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Global Higher Education: Challenges and opportunities

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Combined and uneven globalisation

In some respects tendencies to global integration are reversing but not in higher education and science

sector	Global system	Multi-lateral	Border flows	Notes
Ecology	YES			The ecology is a natural global system
Trade	NO	YES*	YES	There are growing barriers to open trade
Finance	NO	YES	YES	Reversal of earlier growth of financial flows
Communications	YES*			Emerging national blockages, technology cold war
Governance	NO	YES**	NO	There is no momentum towards global integration
Science	YES	YES	YES	Global cooperation and integration are increasing
Higher education	NO	NO	YES	Extensive cross-border engagements and effects

* with exceptions, nations that operate outside the common framework

** weak except in Europe and to a more limited extent, ASEAN

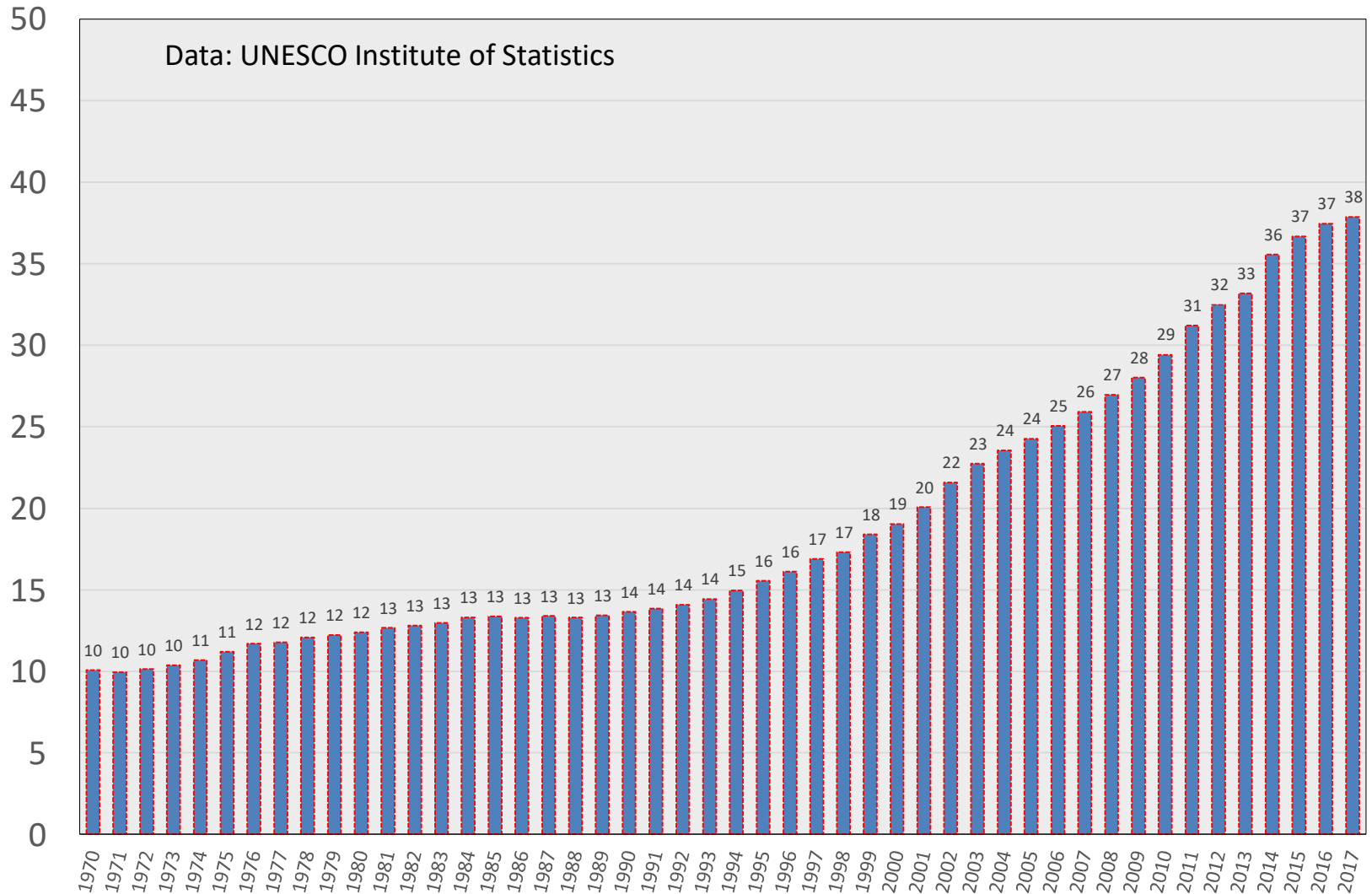
Global Higher Education: Challenges and opportunities

- Worldwide growth of tertiary education
- Growth and spread of science
- Diversification of science power and rise of China
- Brexit: 'Good-bye to all that?'
- Opportunities and challenges

