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Full Professor at University of Leuven

Senior Fellow at Bruegel

Scientific Council Member of the ERC


Chair of the Finland 2009 Innovation Evaluation



## **Evaluating Finland's science, research & innovation capacity**



# The 2009 Innovation Evaluation



**“The Finnish system is at a crossroads due to both internal and external factors. The current state of the Finnish innovation system is good but it does not suffice. Major adjustments are needed in order for Finland to meet its future challenges”**

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## A selection of recommendations..

- The Finnish innovation system is less **internationalized** than conventionally thought. Tapping deeper into the global knowledge pool should be one of the main objectives of innovation policy.
- The present public support system needs to improve on accessibility and relevance for **high-growth-entrepreneurial-firms**

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## Major Recommendations wrt Research

- **Increasing the quality of research**
- **Increasing internationalization**
- Streamlining the higher education and public research sector
- Enhancing efficient knowledge dissemination to the rest of society
- Tackling the problem of late graduation

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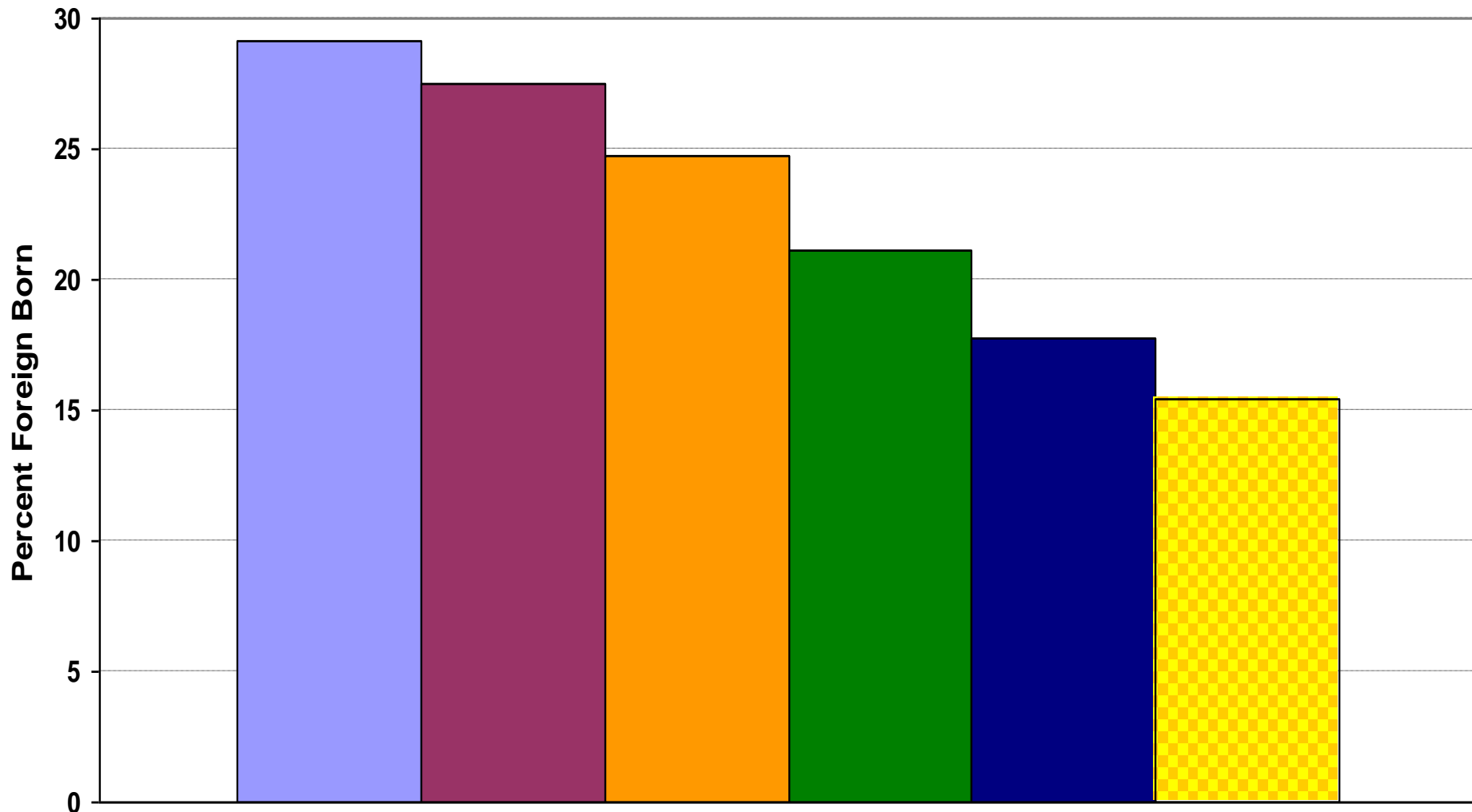
## Major Recommendations wrt Research

*The most critical challenge is to increase the quality of research in Finland.*

**Excellence in research is vital to world class innovation activity**

**It is also a precondition for internationalization of the university sector, industry science links  
relevance of research for innovation.**

