

# Innovations and Competition in Hungarian Education

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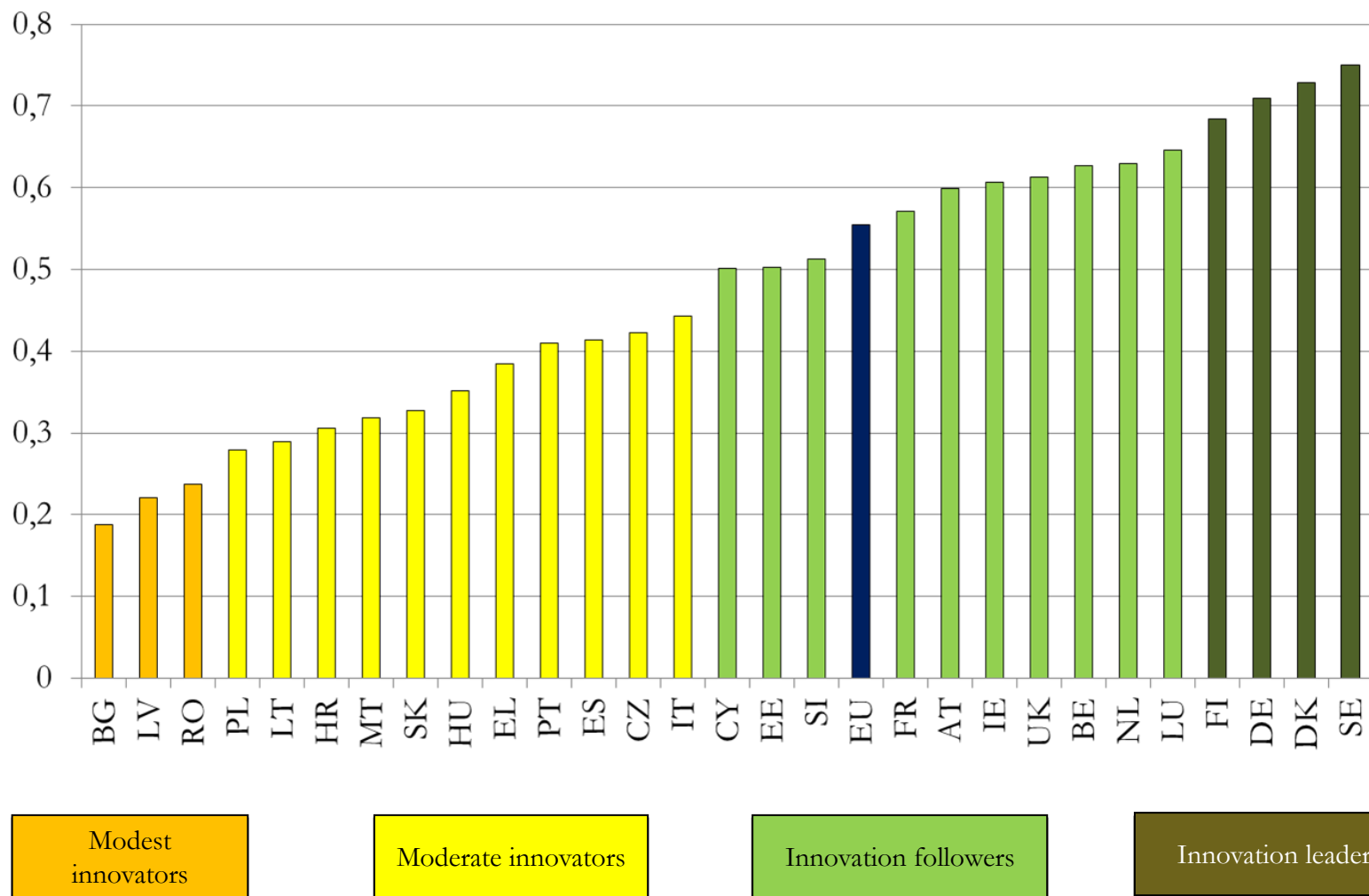
# International competitiveness in innovation

- Why is innovation important to the competitive performance of the economy?
  - „middle income trap”
    - Continuous and significant FDI inflows
    - Strengthen the National Innovation System (NIS)
    - Connection between NIS and firms
- Research and development (R&D) – innovation
- Krugman (1994) – rejected the idea of understanding competitiveness at the macro level
- Supply-side and demand-side approaches
- Product competitiveness – competitiveness of R&D

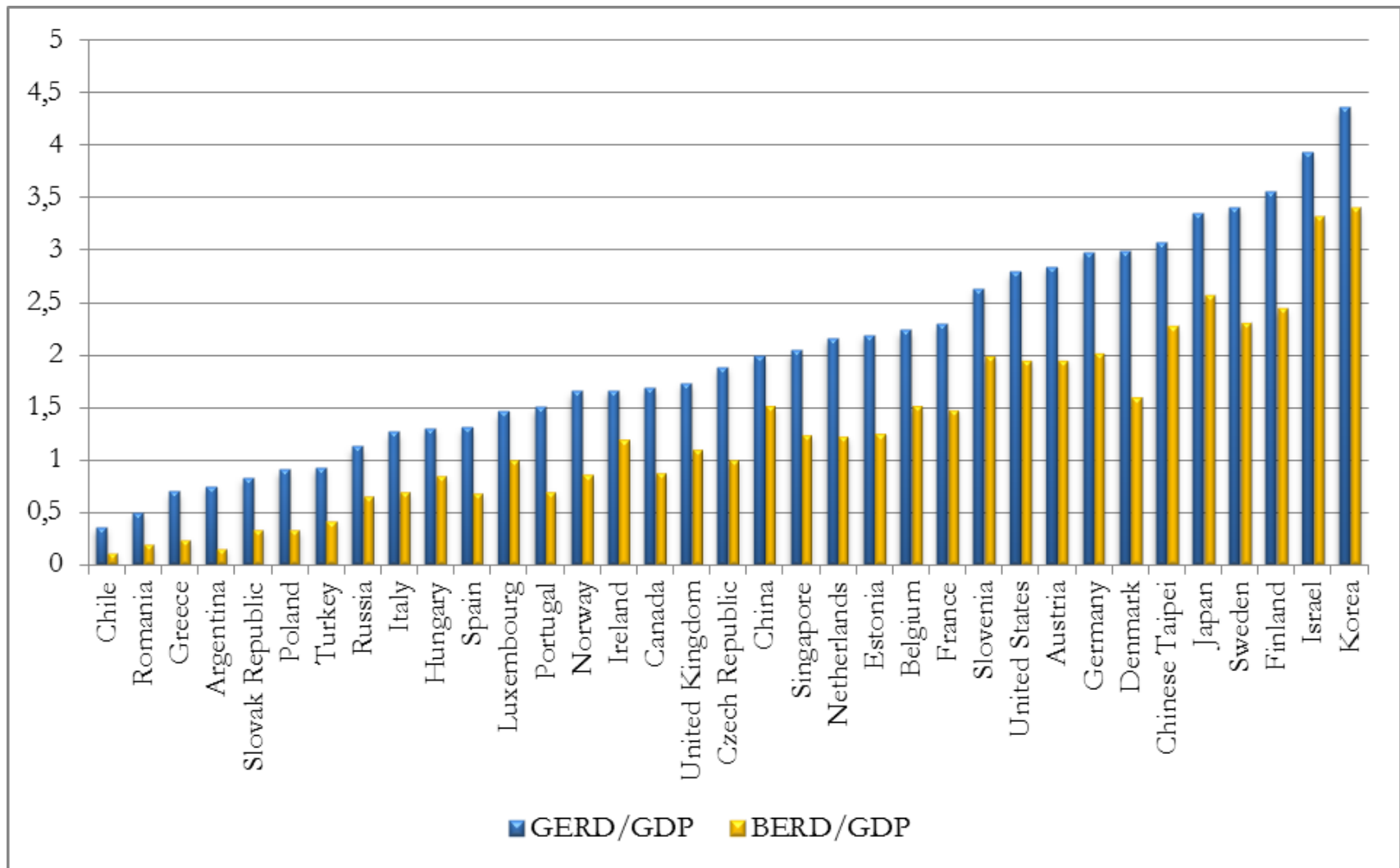
# R&D and Innovation in the European Union

- Measure the international competitiveness of R&D and innovation – GERD/GDP – BERD/GDP
- Lisbon Agenda: 3% (2010: 1,9%) – caveats:
  - Rapidly deteriorating fiscal situation
  - Economic slowdown
- EU2020: 3% (Hungary: 1,8% - 2020)
- European Innovation Scoreboard
  - Elements of the synthetic indicators of innovation performance
  - Good proxy of a competitiveness ranking

