologies	**Biotechnology**
Clipper Windpower	Electricity
Basler	Electrical components & equipment
ExonHit Therapeutics	**Biotechnology**
Exiqon	**Biotechnology**
Reed Elsevier	Media
Gas Turbine Efficiency	Industrial machinery
ARC International	Semiconductors
Glunz & Jensen	Computer hardware
Sophos	Software
nCipher	Software
Merial	**Biotechnology**
Reckitt Benckiser	Household goods & home construction
NicOx	**Pharmaceuticals**
Boliden	Mining
MediGene	**Biotechnology**
Antisoma	**Biotechnology**
AGI Therapeutics	**Pharmaceuticals**
Plethora Solutions	**Pharmaceuticals**

Biotech, Pharma

Patents

Average regional repartition of patent inventors of 637 European scoreboard companies



Source: Cincera and Ravet (2013)

EU15	Germany	27.24%
	United Kingdom	16.32%
	France	14.50%
	Sweden	7.60%
	Italy	6.69%
	Finland	5.03%
	Netherlands	4.30%
	Denmark	3.38%
	Belgium	2.56%
	Spain	2.55%
	Ireland	0.65%
	Austria	0.54%
	Portugal	0.34%
	Luxembourg	0.13%
	Greece	0.02%
EU27 (not EU15)	Hungary	0.41%
	Czech Republic	0.06%
	Slovenia	0.04%
	Latvia	0.04%
	Poland	0.03%
	Estonia	0.03%
	Bulgaria	0.01%
	Slovakia	0.00%
	Cyprus	0.00%
	Lettonia	0.00%
EU non27		1.79%
USC		4.72%
Japan		0.45%
China		0.02%
India		0.02%
ROW		0.54%

Recent evidence on R&D in Europe
R&D from corporate data:
the EU-IRI Scoreboard 2013

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Knowledge for Growth Unit

Limitations of R&D Scoreboard

- Regional classification

  Firms are classified as EU- or US-based depending on the ultimate ownership of the company and not by the location of its activities

  When EU young firms are taken over by US entities, the R&D, growth and jobs created by these companies are accredited to the US rather than the EU

- Size of the sampled firms

  The analysis only covers firms that have reached an R&D size sufficient to qualify them for entering the scoreboard of largest R&D spenders

  The EU's lack of yollies could thus be explained by:

  i) a lack of start-ups and/or

  ii) a lack of firms growing large enough to feature in the scoreboard

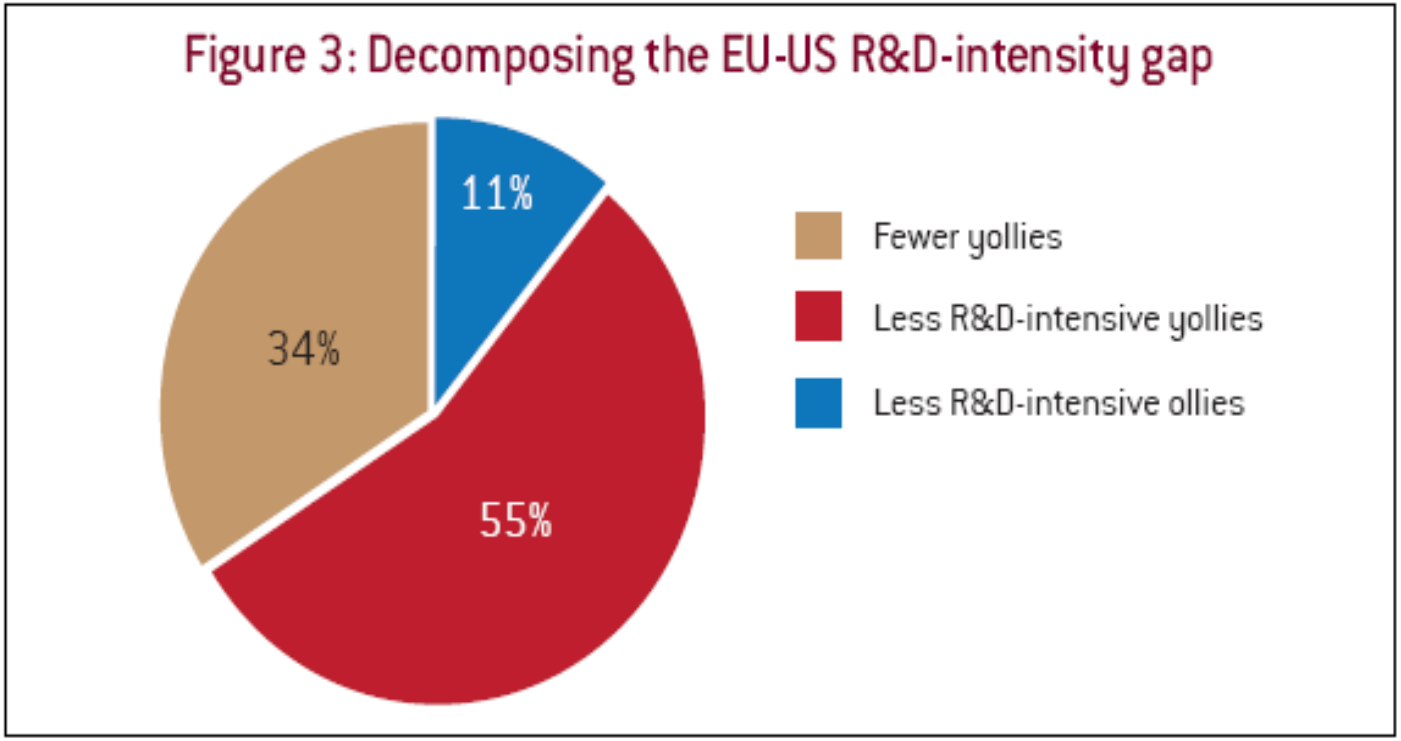
  The scoreboard data does not allow these possible explanations to be disentangled, though the separate problems of firm entry and firm growth come with different policy implications