# Scientists Making Exceptional Contributions in U.S. Life Sciences



Most Cited Authors

Citation Classics, 1st Authors

Founders/Chairs of Biotech Firms

NAS Members

Hot Papers, 1st Authors

Benchmark

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## The R&D and innovation policy agenda at crossroads

- Challenge of the crisis
  - Risk of structural stagnation in Europe
  - Financial and other market failures requiring government intervention
  - Constrained public and private financing: scope for RDI funding where returns are long term and with large margins of uncertainty?
  - An opportunity for creative exit strategy from ailing areas, freeing resources to move into new areas
- New Grand Challenges coming from climate change, ageing, food supply...requiring government intervention
- A new multipolar global innovation world: the rise of China with ambition to become a science & innovation world leader

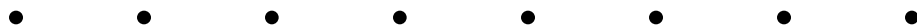


# Finland after our evaluation exercise



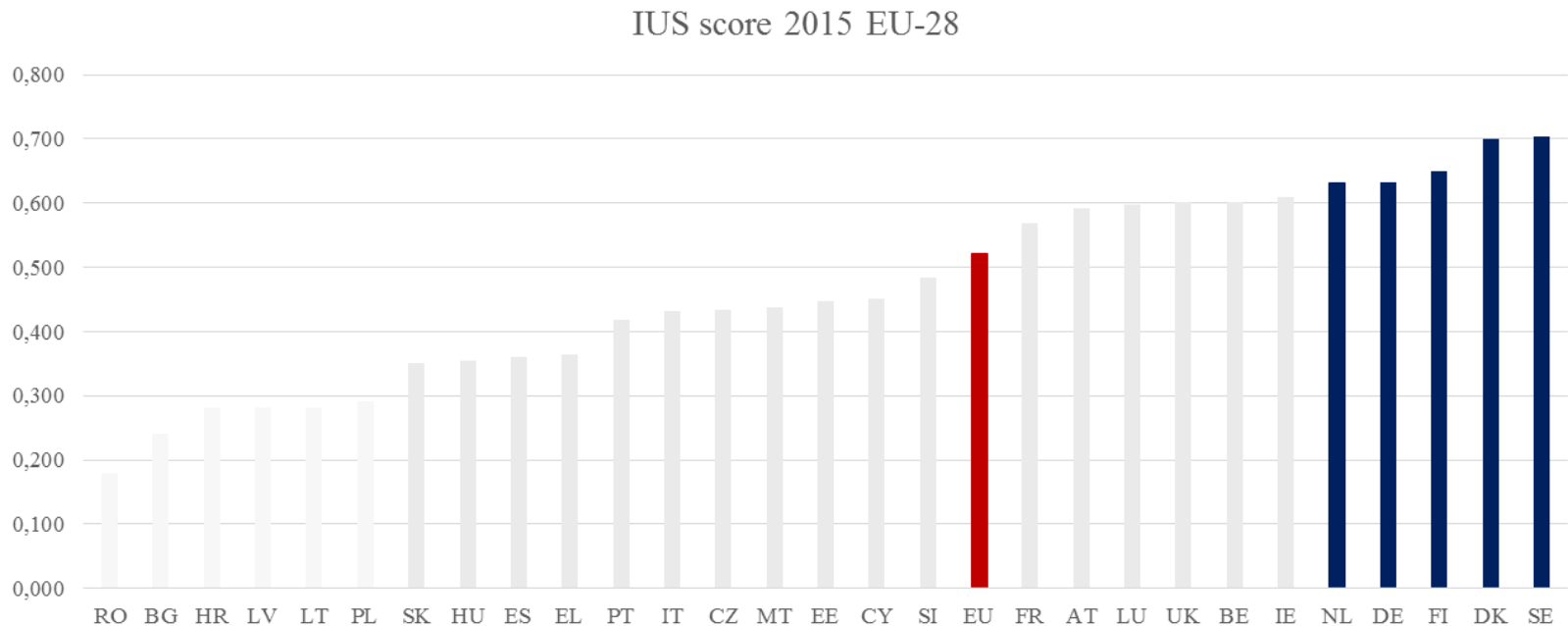
Are you on track to meet the current challenges?