GROWTH OF TERTIARY EDUCATION

World Gross Enrolment Ratio (%): 1970-2017

In 2017 there were 220 million tertiary students



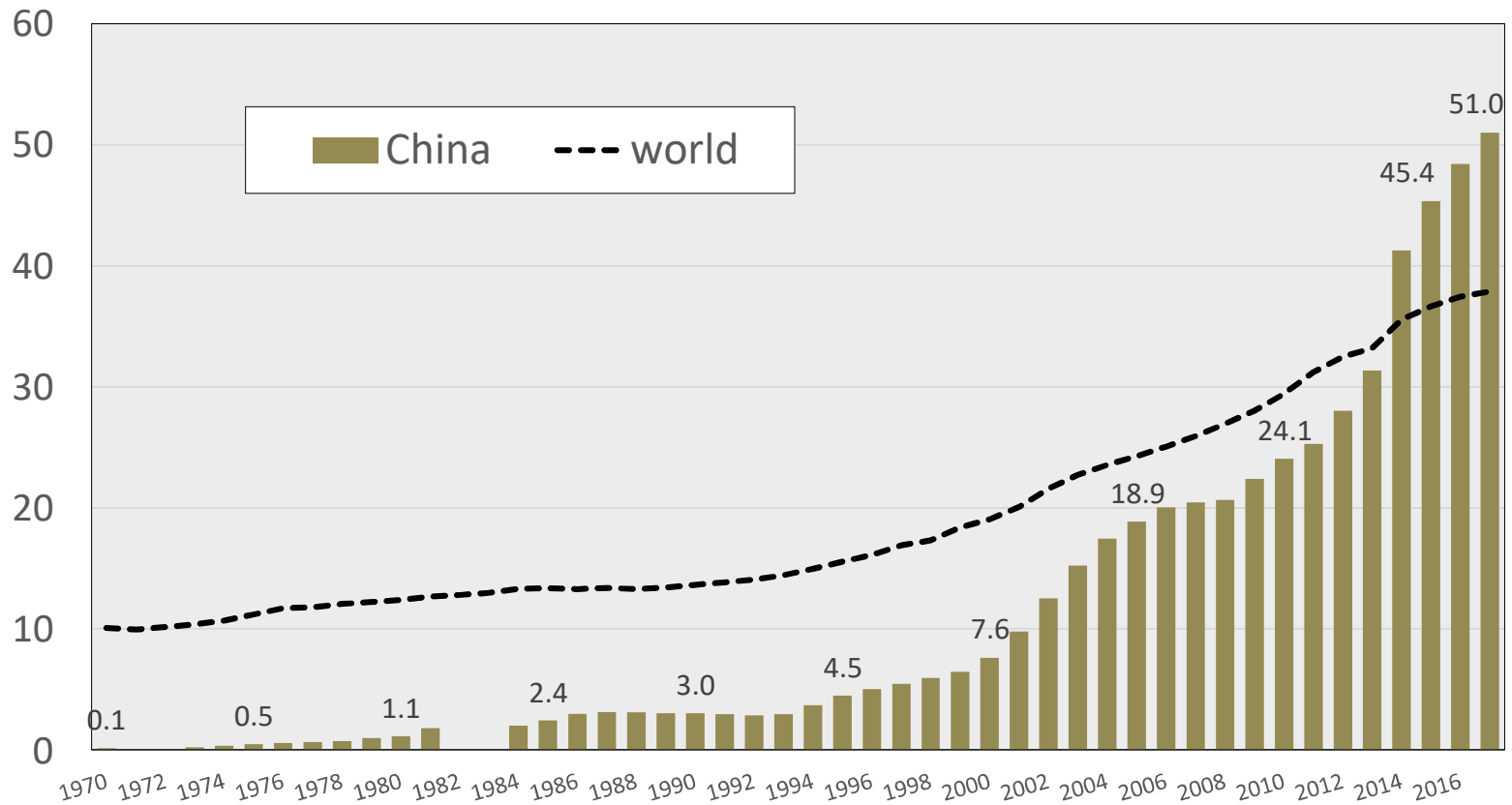
Regional Gross Tertiary Enrolment Ratios (%)

1970, 1990, 2010 and 2017 (UNESCO)

	1970 (%)	1990 (%)	2010 (%)	2017 (%)
World	10.0	13.6	29.3	37.9
Central and Eastern Europe	30.2	33.9	67.9	80.3
North America/ Western Europe	30.6	48.6	76.9	78.4
Latin America and Caribbean	6.9	16.9	40.9	50.6
East Asia and Pacific	2.9	7.3	27.3	46.7
Arab States	6.0	11.4	25.5	37.4
Central Asia	n.a.	25.3	26.7	26.3
South and West Asia	4.2	5.7	17.4	24.9
Sub-Saharan Africa	0.9	3.0	7.7	9.0