Scoreboard company data from top EU and US R&D investors

Industry	EU R&D (€m)	US R&D (€m)	EU R&D int. (%)	US R&D int. (%)
Most R&D intensive (>10%)				
Biotechnology	852.6	8846.4	22.7	24.5
Pharmaceuticals	20899.5	32135.7	14.5	13.9
Semiconductors	3865.3	19630.5	15.8	15.4
Software	3923.9	18009.9	13.3	14.0
Internet	0.0	5330.5	-	14.0
Other large sectors				
Automobiles & parts	35787.9	13110.3	5.2	3.8
Electronic equipment	1162.5	3307.6	7.5	5.4
Chemicals	7230.1	4641.0	3.1	2.9
Aerospace & defence	8632.8	7579.4	6.0	3.1
Electrical comp. & equip.	5911.0	438.2	4.6	3.4

- **R&D intensity of EU companies close to that of their US counterparts**
- **Very different sectoral composition of EU and US companies**
- **EU-US R&D gap concentrated in a few high-tech sectors**

What the US has but the EU lacks: Yollies

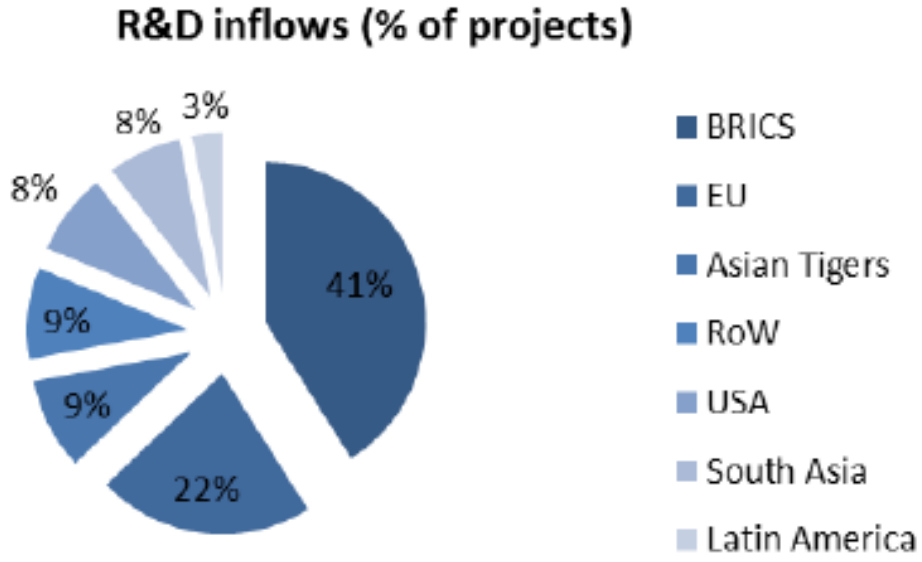


The lower R&D intensity of EU yollies is contributing the most (55%) to the total EU-US R&D intensity gap

Source: Cincera, M., R. Veugelers (2013)
Young Leading Innovators and the EU's R&D intensity gap,
Economics of Innovation and New Technology, 22(2): 177-198

Source?