# European Innovation Scoreboard



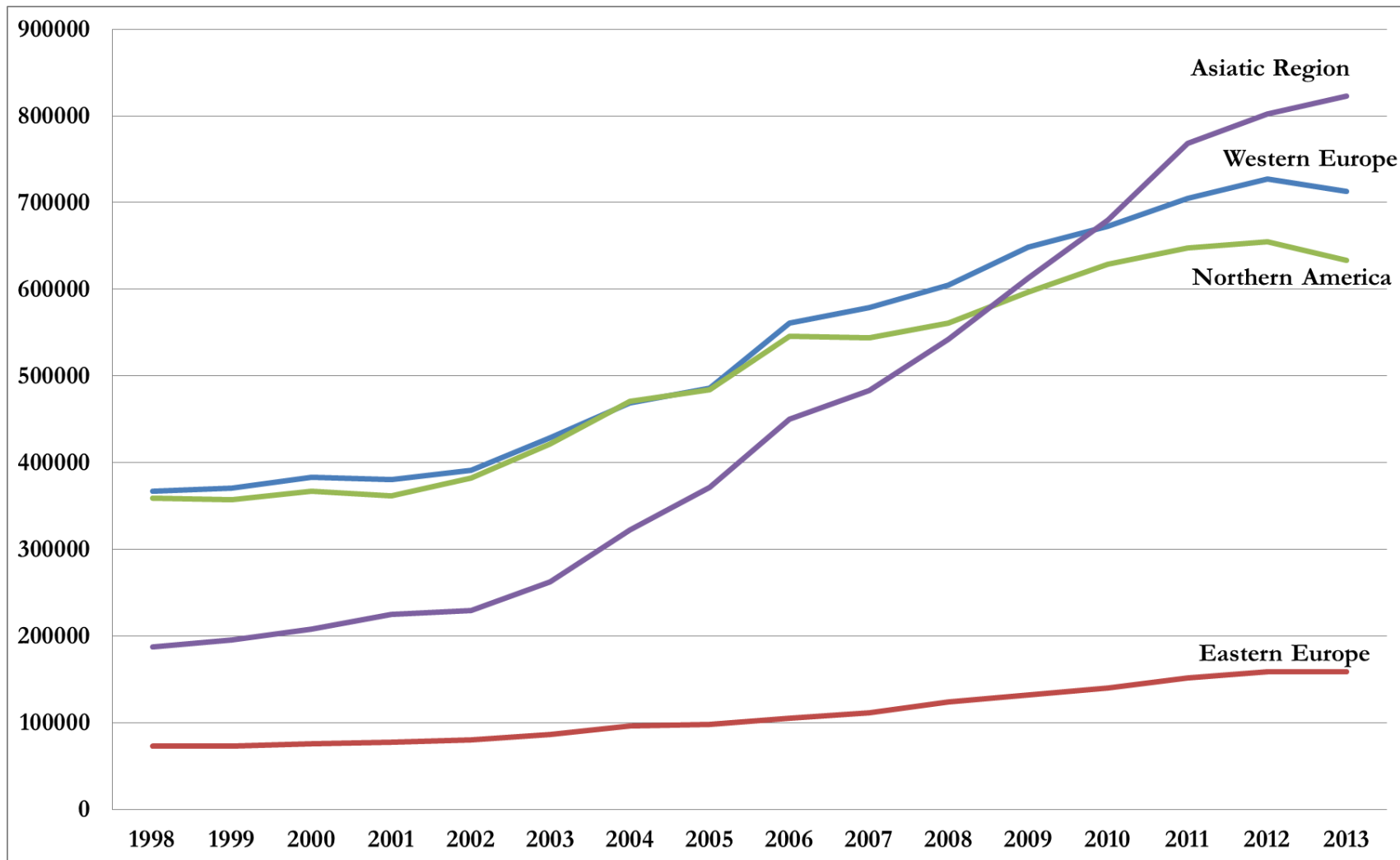
## GERD and BERD as a percentage of GDP (2012, %)



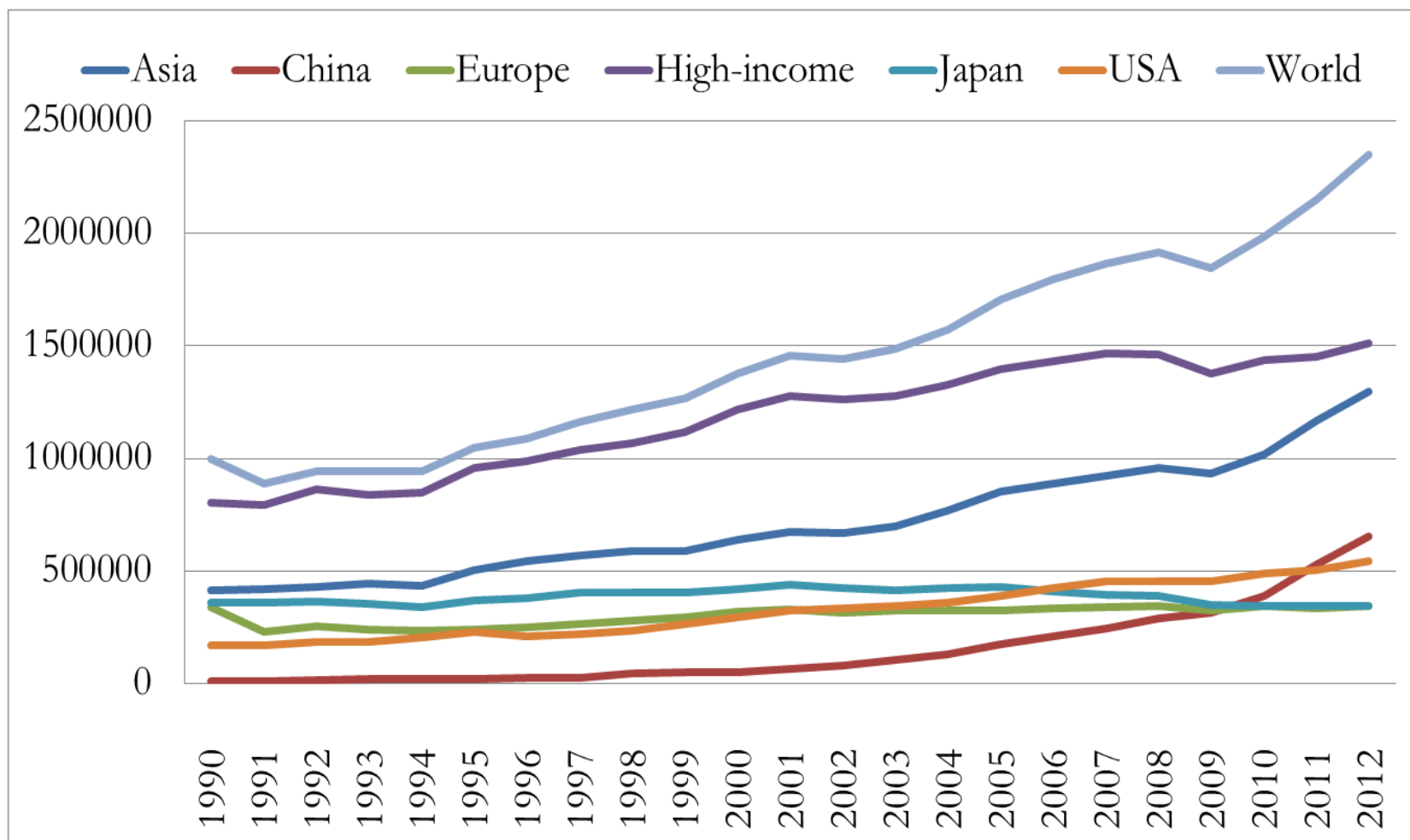
# European Paradox

- The EU lagging behind the US (plus South Korea and Japan) in terms of R&D and innovation
- EU spends relatively much on science and R&D, but it only has a limited effect on increasing competitiveness
- Output appears more in publications than in patents