Accelerating growth in China

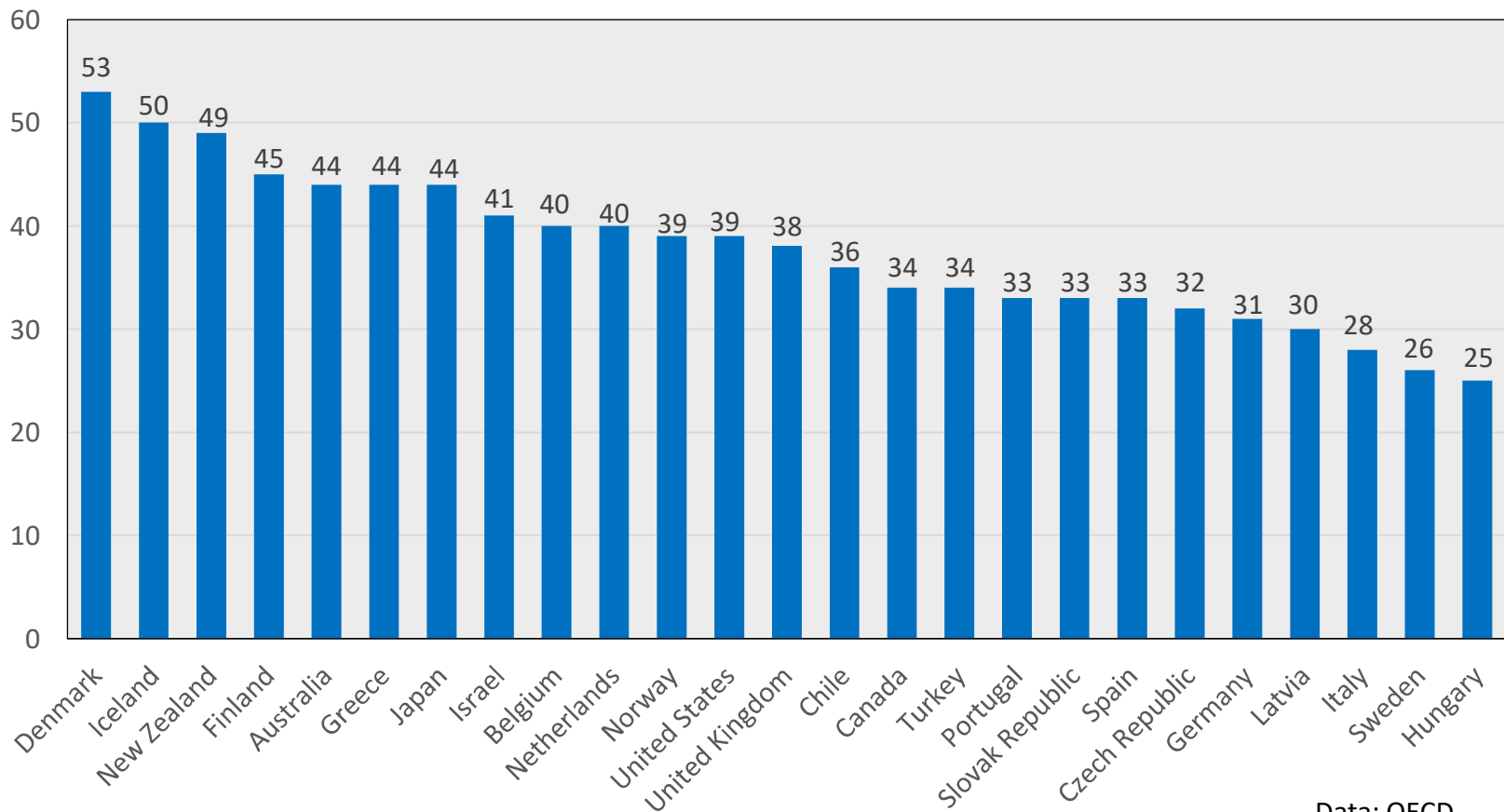
Gross Enrolment Ratio (%): 1970-2017



Data: UNESCO

First time graduation rates at Bachelor level, 2016

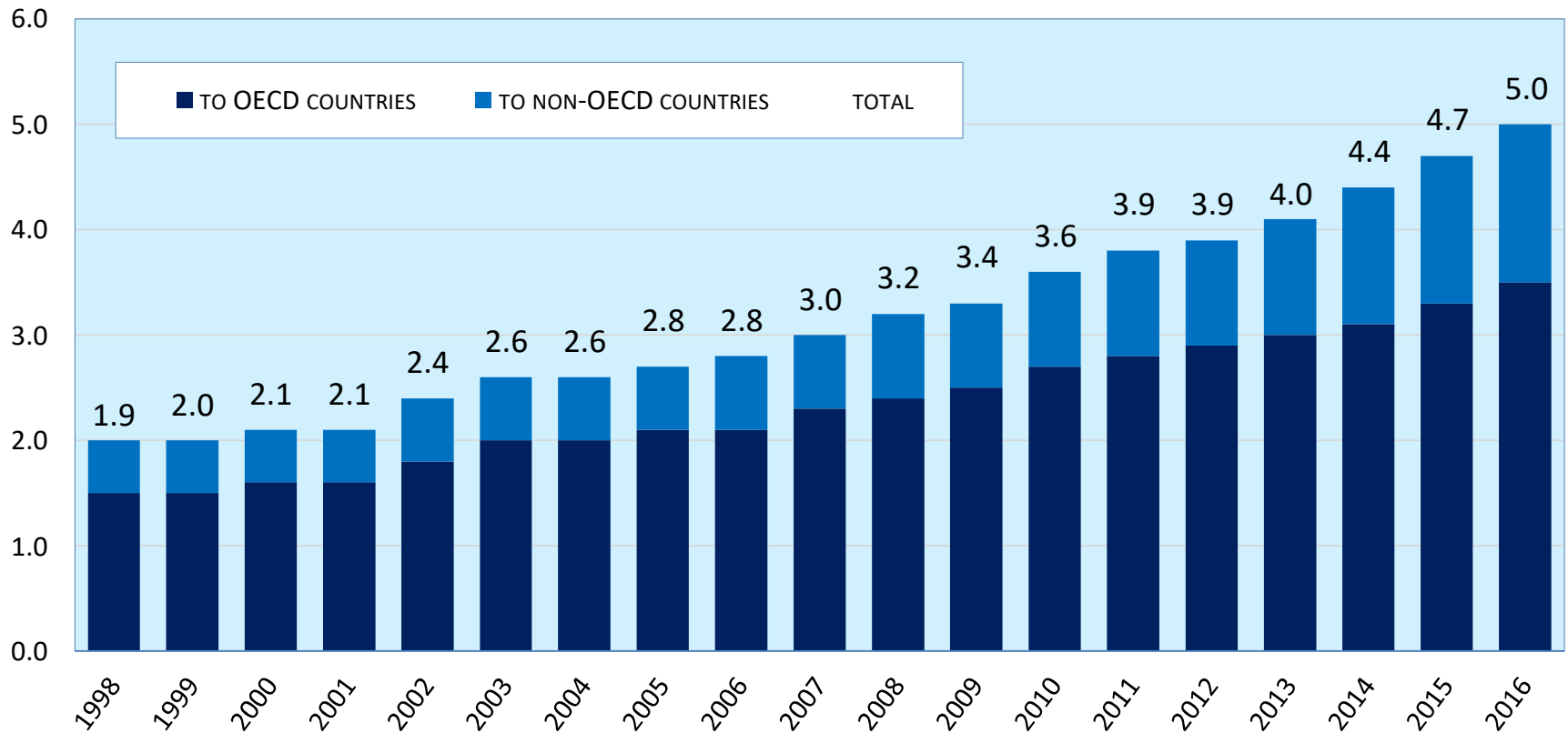
excludes international students