*Evidence from EU's Innovation Union Scoreboard 2016*





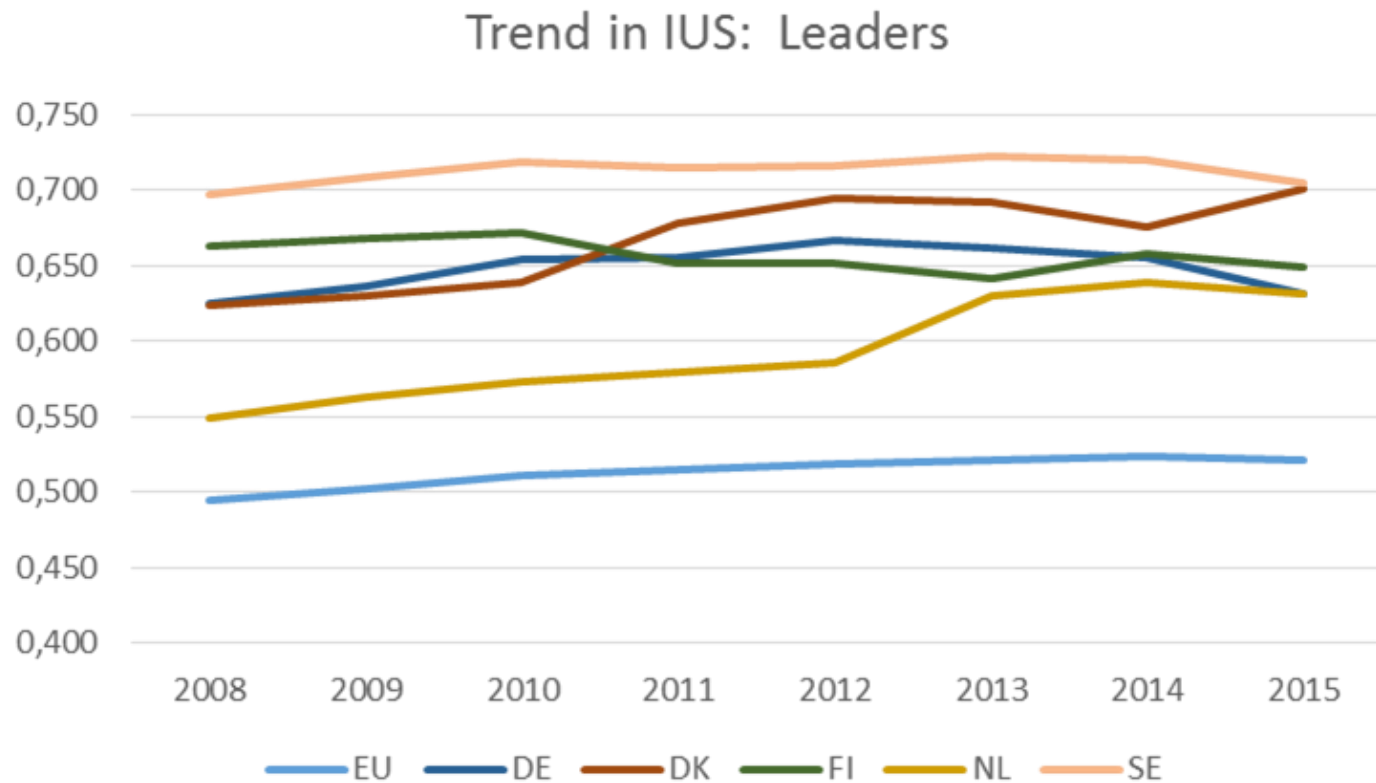
# Finland: an Innovation Leader in Europe still



<sup>1</sup> IUS is a composite indicator capturing 8 dimensions of innovation: Human Resources, Research Systems, Finance, Firm Investment, Linkages, IPR, Innovations, Economic Effects. For the international benchmarking of Europe, it uses information from 12 indicators to assess these 8 dimensions.

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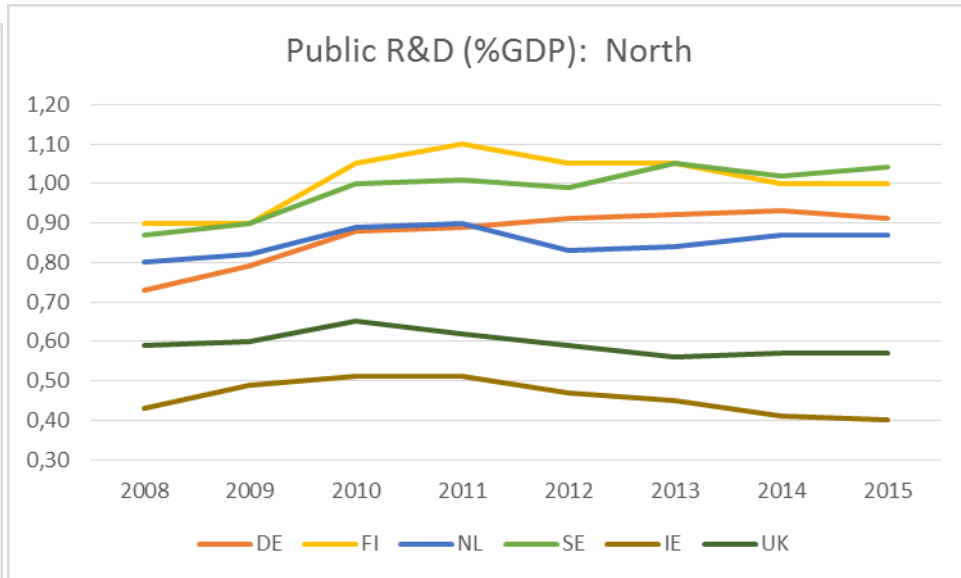
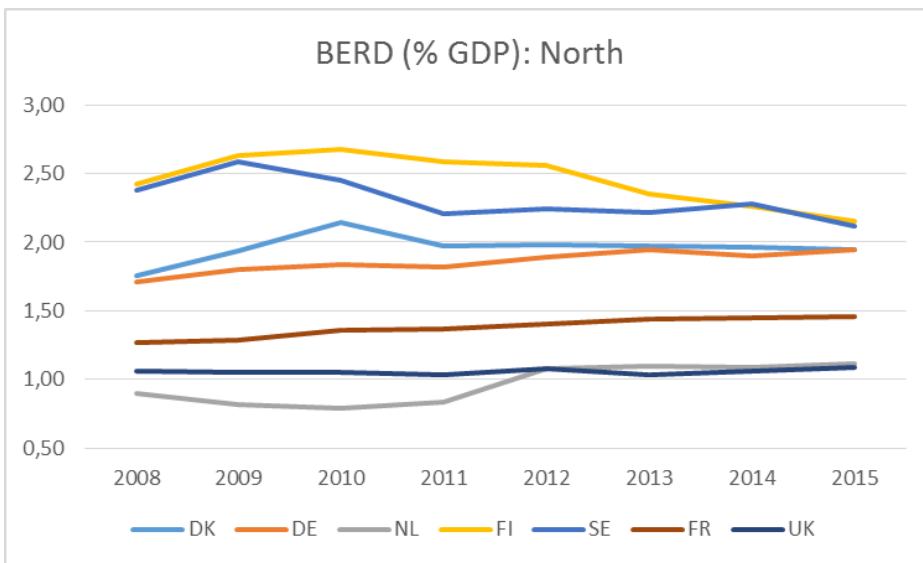
# Finland: an Innovation Leader still for how long?