# Number of scientific publications (1998-2013)



## Worldwide patent applications (direct and PCT national phase entries, total count by filing office)

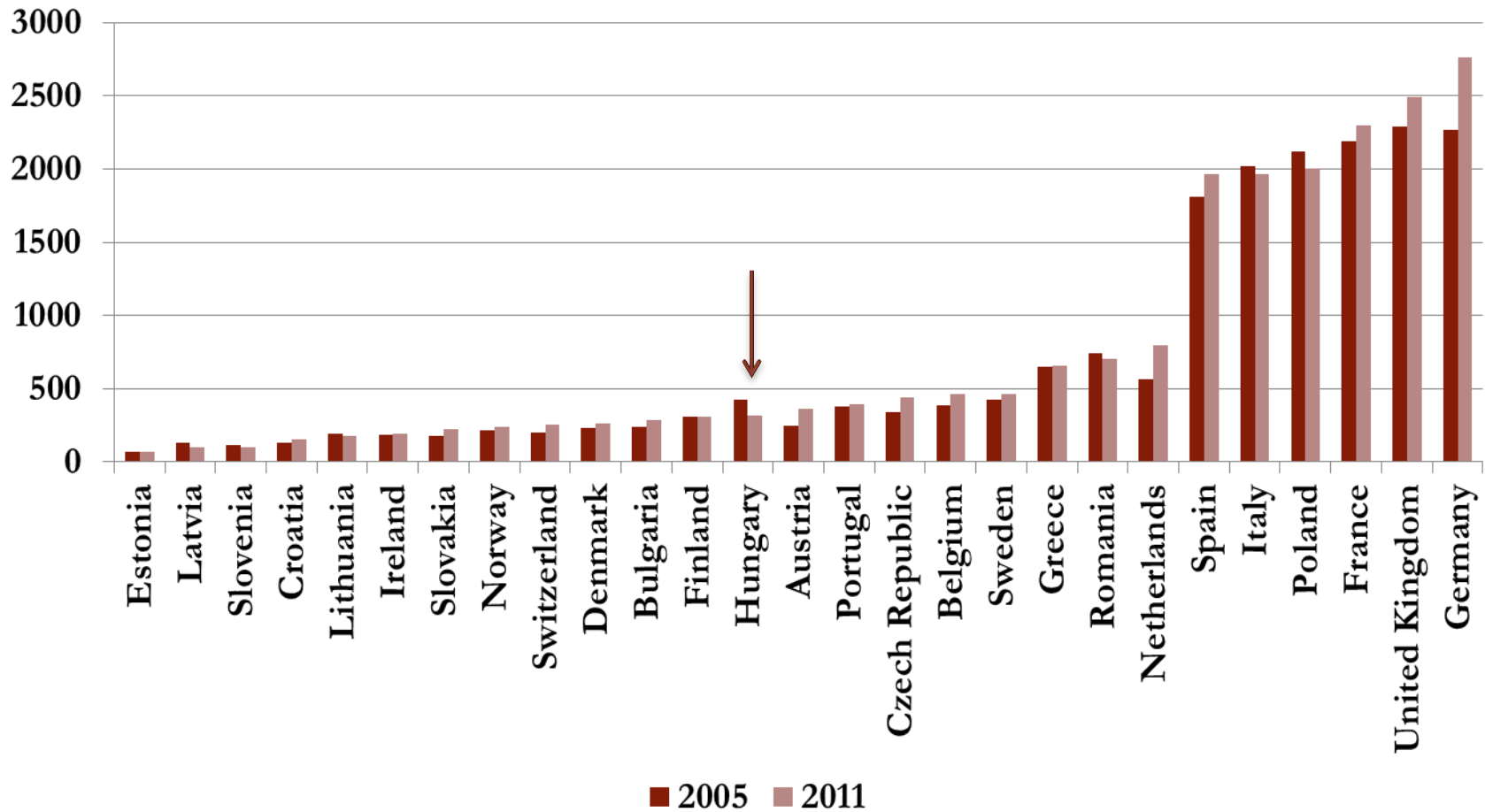




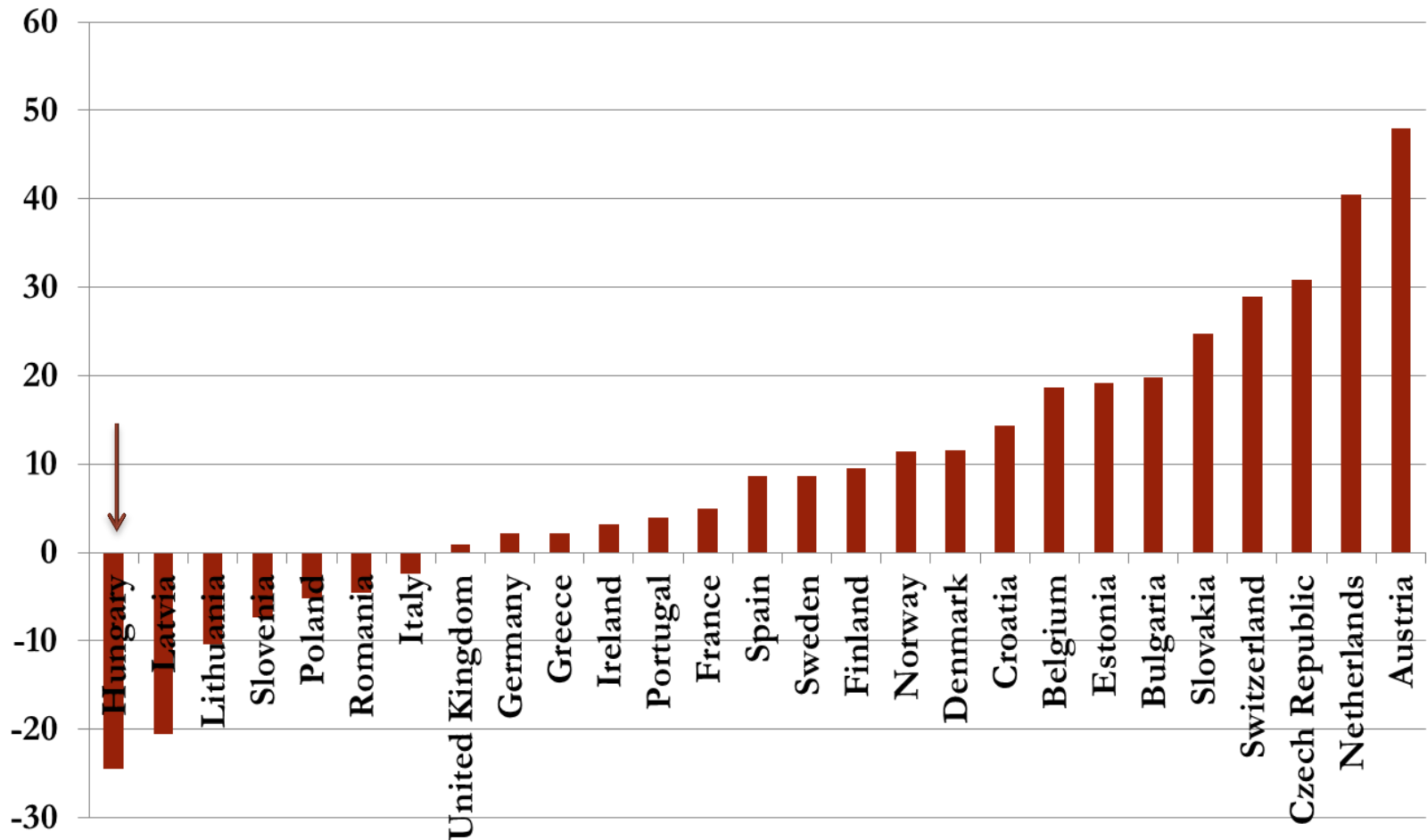
# Reasons underlying the lag

- Strong US dominance in international higher education
  - *Ranking lists of universities (ARWU, THES, QS) – a complex problem of competitiveness analysis*
  - Johns Hopkins University (2012: \$2 106 185 000),  
University of Michigan (2012: \$ 1 322 711 000),  
Harvard (2012 - \$799 432 000)
- English as a lingua franca
- US – one national market of scientific output
- Institutional differences