Data: OECD

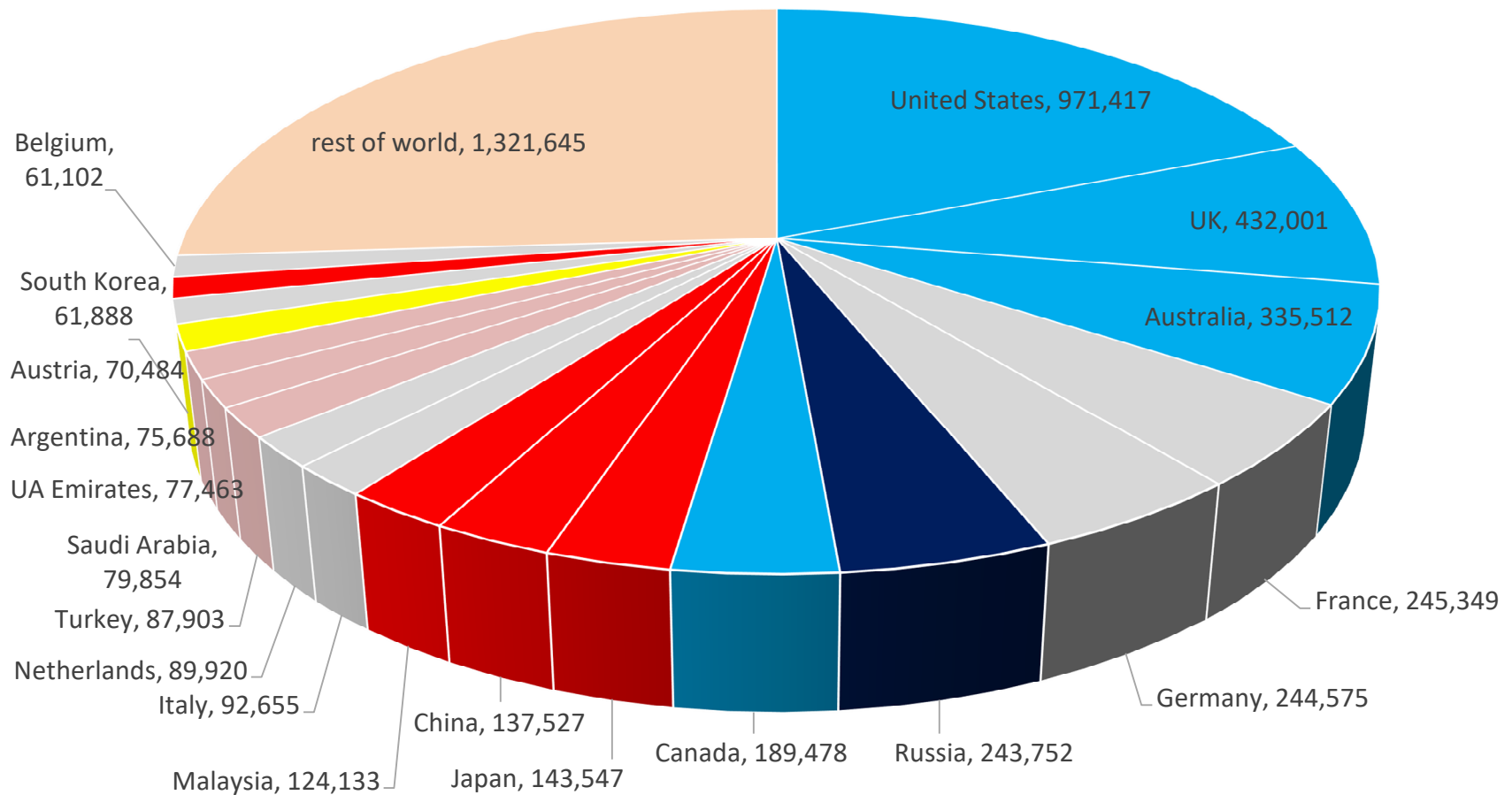
Total international/ foreign students in tertiary education, 1998-2016 (millions)

OECD data 2018



Data: OECD

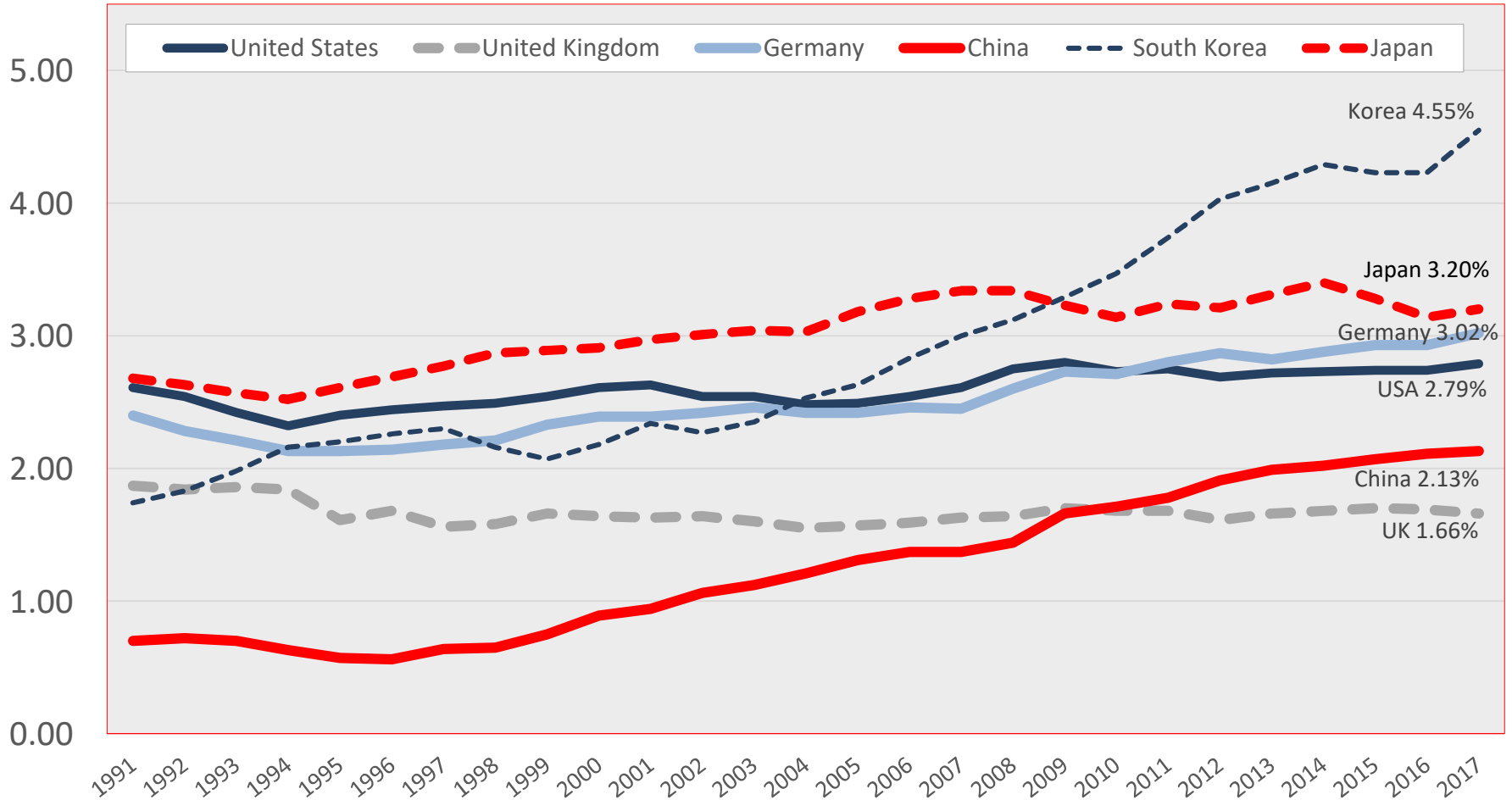
Distribution of incoming students: 2016, OECD data