Source: EC, Innovation Union Scoreboard, 2016

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# Private and Public spending on R&D

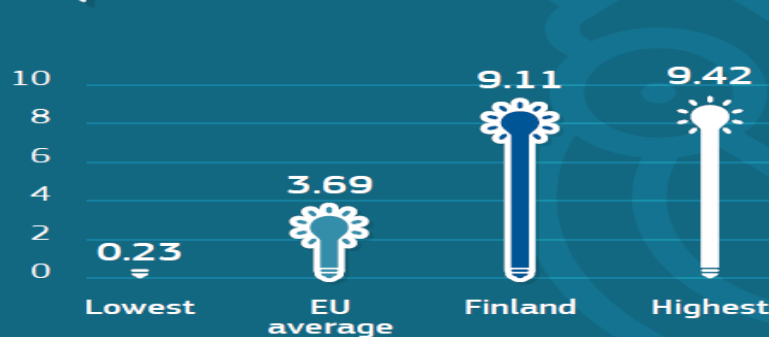


Source: EC, Innovation Union Scoreboard, 2016

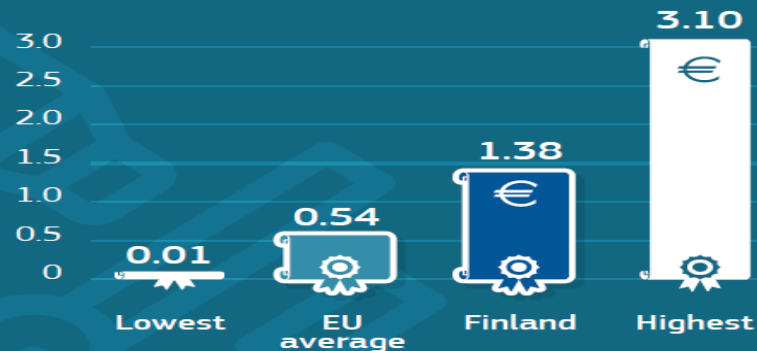
## PATENT APPLICATIONS

## PATENT AND LICENCE REVENUES

*Finland has a strong ability to generate innovation outputs*



*Number of international patent applications (under the Patent Cooperation Treaty) per € billion of GDP (2013)*



*License and patent revenues from abroad (2014)*

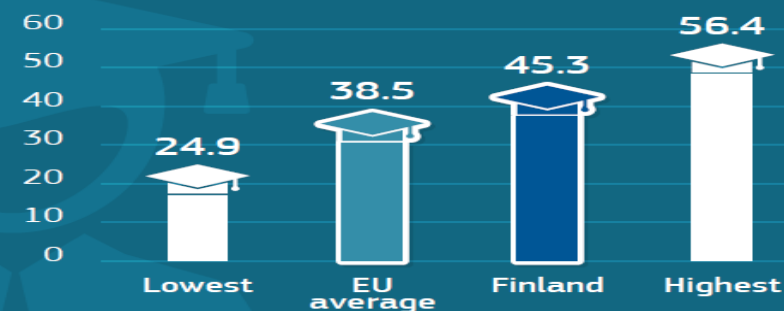
## SCIENCE & ENGINEERING SKILLS

## TERTIARY EDUCATION

*Finland can count on its high production of highly skilled human resources*



*Share of new graduates (per thousand aged 25-34) in science and engineering (2014)*



*% 30-34-year-olds who have graduated from tertiary education (2015)*



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## RECOMMENDATIONS

### ROOM FOR IMPROVEMENT



Stimulate **business scale-up and internationalisation**



Maintain and further **improve outcomes** from the higher education and public research systems