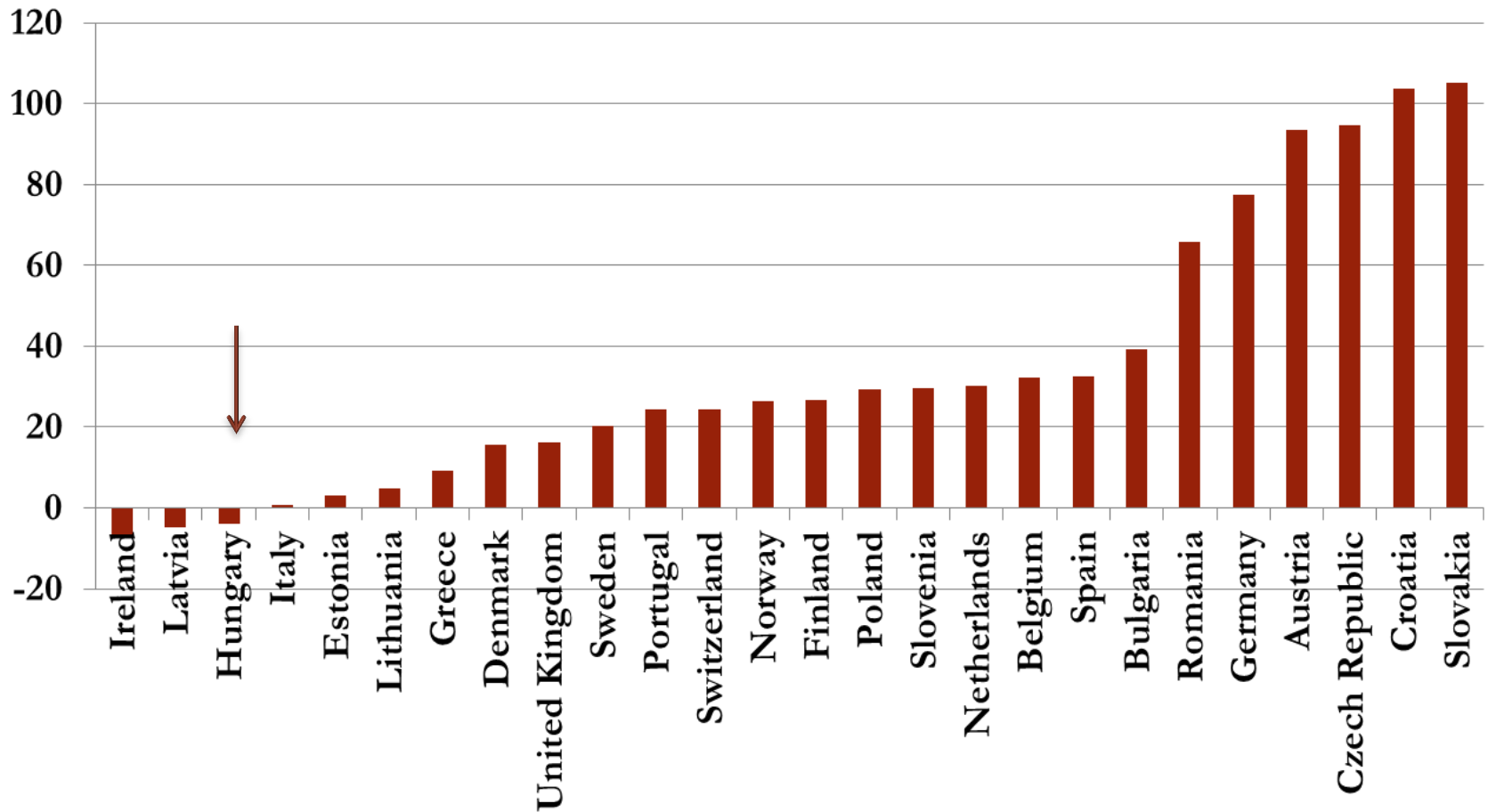
## Number of students in tertiary education (2005, 2011, in thousand)



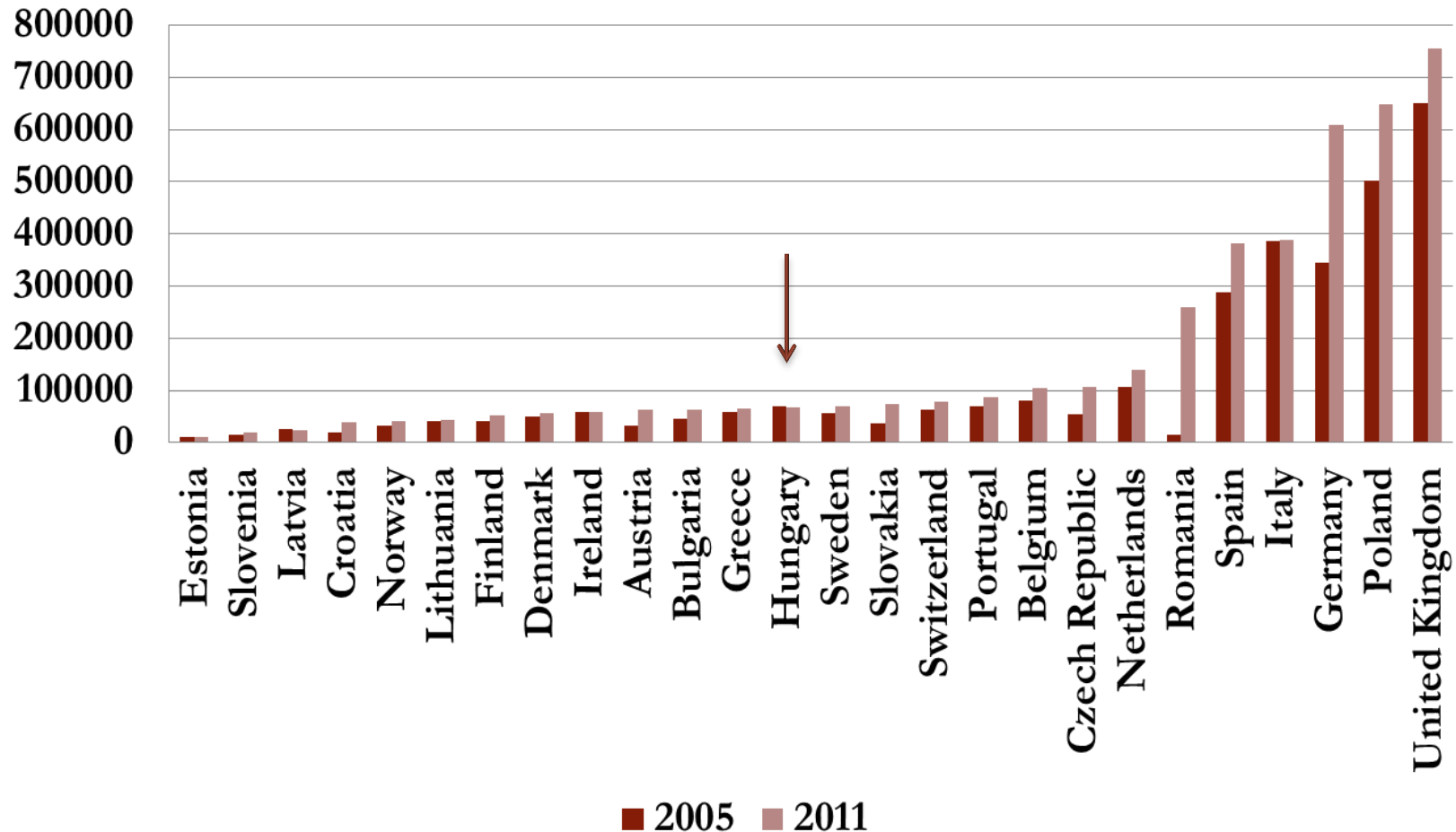
## Changes in the number of students (2005-2011, %)



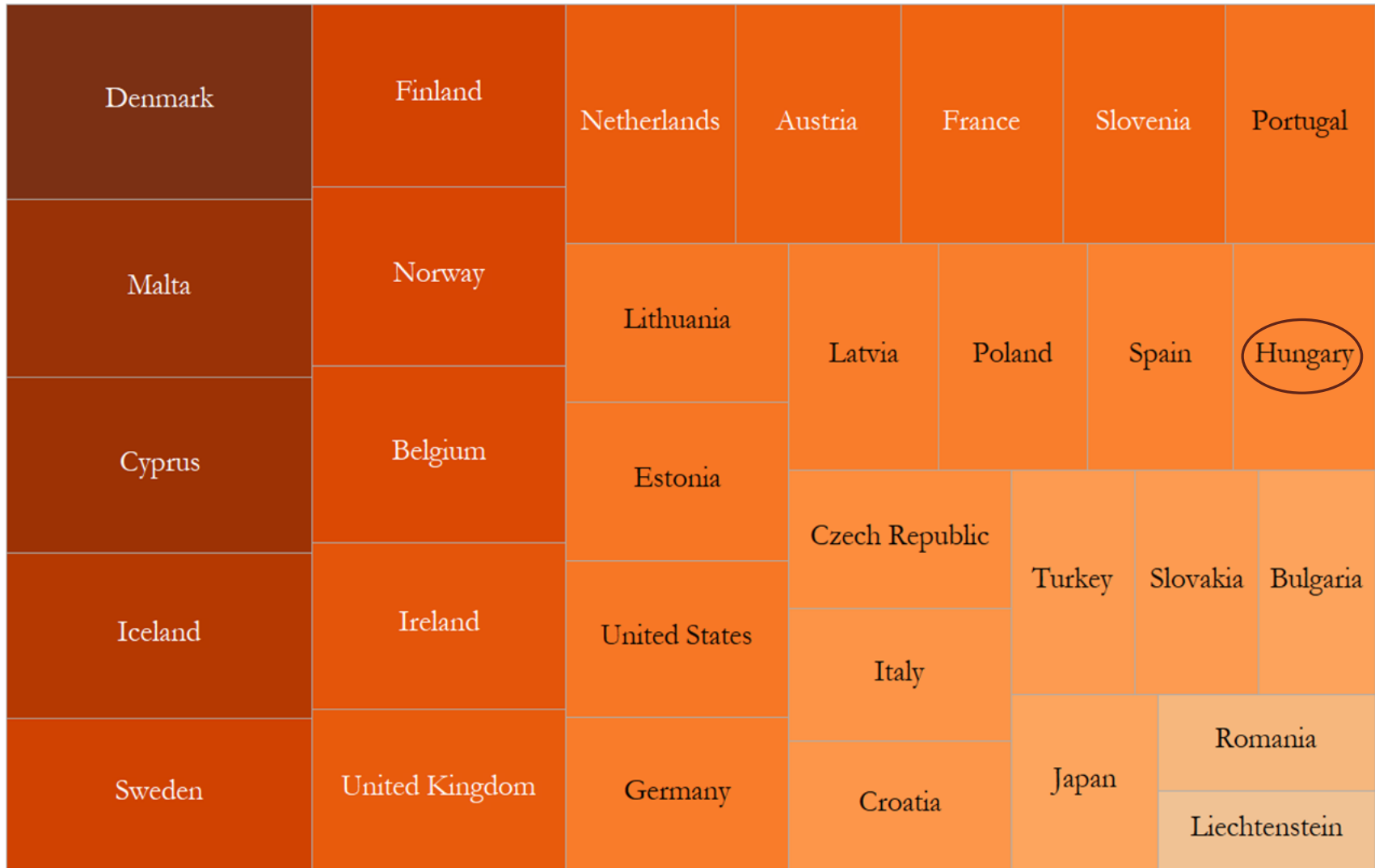
## Number of graduates (changes between 2005-2011, %)