GROWTH AND SPREAD OF SCIENCE

R&D as proportion (%) of GDP, 1991-2017:

USA, UK, Germany, China, Japan, South Korea



Data: OECD

Universities producing over 5000 papers and 200 high citation (top 5%) papers

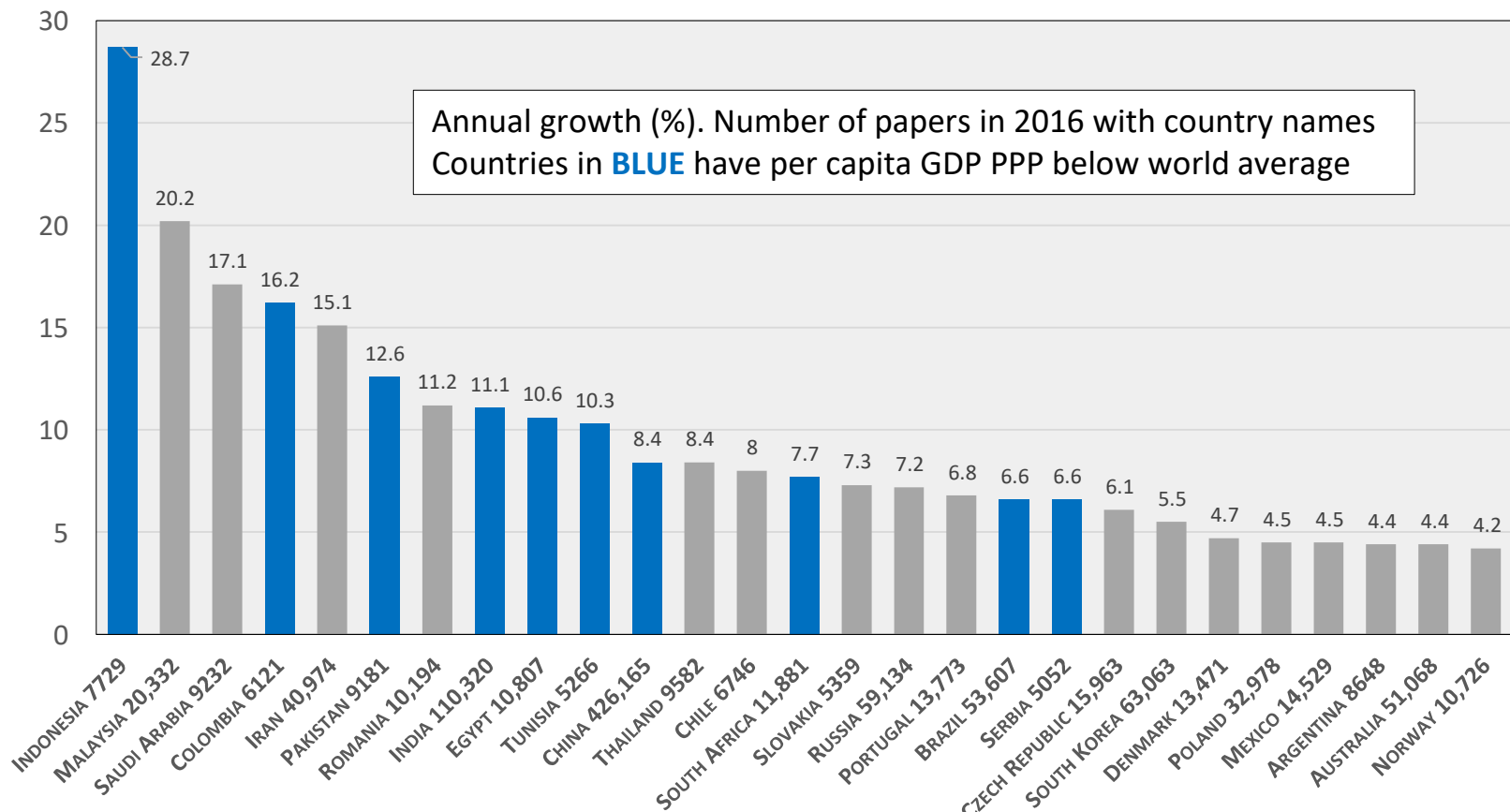
2006-09 to 2014-17

	2006-2009	2007-2010	2008-2011	2009-2012	2010-2013	2011-2014	2012-2015	2013-2016	2014-2017
5000 papers or more									
WORLD	131	139	144	152	167	185	196	209	215
CHINA	10	15	16	18	21	25	29	39	44
200 high citation papers or more (papers in top 5% of their research field)									
WORLD	197	203	212	226	243	258	267	277	291
CHINA	8	9	12	18	23	30	34	41	47

Data: Leiden ranking

Average annual rates of growth (%) in science papers: 2006-2016

countries with growth rate above world average of 3.9% and producing more than 5000 papers in 2016



Proportion of all science papers that were internationally co-authored

selected countries: 2003 and 2016

Country	2003 %	2016 %
TEN LARGEST RESEARCH SYSTEMS		
United Kingdom	36.9	57.1
France	39.6	54.8
Germany	39.4	51.0
Italy	33.1	47.3
United States	23.3	37.0
Japan	18.9	27.9
South Korea	25.1	27.0
Russia	26.9	25.1
China	15.3	20.3
India	18.1	17.4