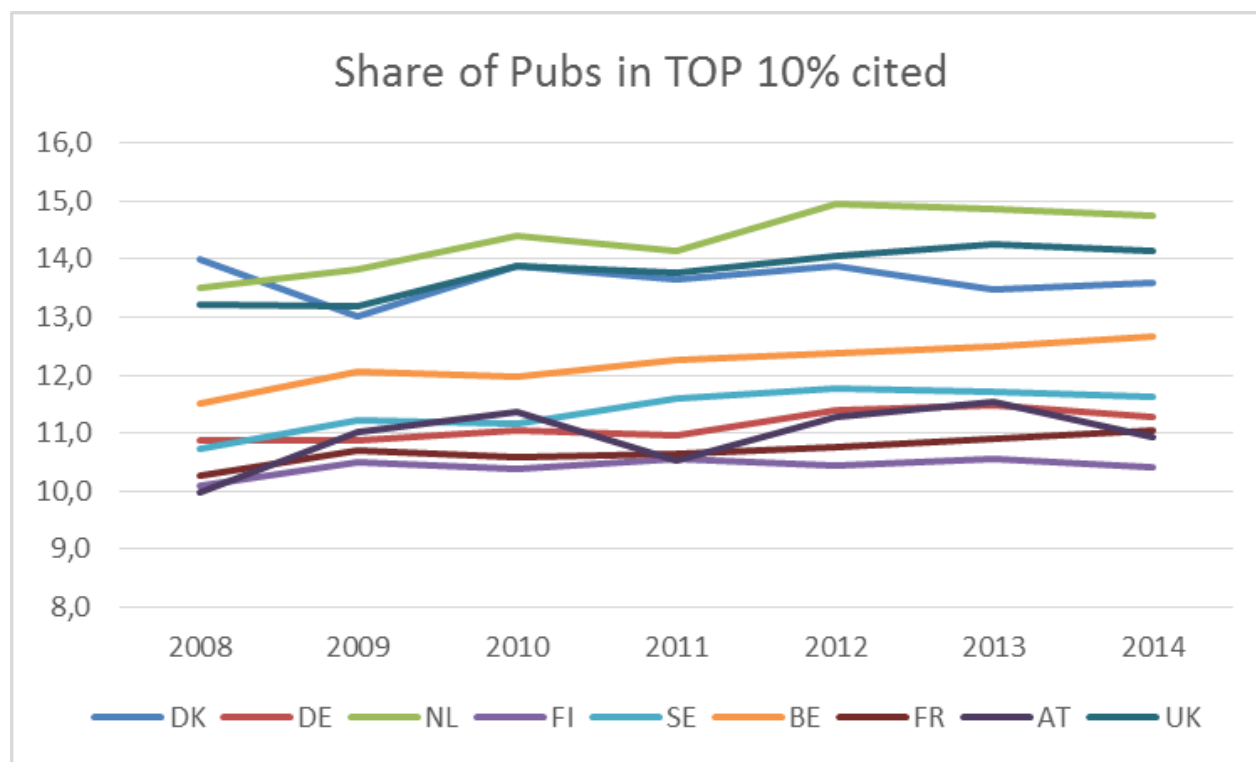


<https://rio.jrc.ec.europa.eu/en/country-analysis>

[http://ec.europa.eu/research/horizon2020/index\\_en.cfm?pg=country-profiles](http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=country-profiles)

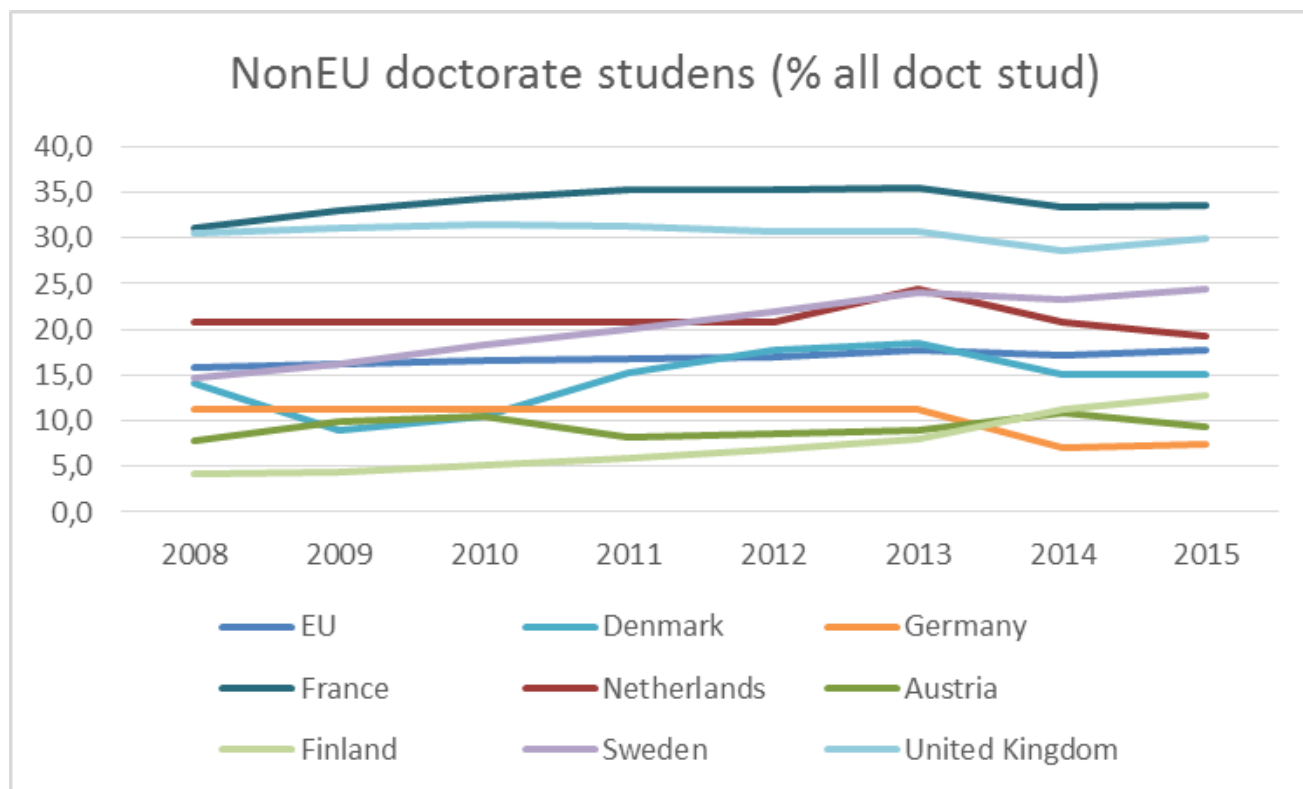
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# Quality of the science base