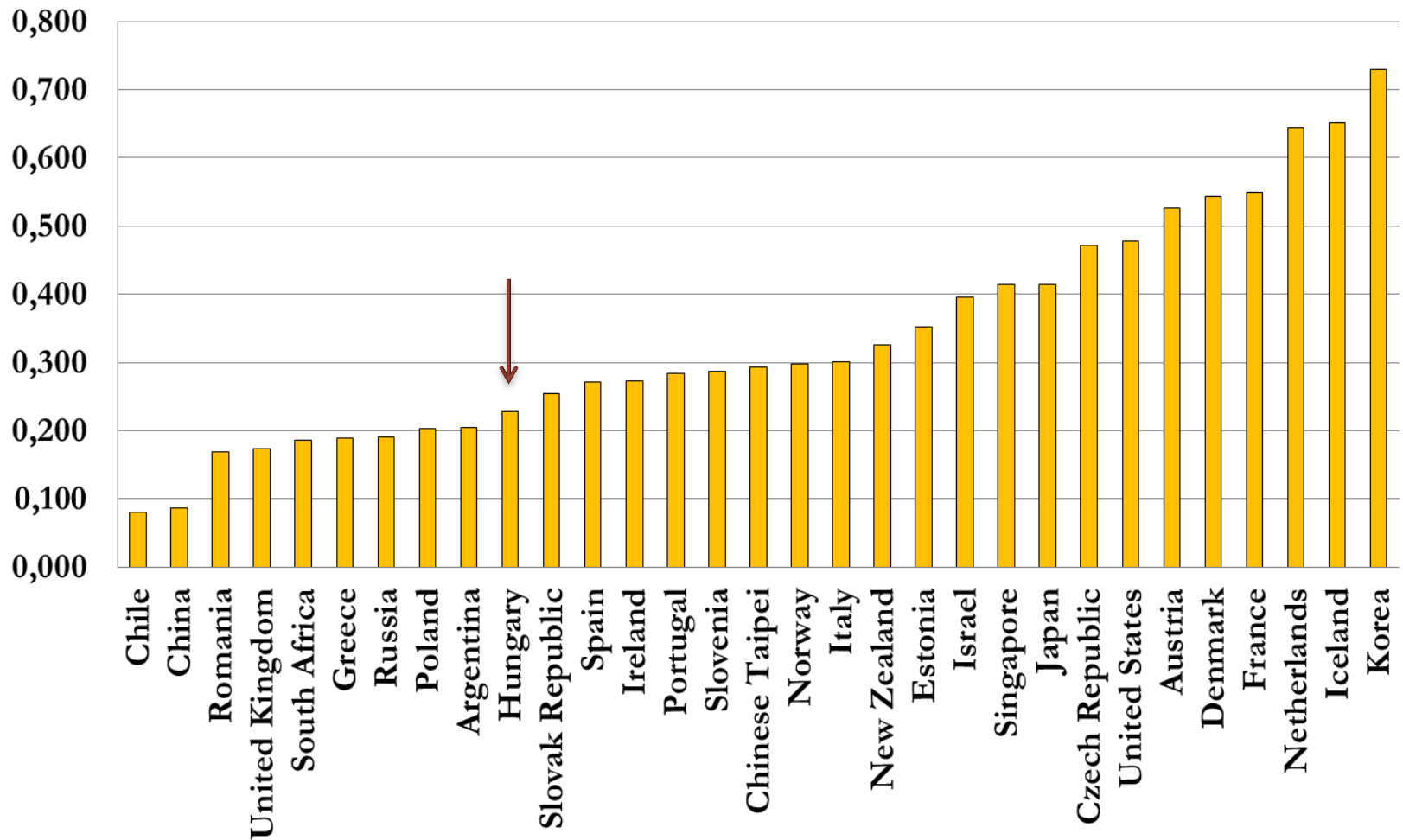
## Number of graduates (2005, 2011)



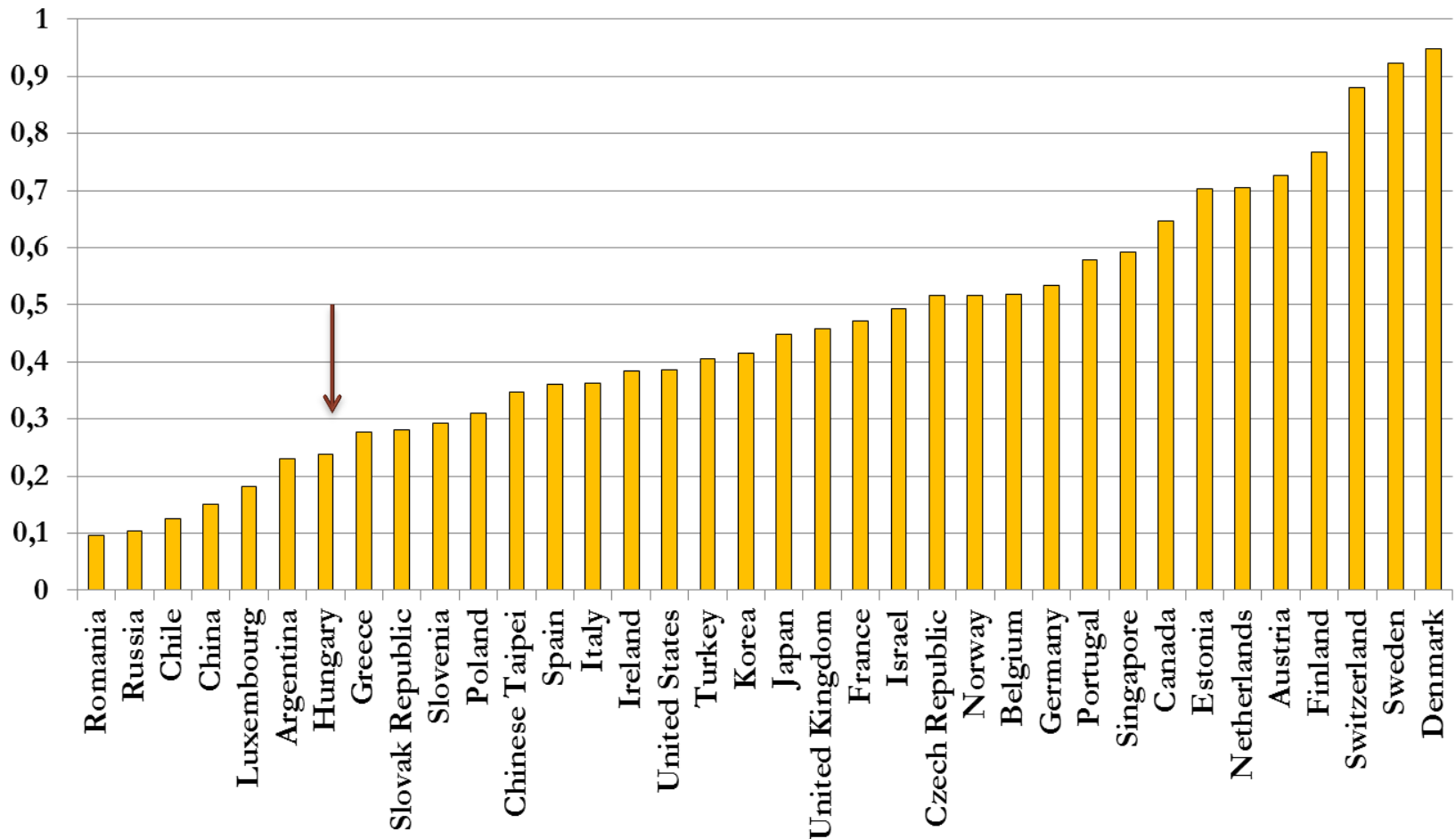
## Public expenditure on education (% of GDP, 2011)