IRI research results using FDI data: internationalisation



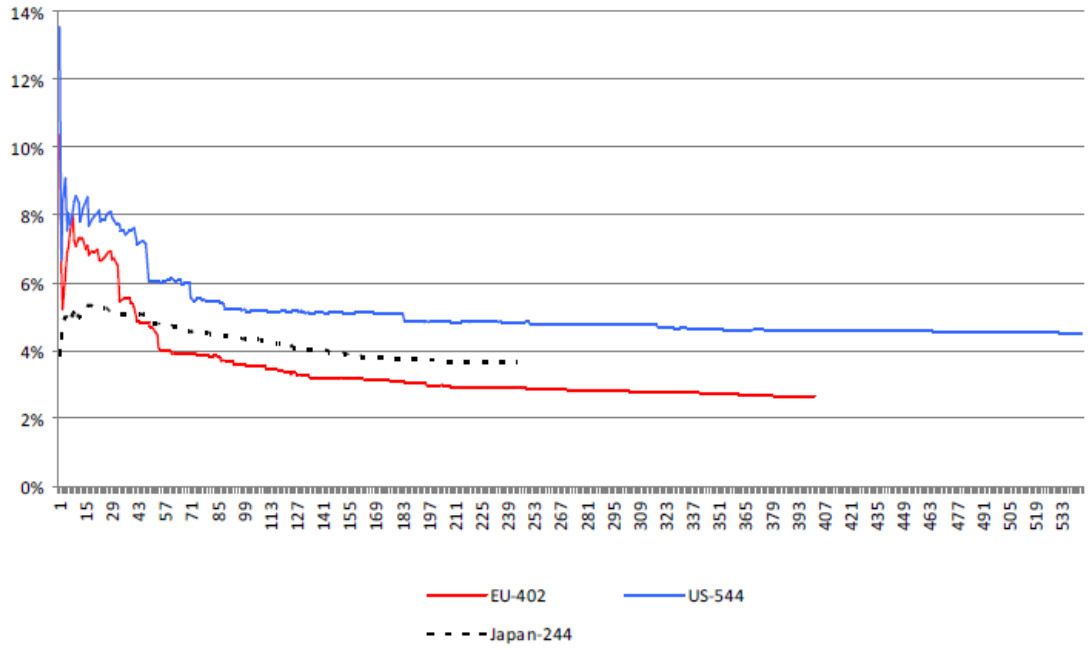
- **The EU attracted 22% of FDI projects on R&D from the non-EU companies**
- **Whereas the US received a share of 8%**
- **Six of ten of the countries with the highest number of international R&D projects are European**
- **FDI R&D projects are concentrated in IT hardware, automobiles & parts and pharma & biotech**

Reproduce some of your anaysis with recent editions of R&D scoreboards ?

IRI research results using Scoreboard data: the R&D gap

	Difference in R&D intensity from US-544	of which Structural effect:	of which Intrinsic effect:
EU-402	**-1,80**	-1,84	0,05
Japan-244	**-0,35**	-0,37	0,02

Figure 5: Cumulated average R&D intensity of the examined samples of 402 EU, 544 US and 244 Japanese companies, in 2007 (%)