Source: EC, Innovation Union Scoreboard, 2016

# Attracting foreign students



Source: EC, Innovation Union Scoreboard, 2016

# Quality & Internationalisation of Science @ Finnish Universities

University	P	PP_top1	PP_top10	PP_int_col	P	PP_top1	PP_top10	PP_int_col
	2006–2009				2011–2014			
University of Helsinki	12224	0,016	0,128	0,509	15279	0,021	0,143	0,588
University of Turku	4361	0,009	0,102	0,492	5676	0,016	0,123	0,574
Aalto University	3904	0,010	0,107	0,457	5575	0,017	0,123	0,557
University of Eastern Finland	3663	0,012	0,102	0,389	4479	0,015	0,120	0,527
University of Oulu	3350	0,010	0,103	0,460	4359	0,017	0,119	0,528
University of Tampere	2851	0,011	0,114	0,360	3450	0,021	0,127	0,447
University of Jyväskylä	2408	0,009	0,115	0,483	3379	0,016	0,115	0,558
Tampere University of Technology	1322	0,007	0,091	0,384	2004	0,011	0,112	0,534
All Finland	34083	0,012	0,113		44201	0,018	0,129	

On basis of  
<http://www.leidenranking.com/ranking/2016/list>



# World class universities

Ranking of 200 largest (by P) universities by Share of Top 1% publications  
All fields; 2011-2014