## Basic research expenditure as a percentage of GDP (2011)

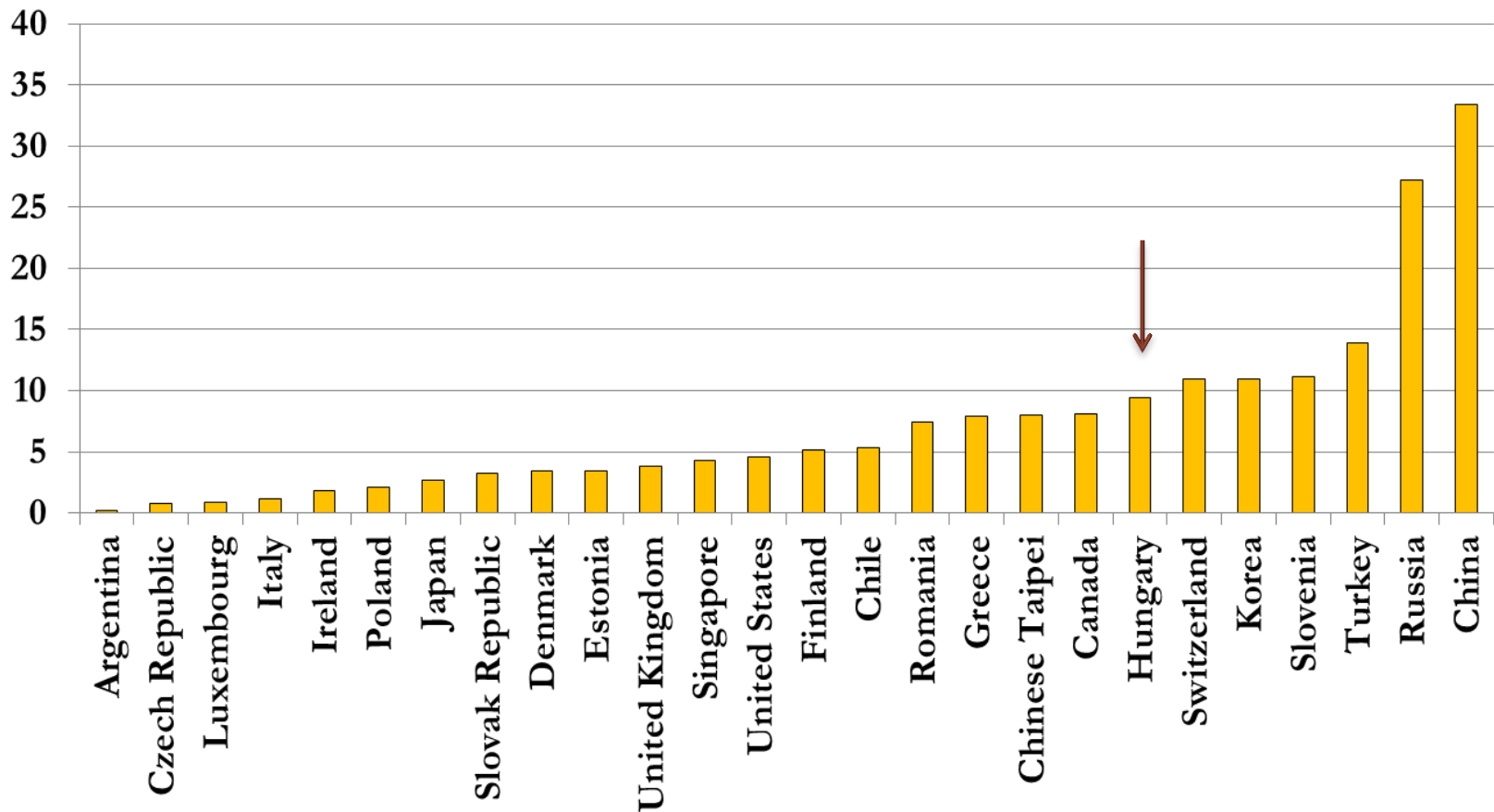


# Higher education expenditure (HERD) on R&D as a percentage of GDP (2012)

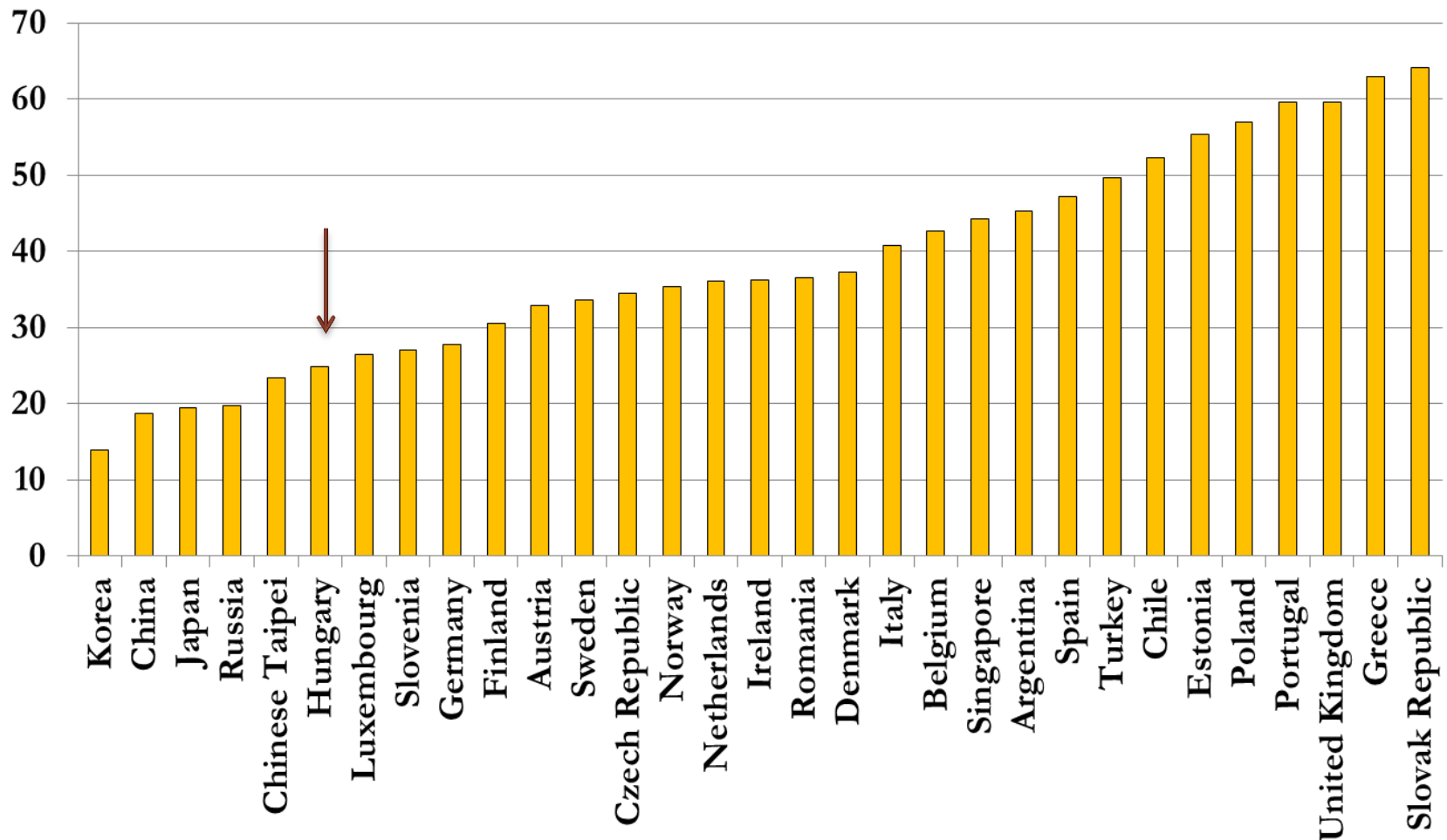




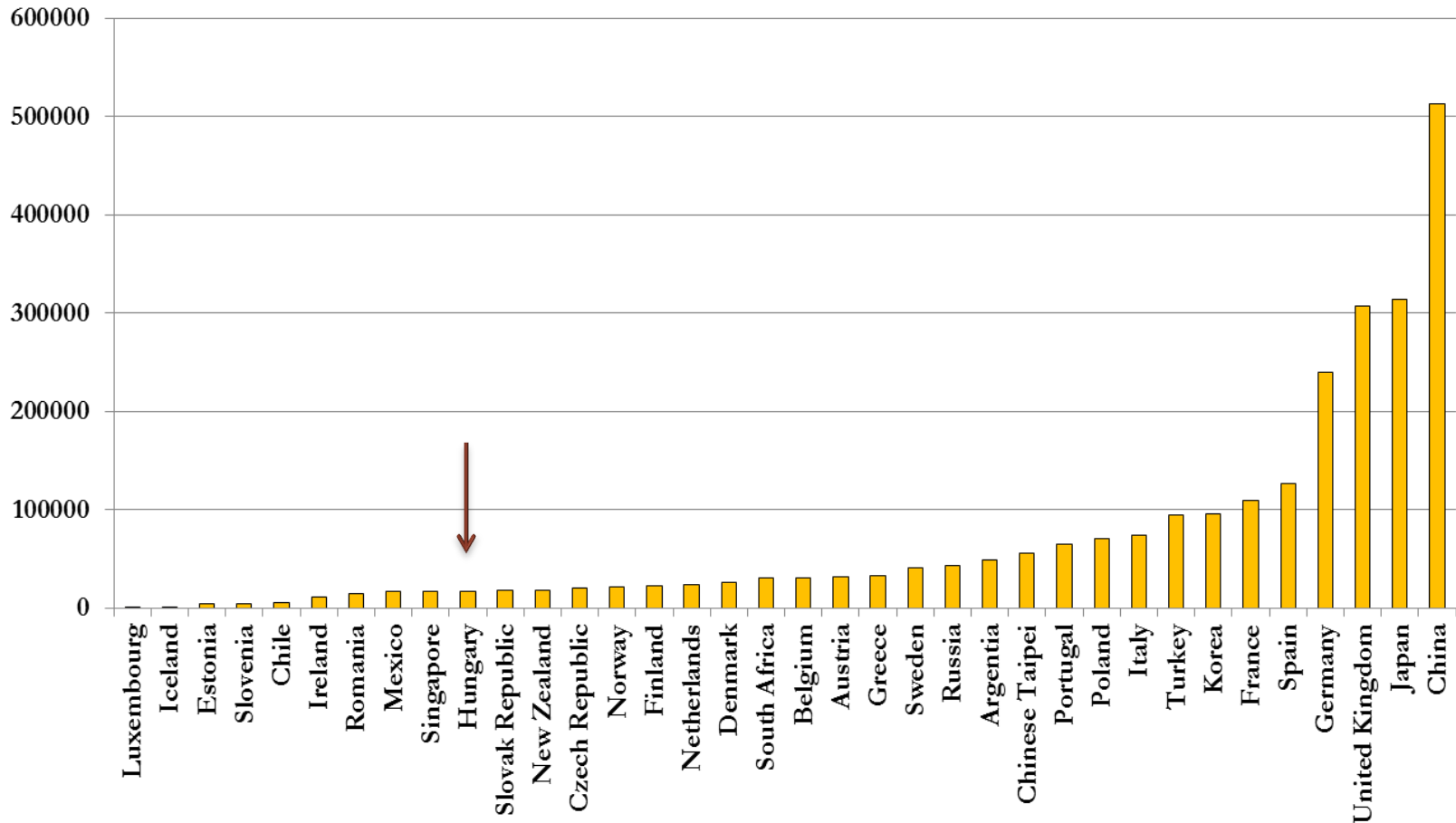
## Percentage of HERD financed by industry (2012)



## Higher education researchers as a percentage of national total (2012)



# Higher education sector: Total researchers (headcount)



- How could the international dimension of higher education competition be assessed?
- Are international ranking lists of universities good measures of universities' competitiveness?

# Short history of university rankings

- Carl Kořistka: **"The higher polytechnic education in Germany, in Switzerland, in France, Belgium and England"** (1863)
  - Very simple analysis of one segment of higher education
- Alick Henry Herbert Maclean: **„Where we get our best men.** Some statistics showing their nationalities, countries, towns, schools, universities, and other antecedents” (1900)
  - Scientific performance as a proxy
- 1983: **„America’s Best colleges”** – US News and World Report
- 1993: **„Times Good University Guide”**
- 2003: **Academic Ranking of World Universities (ARWU)** – Shanghai Jiao Tong University
- 2004: **Times Higher Education World University Rankings**