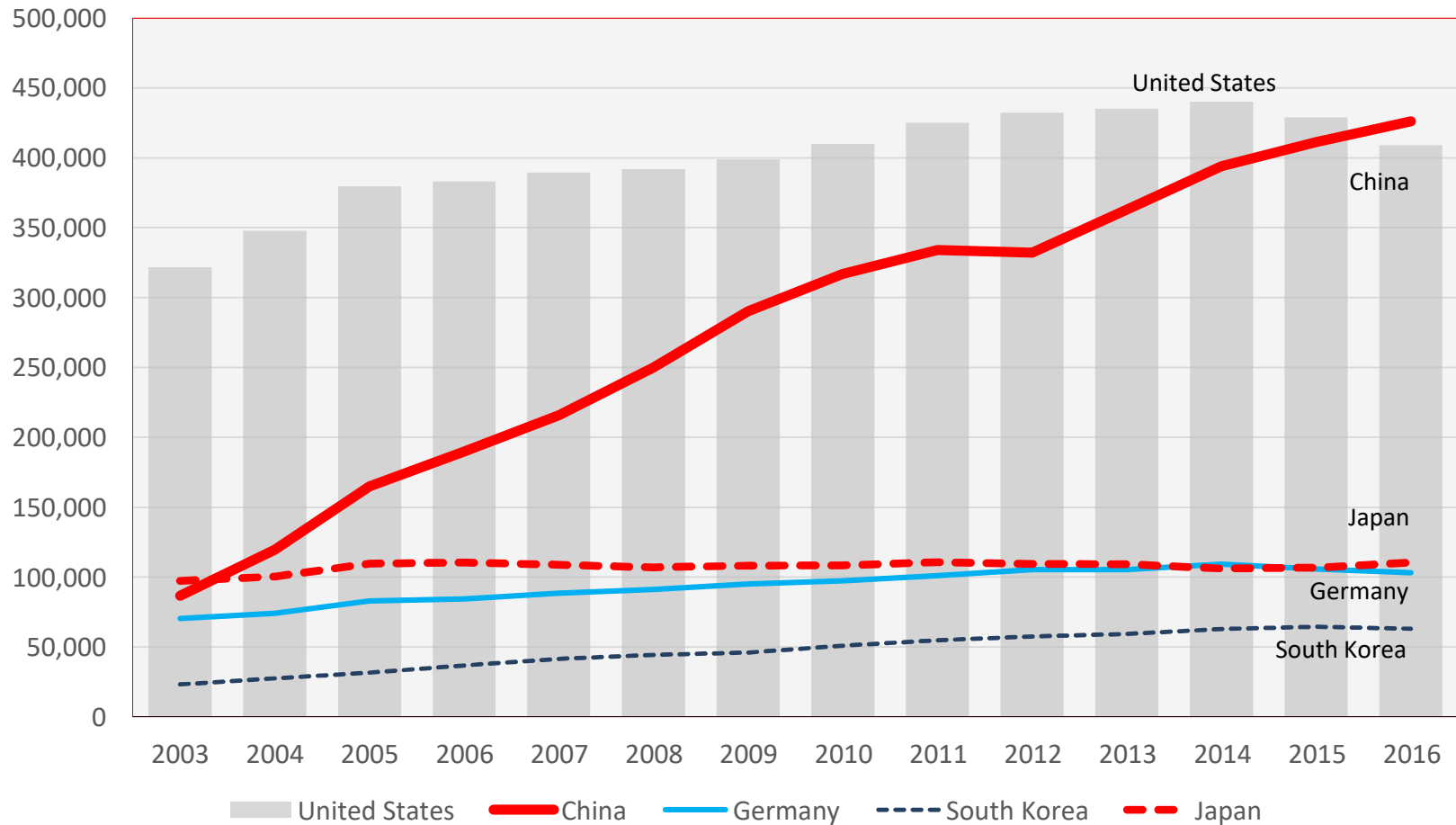
Country	2003 %	2016 %
STRONG SMALLER RESEARCH SYSTEMS		
Switzerland	54.5	69.2
Denmark	47.7	63.3
Singapore	35.0	62.8
Netherlands	44.7	61.8
Finland	41.2	60.4
SOME RECENTLY EMERGED SYSTEMS		
Saudi Arabia	34.5	76.8
Chile	52.7	61.7
Brazil	27.2	32.5
Iran	24.2	20.8

Data: US NSB

DIVERSIFICATION OF SCIENCE POWER AND RISE OF CHINA

Annual number of published papers

US, China, Germany, Japan, South Korea: 2003-2016



Data: US National Science Board

Growth in high citation (top 5%) papers

selected East Asian universities: 2006-09 to 2012-15

University		Top 5% papers 2006-2009	Top 5% papers 2014-2017	Growth 2006-09 to 2014-17 p.a.
Tsinghua U	CHINA	402	1270	15.46%
Zhejiang U	CHINA	335	1092	15.92%
Shanghai Jiao Tong U	CHINA	314	939	14.67%
Peking U	CHINA	307	831	13.26%
Huazhong UST	CHINA	114	693	25.31%
Harbin IT	CHINA	180	630	16.95%
U Hong Kong	HONG KONG SAR	308	424	4.08%
National U Singapore	SINGAPORE	513	890	7.13%
Nanyang Technological U	SINGAPORE	275	772	13.77%
Tokyo U	JAPAN	656	627	- 0.56%
Kyoto U	JAPAN	485	438	- 1.27%
Seoul National U	STH. KOREA	343	553	6.15%
National Taiwan U	TAIWAN	276	311	1.50%
MIT	USA	1226	1549	2.97%
U Cambridge	UK	1017	1324	3.35%

Data: US NSB

Top universities in STEM research

(1) physical sciences and engineering, and (2) mathematics and complex computing,
 Papers in top 5 per cent of their field by citation rate, World: 2014-2017

University	System	Physical sciences & engineering
Tsinghua U	CHINA	776
MIT	USA	691
Stanford U	USA	598
UC, Berkeley	USA	580
Harvard U	USA	552
Zhejiang U	CHINA	509
Nanyang TU	SINGAPORE	503
U Science & T.	CHINA	452
U Cambridge	UK	449
Shanghai JTU	CHINA	398
ETH Zurich	SWITZERLAND	394
Peking U	CHINA	389
Imperial CL	UK	388
NU Singapore	SINGAPORE	384