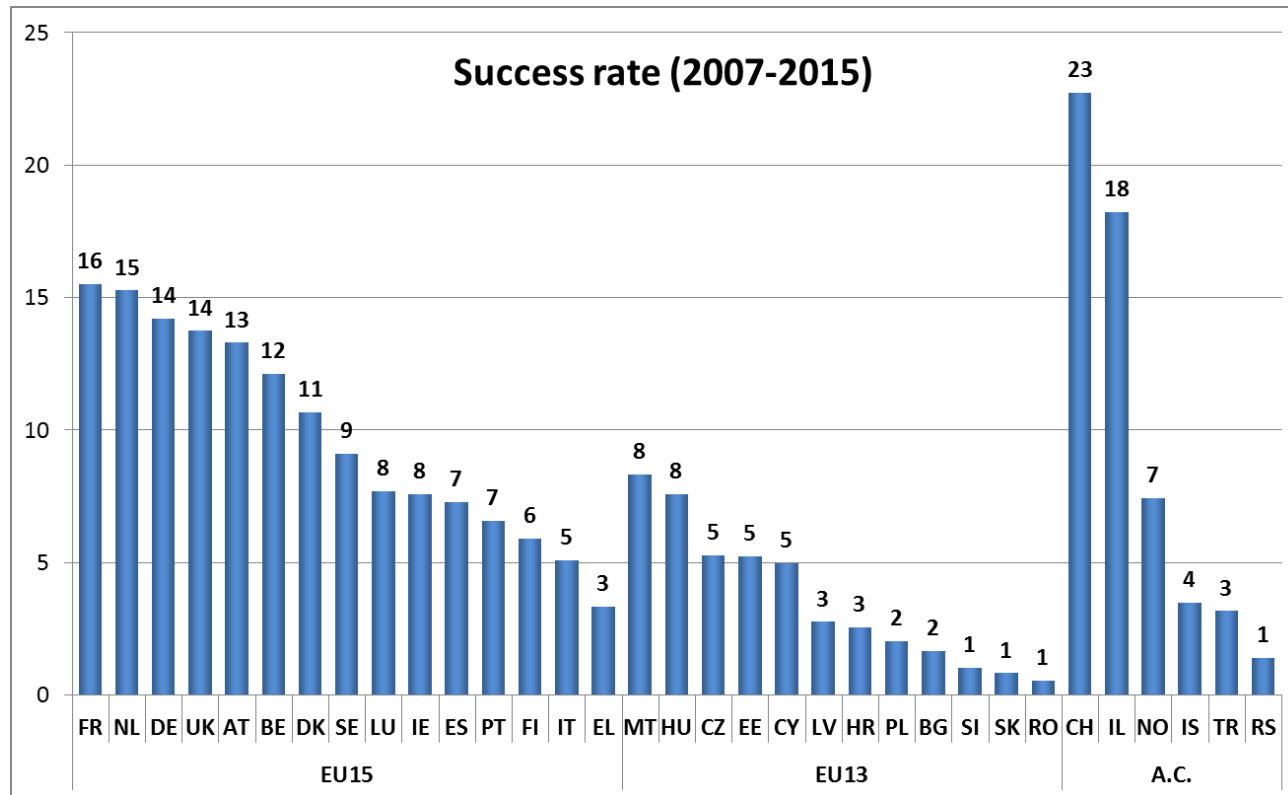
	<u>University</u>	<u>Country</u>	<u>P</u>	<u>PP top1</u>	<u>PP top10</u>	<u>PP int co</u>
1	Massachusetts Institute of Technology	United States	23020	0,049	0,265	0,478
2	Harvard University	United States	63936	0,039	0,233	0,455
3	Stanford University	United States	29432	0,039	0,234	0,391
4	University of California, San Francisco	United States	21748	0,037	0,225	0,349
5	University of California, Berkeley	United States	26545	0,036	0,222	0,465
9	University of Oxford	United Kingdom	29508	0,033	0,207	0,624
12	University of Cambridge	United Kingdom	26554	0,032	0,196	0,617
17	University of Edinburgh	United Kingdom	15235	0,031	0,177	0,585
19	Ecole Polytechnique Federale de Lausanne	Switzerland	11199	0,030	0,200	0,656
21	University College London	United Kingdom	29230	0,029	0,191	0,588
27	King's College London	United Kingdom	15382	0,028	0,189	0,561
31	Imperial College London	United Kingdom	24110	0,028	0,188	0,621
39	University of Bristol	United Kingdom	12293	0,026	0,178	0,539
40	ETH Zurich	Switzerland	18279	0,026	0,189	0,639
45	Katholieke Universiteit Leuven	Belgium	19906	0,025	0,166	0,647
46	University of Zurich	Switzerland	15940	0,025	0,175	0,657
48	Erasmus University Rotterdam	Netherlands	14833	0,025	0,177	0,518
49	University of Copenhagen	Denmark	22639	0,025	0,157	0,604
50	University of Basel	Switzerland	9604	0,024	0,179	0,678
67	Karolinska Institute	Sweden	17604	0,023	0,163	0,628
84	Technical University of Denmark	Denmark	9276	0,022	0,157	0,585
87	University of Helsinki	Finland	15279	0,021	0,143	0,588