# Size does not matter?

- In some countries (e.g. India, Russia) centralized national „super-universities” exist with good chances of faring well on lists.
- University of Budapest?

# Performance criteria of universities

- Research output?
- Innovation output?
- Graduate degree output? (mass)
- PhD degree output? (quality)

# University rankings

- **Academic Ranking of World Universities**  
(ARWU, Shanghai Ranking)
- **The Times Higher Education Supplement**  
(THES)
- *U21 ranking (countries)*
- **QS ranking**
- *Multiranking (scoring based on individual weighing)*
- *Webometrics (ranking list without scores)*

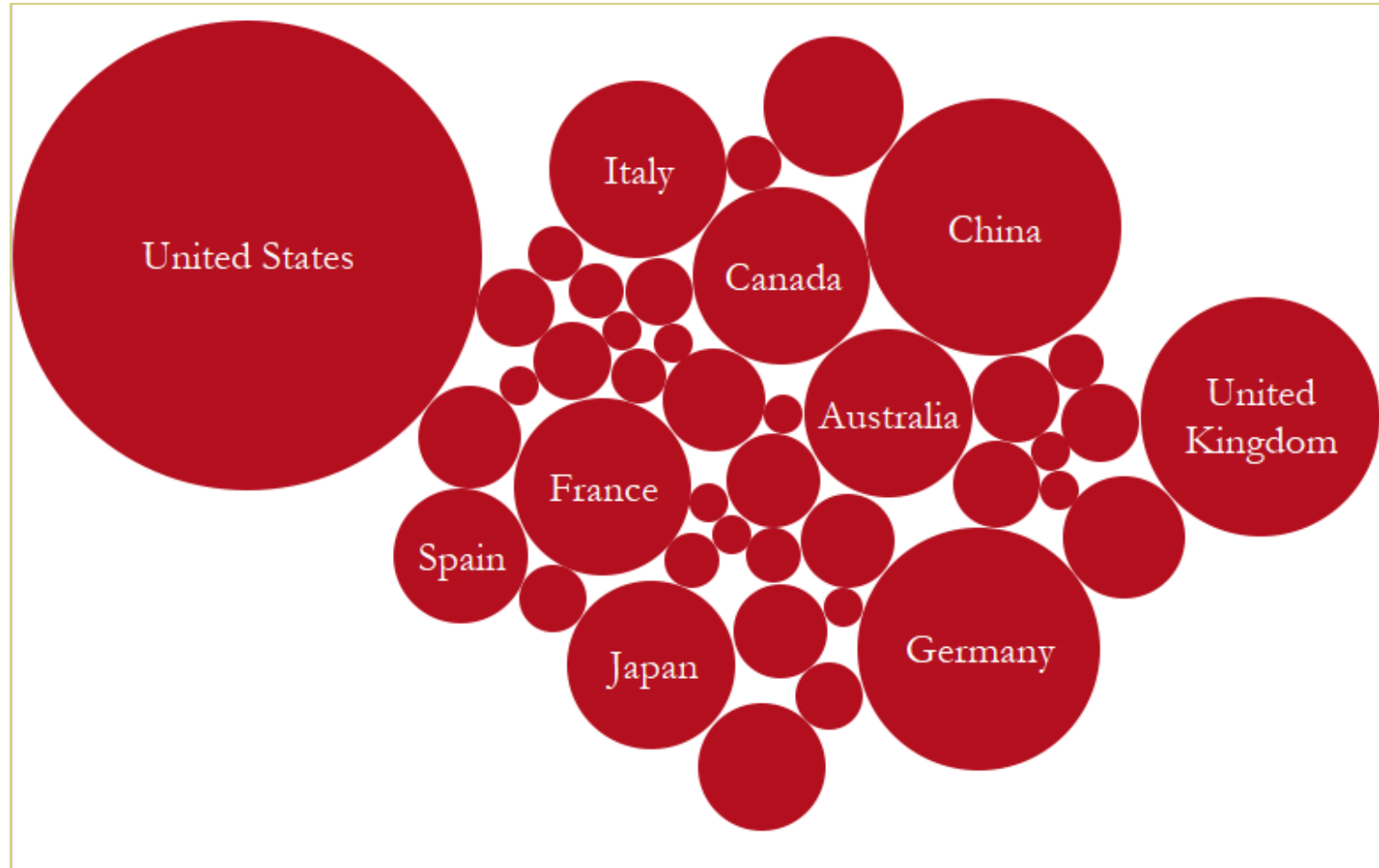


	<b>Publisher</b>	<b>First published</b>	<b>Indicators</b>
<b>ARWU</b>	Jiao Tong University, Shanghai	2003	<ul style="list-style-type: none"> <li>- quality of education</li> <li>- quality of faculty</li> <li>- research output</li> <li>- per capita academic performance</li> </ul>
<b>THES</b>	The Times	1971 (2008 - online)	<ul style="list-style-type: none"> <li>- teaching</li> <li>- research</li> <li>- citations</li> <li>- international mix</li> <li>- funds from industry</li> </ul>
<b>QS</b>	Quacquarelli Symonds	2004 (2011 – new methodology)	<ul style="list-style-type: none"> <li>- Academic peer review</li> <li>- Employment reputation</li> <li>- Faculty/student ratio</li> <li>- Citations per faculty</li> <li>- Proportion of international students</li> <li>- Proportion of international faculty</li> </ul>