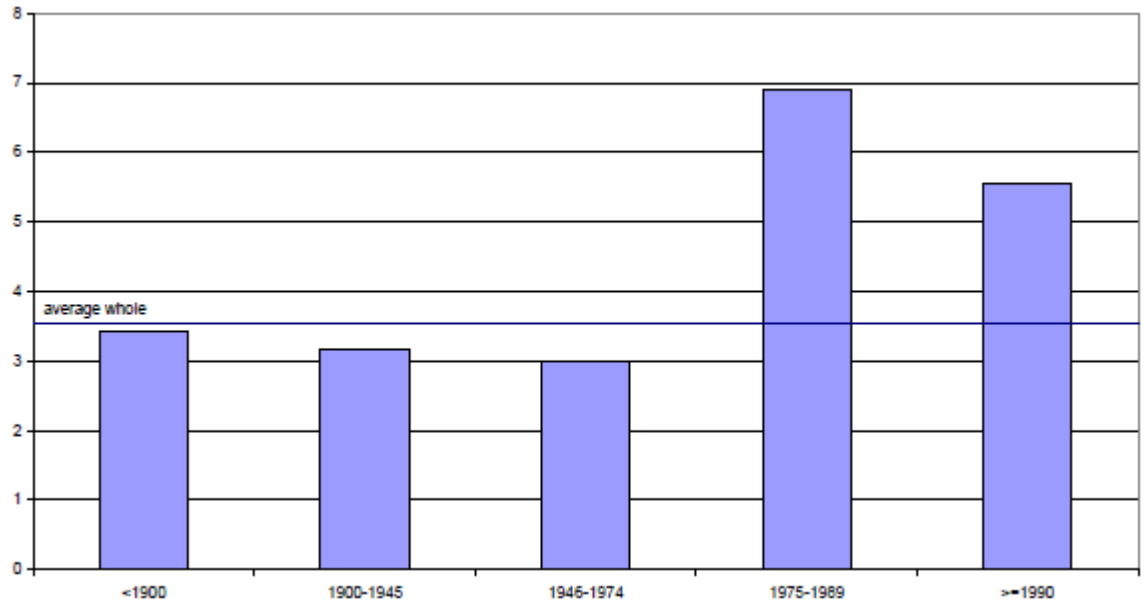
- **Structural differences explain the gap, no sign of underinvestment**
- **US has larger number of companies in high R&D intensive sectors**

Moncada, P. et al..: "Does Europe perform too little corporate R&D", JRC EUR 51955 EN, 2009

Reproduce some of your anaysis with recent editions of R&D scoreboards ?

IRI research results using Scoreboard data: firm age

Figure 2. R&D intensity (RDI) by age-class



Source: Bruegel/European Commission JRC-IPTS.

Table 5. R&D intensity of yollies and ollies by region

	World	EU	US	JAP	RW
R&D intensity	3.6	3.0	4.6	3.7	2.7
Yollies' R&D intensity	6.4	4.4	10.2	1.2	2.7
Ollies' R&D intensity	3.2	2.9	3.5	3.8	2.7

- **Young leading innovators shape are more R&D intensive**
- **The EU has fewer young leading innovators than the US**
- **The US young leading innovators are in high R&D intensive sectors: ICT &health**

Cincera, M. and Veugelers, R..: "Young leading innovators and the EU R&D intensity gap", JRC EUR 60284 EN, 2010

Rates of returns to R&D

EU vs US Yollies (in High-Tech sectors) 2000-2011

	EU & High-tech		US & High-tech	
Constant	-0.039	(0.041)	-0.042*	(0.015)
Δ ln Employees	0.702*	(0.049)	0.524*	(0.017)
Δ ln Physical capital	0.265*	(0.081)	0.316*	(0.033)
R&D intensity	0.064	(0.057)	0.125*	(0.031)
# of observations	284		1357	
R^2	0.25		0.25	

EU vs US Yollies (in High-Tech sectors) 2000-2007

	EU & High-tech		US & High-tech	
Constant	0.002	(0.029)	0.046	(0.015)
Δ ln Employees	0.750*	(0.054)	0.517*	(0.025)
Δ ln Physical capital	0.215**	(0.095)	0.284*	(0.042)
R&D intensity	0.042	(0.063)	0.205*	(0.038)
# of observations	177		811	
R^2	0.26		0.21	

Source: Cincera, M., R. Veugelers (2013)
The returns to R&D of young world leading R&D firms, work in progress