On basis of  
<http://www.leidenranking.com/ranking/2016/list>

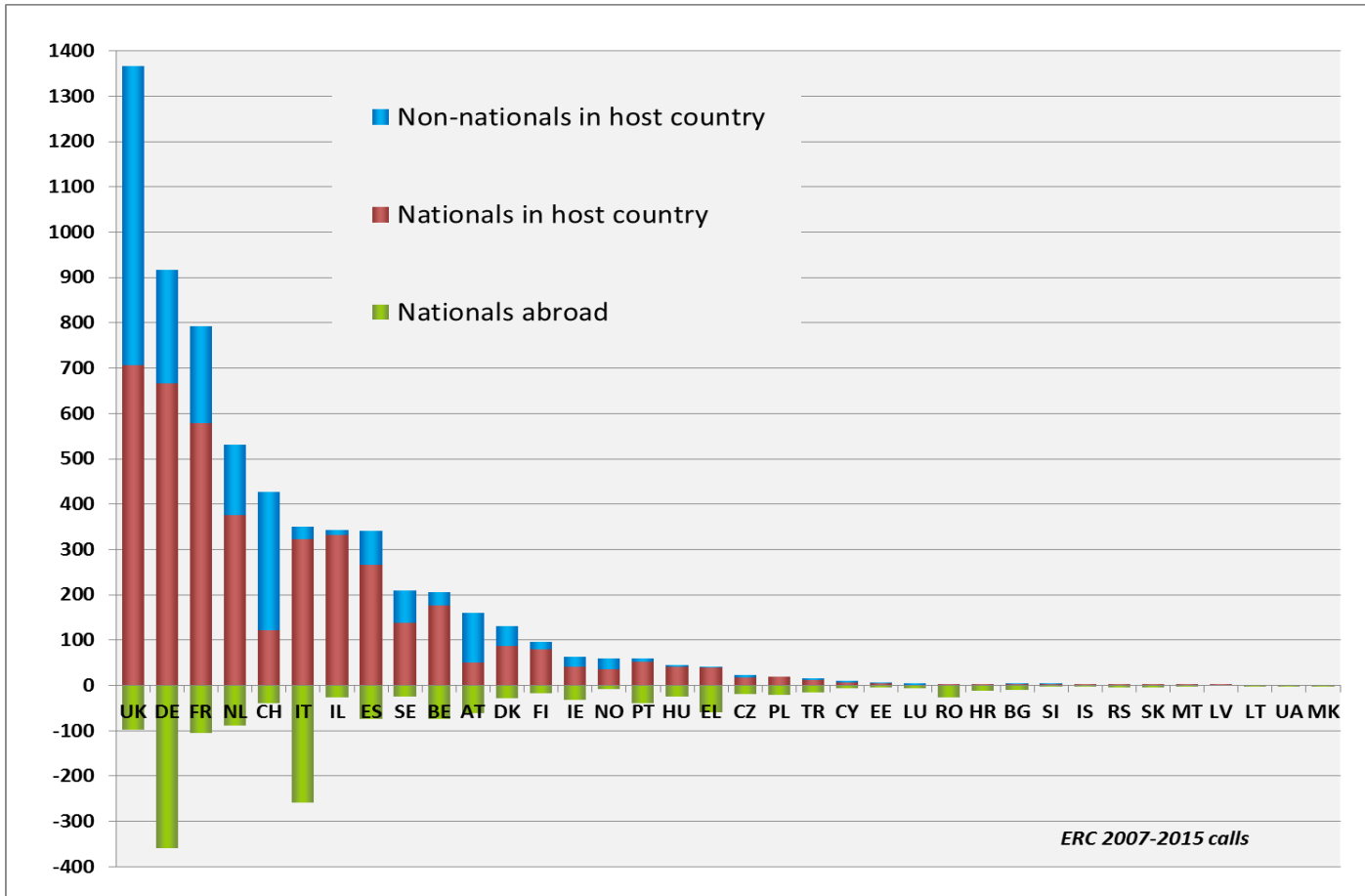
## Partners of Finnish International co-publications

	1998	2008
Sweden	3.39	3.98
Norway	3.60	3.21
Denmark	2.36	3.15
US	0.63	0.63
Japan	0.48	0.62
South Korea	0.55	0.44
China	0.47	0.32
India	0.91	0.46
Brazil	0.50	0.43
Russia	1.50	1.97

# Quality of Finnish Science continued: Finnish success in ERC's funded frontier research




# Quality of Finnish Science continued: Finnish IN & OUT mobility through ERC



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## Quality of Finnish Science continued: Finnish success in ERC through foreigners

### Foreign Grantees in Top Host Countries

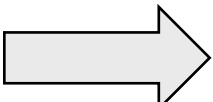


Top Host Countries	s. rate nationals	s. rate non-nat	% foreign grantees
AT	8%	19%	67%
BE	13%	8%	14%
CH	22%	23%	71%
DE	15%	13%	28%
DK	12%	9%	33%
ES	7%	10%	23%
FI	6%	5%	16%
FR	16%	14%	26%
IL	18%	30%	3%
IT	5%	6%	8%
NL	15%	15%	30%
SE	9%	9%	33%
UK	13%	14%	48%

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## Quality of Finnish Science continued: Finnish success in ERC abroad

### PI Nationals at Home and Abroad



PI nationality	s. rate at home	s. rate abroad	% national PIs abroad
AT	8%	18%	55%
BE	13%	15%	29%
CH	22%	15%	27%
DE	15%	16%	35%
DK	12%	18%	26%
ES	7%	10%	20%
FI	6%	9%	14%
FR	16%	13%	15%
IL	18%	20%	7%
IT	5%	13%	43%
NL	15%	14%	19%
SE	9%	12%	15%
UK	13%	15%	13%

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• The current state of the Finnish research system  
• is good but does it suffice to meet the  
• challenges posed by the fast changing global  
• research environment  
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**Are you on track?**



A stronger focus on research quality is  
needed

For internationalisation, a stronger  
selection on quality is needed: it matters  
from where, to where and with whom

# Why we should care about quality of research

- Advancement in science is very skewed; critical role of frontier research.
  - Instigates a multitude of incremental improvements
- Frontier research overproportionally important for linking to technology and innovations



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# Quality science for tech transfer

## Evidence on which universities excel in tech transfer

- The research quality of the faculty
  - Complementarity between second and third mission of universities !
- Proper incentive schemes in place for tech transfer
- Well defined strategies and structures for tech transfer
  - Expertise and experience at tech transfer office
- Critical scaled of tech transfer activities

# Beyond the tech transfer model

- Patenting, licensing and faculty spin-offs are not the only pathways for the transfer of knowledge from universities to industry
- The best form of technology transfer may be the **moving van that transports the graduate or PhD from his or her university to a new job in industry.**
- This implies that the university's most important contribution would run through its first and second mission of research based education and training.
  - Quality of (1<sup>st</sup> mission) education and (2<sup>nd</sup> mission) research for quality of (3<sup>th</sup> mission) tech transfer