# National rankings

- Austria: FORMAT-Ranking, Technische Universität – Wien
- Bulgaria: Bulgarian University Ranking System – Ministry of Education and Science
- Germany: Centre for Higher Education Development (CHE) – (CHE Hochschulranking), WirtschaftsWoche
- Hungary: felvi.hu, HVG
- Romania: Ad Astra (in 2006, 2007)
- Slovakia: Academic Ranking and Rating Agency (ARRA)

# Universities in the TOP500 (2014)



# The ARWU Criteria

Criteria	Indicator	Weight
Quality of Education	Alumni of an institution winning Nobel Prizes and Fields Medals	10%
Quality of Faculty	Staff of an institution winning Nobel Prizes and Fields Medals	20%
	Highly cited researchers in 21 broad subject categories	20%
Research Output	Papers published in Nature and Science	20%
	Papers indexed in Science Citation Index-expanded and Social Science Citation Index	20%
Per Capita Performance	Per capita academic performance of an institution	10%

# Comments on the ARWU criteria

- A pure research centre called „university” could also perform well
- Size of institution often exogenous (depending on policy decisions)
- How are co-authored publications counted?
- Are Nobel Prizes and Field medals of teachers good measures of scientific excellence?
  - Szent-Györgyi Albert – University of Szeged

# ARWU 2014

World Rank	Institution	Country/Region	National Rank
1	Harvard University	United States	1
2	Stanford University	United States	2
3	Massachusetts Institute of Technology (MIT)	United States	3
4	University of California Berkeley	United States	4
5	University of Cambridge	United Kingdom	1
...			
301-400	Eötvös Loránd University	Hungary	1
401-500	University of Szeged	Hungary	2

# The THES Criteria

Criteria	Indicator	Weight
Teaching	The learning environment	30%
Research	Volume, income and reputation	30%
Citations	Research influence	30%
Industry income	Innovation	2,5%
International outlook	Staff, students and research	7,5%

## Comments on the THES criteria

- Citations (with all the shortcomings of this measure) also considered as important
- International component has some weight



# THES 2013-2014

World Rank	Institution	Country/Region
1	California Institute of Technology	United States
2	Harvard University	United States
3	University of Oxford	United Kingdom
4	Stanford University	United States
5	Massachusetts Institute of Technology (MIT)	United States

# The QS Criteria

Criteria	Indicator	Weight
Academic reputation	From global survey	40%
Employer reputation	From global survey	10%
Faculty/student	Faculty student ratio	20%
Citations per faculty	From Scopus	20%
International students	Proportion of foreign students	5%
International Faculty	Proportion of faculty from abroad	5%

# Comments on the QS list

- Relatively strong presence of non-American universities even in TOP 20 (UK: 6, CH: 2, CAN: 1)
- International component has some weight (like in the THES)

# QS 2014-2015

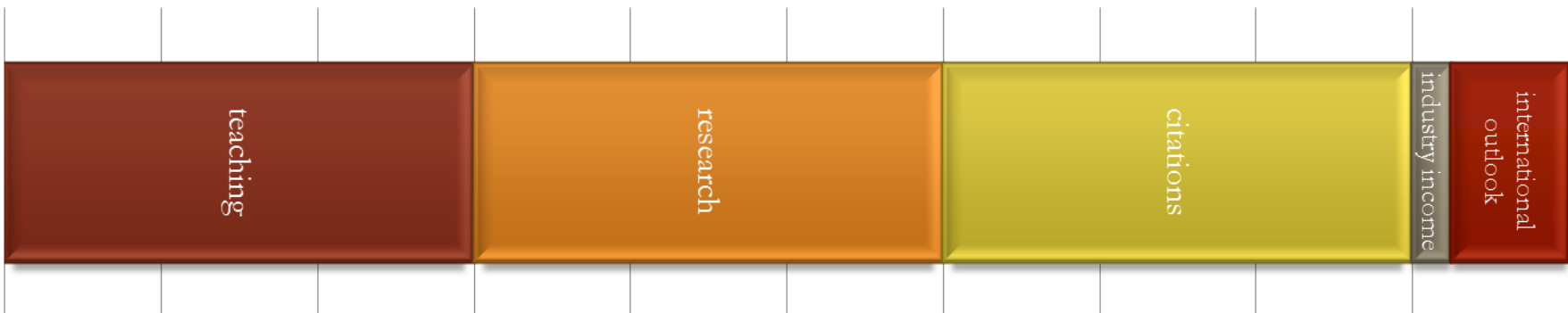
World Rank	Institution	Country/Region
1	Massachusetts Institute of Technology (MIT)	United States
2	University of Cambridge	United Kingdom
2	Imperial College London	United Kingdom
4	Harvard University	United States
5	University of Oxford	United Kingdom
5	Univeristy College London	United Kingdom

# QS 2014-2015

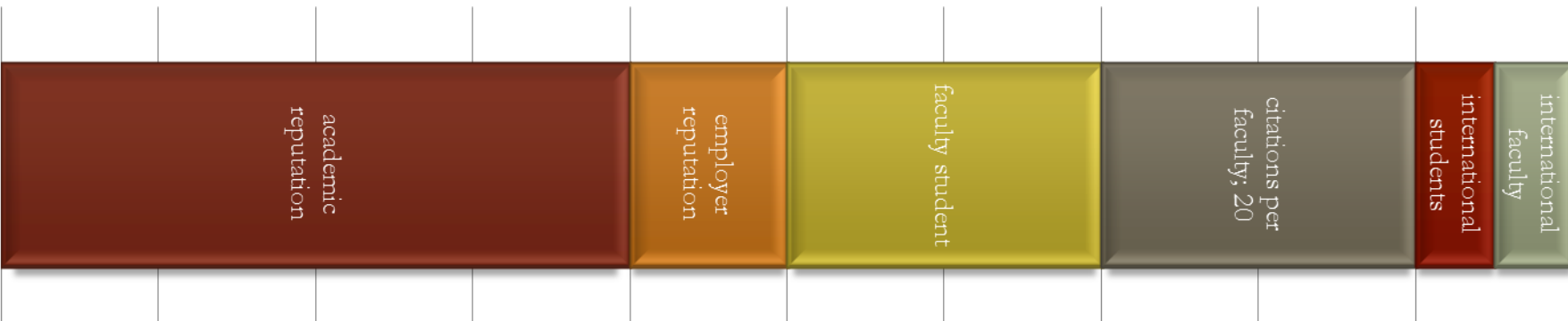
World Rank	Institution	Country/Region
551-600	University of Szeged	Hungary
601-650	Eötvös Loránd University	Hungary
601-650	University of Debrecen	Hungary
701+	Corvinus University of Budapest	Hungary



**ARWU**



**THES**



0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

**QS**

## Correlation between university ranking lists (score, 2011)

	ARWU	THES	QS
ARWU	1	,840	,671
THES	,840	1	,732
QS	,671	,732	1

## Correlation between university ranking lists (rank, 2011)

	ARWU	THES	QS
ARWU	1	,727	,578
THES	,727	1	,576
QS	,578	,576	1

# Correlation between ranking lists

	Cases		Pearson's R		Spearman Correlation	
	Valid	Missing	Value	Approx. Sig.*	Value	Approx. Sig.*
IMD rank – TIMES rank	24	35	,149	,489	,216	,311
IMD rank – ARWU rank	15	44	,298	,280	,229	,413
IMD rank – QS rank	42	17	,723	,000	<b>,722</b>	<b>,000</b>
IMD score – TIMES score	24	35	,348	,096	,344	,099
IMD score – ARWU score	15	44	,388	,218	,211	,451
IMD score – QS score	42	17	<b>,745</b>	<b>,000</b>	,729	,000
ARWU score – TIMES score	13	46	,651	,016	,527	,064
WEF rank – TIMES rank	24	38	,211	,323	,241	,257
WEF rank – ARWU rank	15	47	,336	,221	,261	,348
WEF rank – QS rank	42	20	,699	,000	<b>,743</b>	<b>,000</b>
WEF score – TIMES score	24	38	,315	,133	,381	,066
WEF score – ARWU score	15	47	,340	,216	,332	,226
WEF score – QS score	42	20	<b>,737</b>	<b>,000</b>	,750	,000



# University rankings: a complex problem of competitiveness analysis

- Competitiveness based ranking lists: supply-side and demand-side approach combined
- Universities:
  - Supply-side includes human capital and financing
  - Demand-side includes output, market shares and possible substitution effects
- Ranking lists surveyed: some of the most important components of usual competitiveness analysis missing
  - To be found: elements of human capital (e.g. awards and data on teaching staff) and output (e.g. citations)
  - Financing aspect and market shares completely missing

**THANK YOU FOR YOUR KIND  
ATTENTION!**