University	System	Maths & computing
Tsinghua U	CHINA	236
Harbin IT	CHINA	182
Zhejiang U	CHINA	155
Huazhong U S&T	CHINA	153
U Electronic S&T	CHINA	143
Xidian U	CHINA	142
Beihang U	CHINA	141
MIT	USA	138
Nanyang TU	SINGAPORE	137
NU Singapore	SINGAPORE	137
Shanghai JTU	CHINA	130
City U HK	HK SAR	124
South East U	CHINA	123
Stanford U	USA	119

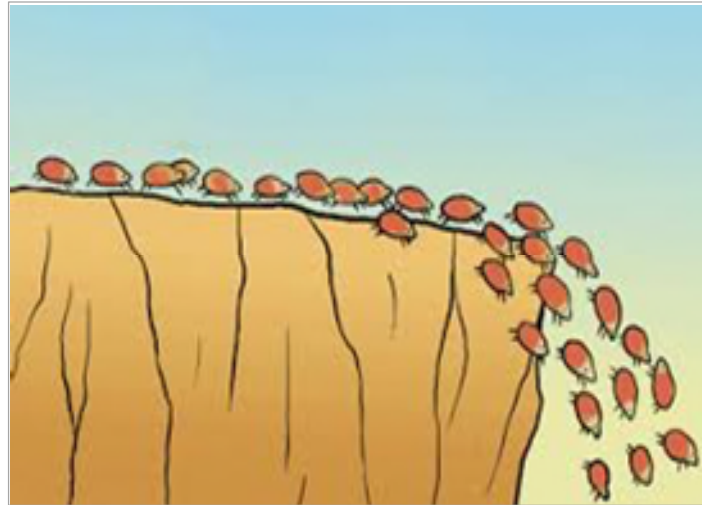
Top universities in Biomedical and Life/Earth

University	System	Top 5% papers in Biomedical and Health Sciences		University	System	Top 5% papers in Life and Earth Sciences
Harvard U	USA	2935		Harvard U	USA	261
Johns Hopkins U	USA	1085		Wageningen U	NETHERLANDS	253
U Toronto	CANADA	1071		U Washington Se.	USA	231
UC San Francisco	USA	967		ETH Zurich	SWITZERLAND	227
Stanford U	USA	915		UC Davis	USA	227
U College London	UK	850		UC Berkeley	USA	223
U Pennsylvania	USA	782		Cornell U	USA	206
U Michigan	USA	766		U Oxford	UK	200
U Washington Se.	USA	719		U Queensland	AUSTRALIA	187
U Oxford	UK	718		Stanford U	USA	187
Columbia U	USA	689		U Wisconsin-Madd.	USA	180
U Texas HSC Hou.	USA	667		U British Columbia	CANADA	170
Yale U	USA	661		MIT	USA	162
UC San Diego	USA	635		Ghent U	BELGIUM	161
UC Los Angeles	USA	602		Zhejiang U	CHINA	160

Chinese and Euro-American universities

	East (China) RED = features distinctive to China	West (e.g. USA, UK, Germany)
External governance	Integration of autonomous institutions into state strategies and policies via dual governance	Similar level of institutional autonomy as in China with a lesser level of integration into the state
Internal governance	Corporate forms, strong leaders, managed performance, self-improvement ethos	Strong corporate leaders in US/UK, more faculty-based in Europe, increasingly managed performance
Academic freedom	Emphasis on responsibility of and respect for faculty. High anxiety	Emphasis on freedom from interference. High anxiety
Knowledge, curriculum	Western not traditional Chinese epistemology, curricula, Confucian self-cultivation, high priority STEM	Western disciplines, weaker learning tradition/ less student work, more non-STEM disciplines than in China
Social relations	Focus on relations with industry and provincial cities/authorities	US outreach tradition, shift in most countries to industry/external links
International	High internationalisation(?) English, benchmarking, research, students	Internationalisation varies: e.g. second language in Europe not US

BREXIT: 'GOOD-BYE TO ALL THAT'?



UK and European research programmes

- In European Research Area's Seventh Framework Programme (FP7) cycle UK contributed €5.4 billion out of €50 billion; UK-based research organisations secured €8.8 billion in grants
- In the 2018 round of European Research Commission Advanced Grants the UK was most successful country, 66 applicants were awarded €155 million. UK universities also attracted Framework grant winners from other countries
- European Structural Funds: European Regional Development Fund (ERDF) grants in 2007-2013 provided €1.9 billion to UK research organisations; also EIB loans for research.
- Dependence on European funds varies by discipline: 13% overall, 38% archaeology, less than 10% clinical medicine

Research papers co-authored by UK researchers with other countries 2016

and propensity to collaborate with each country in the pair relative to the overall co-authorship patterns of both countries (1.00 = expected rate of collaboration): 2016

partner country	propensity to collaborate	co-authored papers
EUROPE		
Ireland	2.16	2,621
Greece	1.74	2,531
Netherlands	1.50	8,039
Denmark	1.43	3,658
Hungary	1.43	1,274
Norway	1.40	2,720
Finland	1.28	2,317
Italy	1.27	10,023
Sweden	1.27	4,967
Belgium	1.26	4,174
Switzerland	1.21	5,720
Portugal	1.19	2,309
Spain	1.16	7,789
Poland	1.12	2,523
Germany	1.07	14,200
Austria	1.03	2,514
France	1.01	10,079
Czech Republic	0.96	1,535
Russia	0.77	2,335

partner country	propensity to collaborate	co-authored papers
ANGLO-SPHERE		
New Zealand	1.35	1,640
South Africa	1.33	2,170
Australia	1.19	8,838
Canada	0.84	6,685
United States	0.77	25,858
EAST ASIA		
Singapore	0.77	1,541
Japan	0.65	3,659
China	0.62	10,472
Taiwan	0.57	981
South Korea	0.45	1,589
OTHER ASIA		
Thailand	0.94	862
Malaysia	0.84	1,428
Pakistan	0.76	847
India	0.67	2,494