Thank you for your attention

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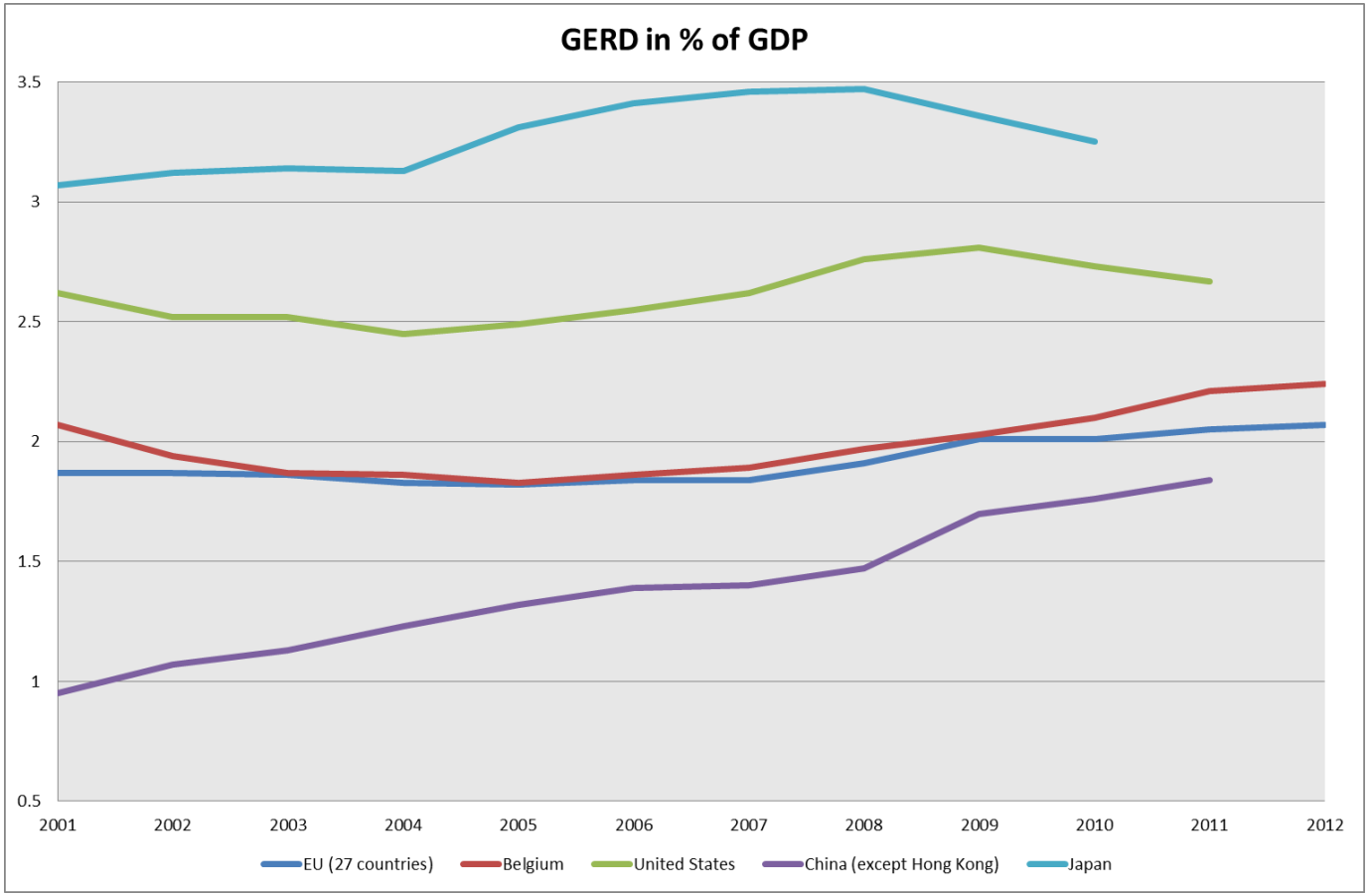
International Centre for Innovation
Technology and Education

http://www.solvay.edu/icite

Motivations (1/3)