Non-UK EU citizens in postgraduate research

12 largest populations in individual UK universities, 2017-18

Institution	Non-UK EU research students	All research students	Non-UK EU proportion (%)
University of Cambridge	1130	2820	40.1
University of Oxford	910	2495	36.5
Imperial College London	845	2105	40.1
University College London	845	2240	37.7
University of Edinburgh	745	1850	40.2
University of Manchester	470	1880	25.0
Kings College London	385	940	41.0
University of Nottingham	380	1295	29.3
University of Glasgow	335	1000	33.5
University of Birmingham	320	1110	28.8
University of Southampton	300	980	30.6
University of Sheffield	300	1295	23.2

Financial implications of Brexit

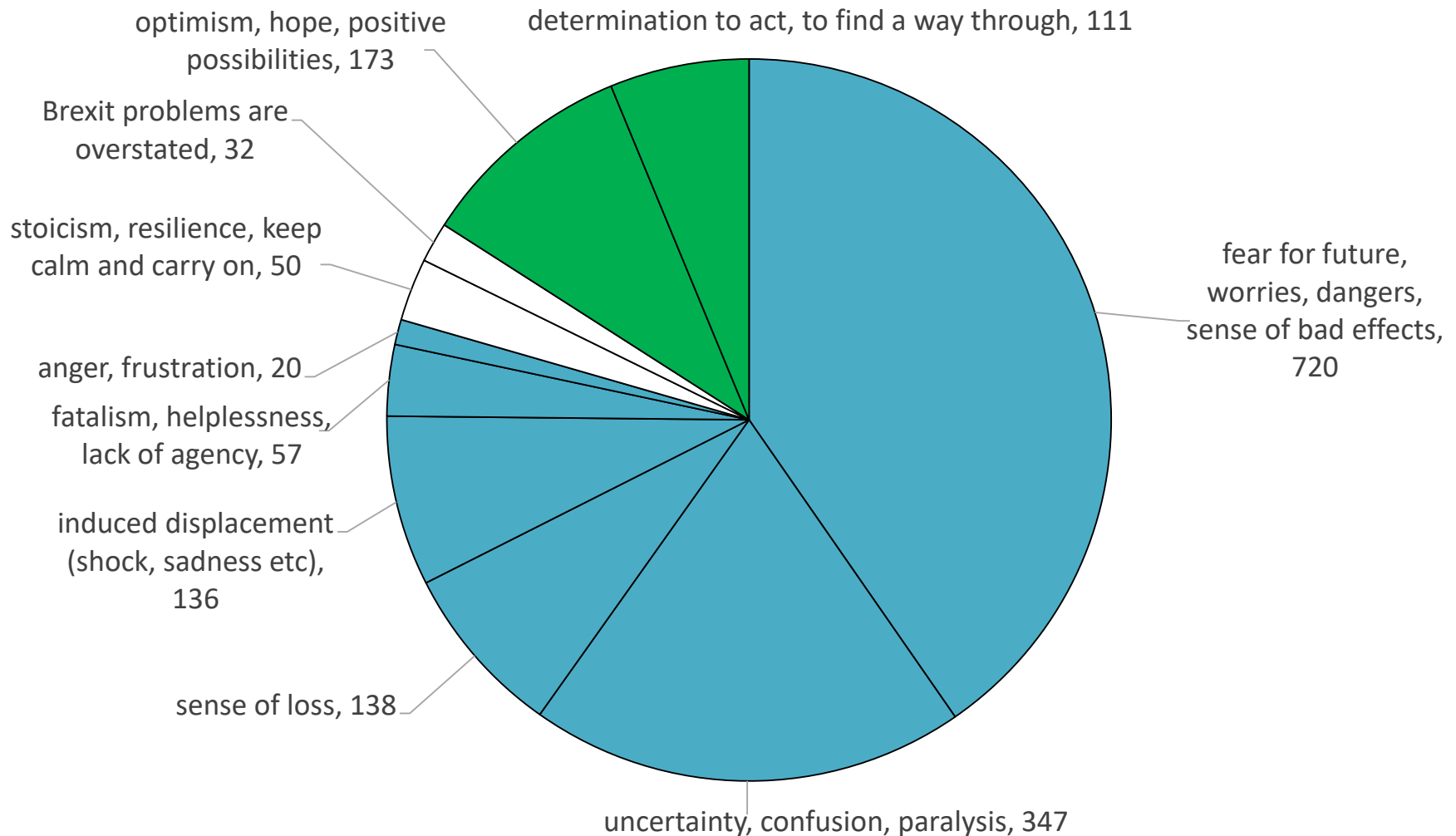
- Up to now UK universities have escaped austerity, benefitting from two public sector streams of funding, as well as the scope to generate international student fees
- Now they face Augar's 18% cut in unit funding over five years, and
- Loss of net income from EU research (both framework programmes and structural funds, loss of EU student fee revenues in many institutions, loss of EIB loans for infrastructure which have supported major projects across the country (e.g. €365.7 million UCL in 2015 and 2016))

Centre for Global Higher Education study of perceived consequences of Brexit

- Case studies, entailing interviews and review of documents, in 12 contrasting UK universities in the four nations. Interviews with institutional leaders and senior administrators, professors and researchers (sciences, health sciences, social sciences), others (junior staff, governing body, student leaders, etc).
 - England: UCL, Manchester, Durham, Sheffield Hallam, Coventry, Exeter, Keele, SOAS
 - Scotland: St Andrews, Aberdeen
 - Wales: South Wales
 - Northern Ireland: Belfast
- 127 semi-structured interviews across the 12 universities

Coded emotions expressed in 127 interviews

Negative emotions 79%, neutral 5%, positive 16%



OPPORTUNITIES AND CHALLENGES

Opportunities and challenges

OPPORTUNITIES	CHALLENGES
Growing centrality of higher education in society in nearly all countries	Massification brings quality problems, growing sector stratification/inequality
Continued globalisation of knowledge and communications	Activity more concentrated in a few global cities and global universities
Spread of science across the world, expanding networked opportunities	Uneven investment priorities, populist pushback against science and mobility
East Asia is now bigger than Europe as a zone of R&D and science	STEM bias, instrumentalism, growing US/China geo-political tensions
Brexit breaks path-dependency and triggers new alignments	Weakening of UK higher education and of European Research Area
Growing engagement between higher education and society, localities	Problem of balancing international research agendas with local needs