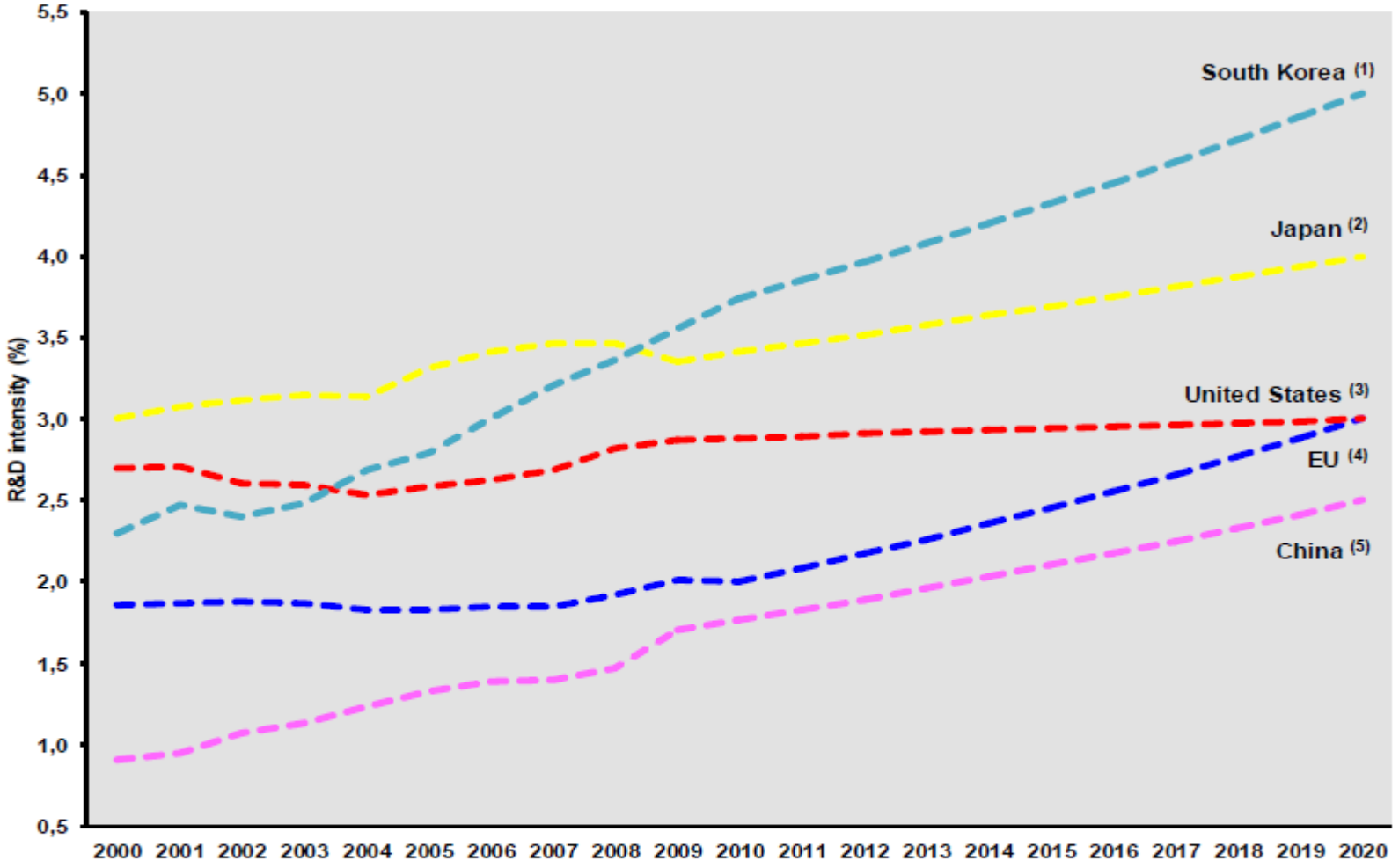


R&D and innovation = key drivers of competiveness:

→ Lower cost

→ Higher quality of new goods and services

Source: EUROSTAT (2013)



Source: DG Research and Innovation - Economic Analysis Unit

Data: DG Research and Innovation, Eurostat, OECD

Notes: (1) South Korea: (i) The projection is based on an R&D intensity target of 5,0% for 2020; (ii) There is a break in series between 2007 and the previous years.

(2) Japan: (i) The projection is based on an R&D intensity target of 4,0% for 2020; (ii) There is a break in series between 2008 and the previous years.

(3) United States: (i) The projection is based on an R&D Intensity target of 3.0% for 2020; (ii) R&D expenditure does not include most or all capital expenditure.

(4) EU: The projection is based on an R&D Intensity target of 3.0% for 2020.

(5) China: The projection is based on an R&D Intensity target of 2,5% for 2020.