Beijing Normal University
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# Higher education and globalisation 2019

## Research collaboration and people mobility in a time of geo-political rivalry

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# Higher education and globalisation 2019

## Research collaboration and people mobility in a time of geo-political rivalry

- Global integration in 2019
  - Combined and uneven
  - Political economy since 2008, communications, science
  - Rise of China and geo-political rivalry
- Global research system
  - Interpretations of global science
  - Growth of R&D funding and scientific outputs
  - Spread of scientific capacity across the world
  - Growth of networked international collaboration (co-authorship)
  - Pluralisation of research power
- Global mobility
  - International student flows
  - Migration politics
- Concluding thoughts

# GLOBAL INTEGRATION (AND NOT) IN 2019

# Global integration and transformation

- 'Globalisation' refers to *integration* on a worldwide or large regional basis, based on patterns of connection and exchange sufficiently regular and sustained to *transform* societies, or some aspect of them. Globalisation is associated with structures, agency and *causation* at the global level (e.g. global ecology)
- Nations and local institutions have agency and importance, but are not solely self-generating. Forces external to nations can be as important as forces within.
- People think within the "national container" so global systems (e.g. research) are poorly understood.

**Sebastian Conrad (2016). *What is Global History?* Princeton University Press**
**Shahjahan, R. and Kezar, A. (2013). Beyond the 'national container': Addressing methodological nationalism in higher education research. *Educational Researcher*, 42 (1), pp. 20-29**

# Combined and uneven global integration

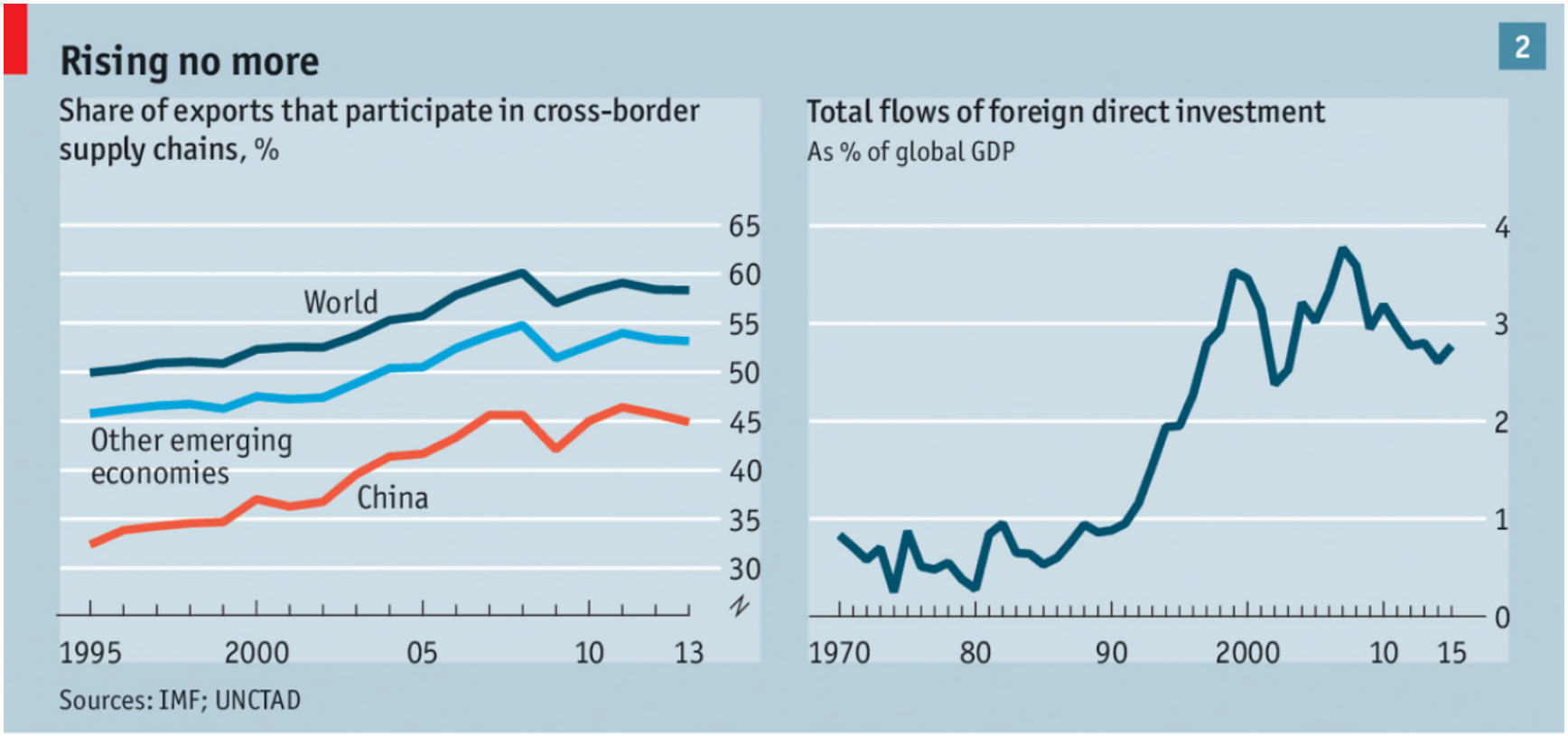
| sector | Global system | Multi-lateral | Border flows | Notes |
|---|---|---|---|---|
| Ecology | YES | | | The ecology is a natural global system |
| Trade | NO | YES* | YES | Growing barriers to open trade |
| Finance | NO | YES | YES | Reversal of earlier growth of financial flows |
| Communications | YES* | | | Nations are becoming better at separating off |
| Governance | NO | YES** | NO | No momentum towards global integration |
| Science | YES | YES | YES | Global convergence and integration continues |
| 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 rivalry and global cooperation

- Since 2010 the globalisation of the economy has slowed, and the Trade ‘Cold War’ will slow it further.
- The possibility of a Technology ‘Cold War’ hangs over continued communicative globalisation. Will we have two global networks with limited interfaces between them?
- Global governance is embryonic and the prospects of advance towards a more integrated world polity have been set back by the growing international tension, especially between the United States and China.
- While international education continues to grow there are some downward pressures on mobility, notably into the US.
- The globalisation of knowledge and science continues but moves to close up are beginning to emerge

# Economic globalisation slows and retreats



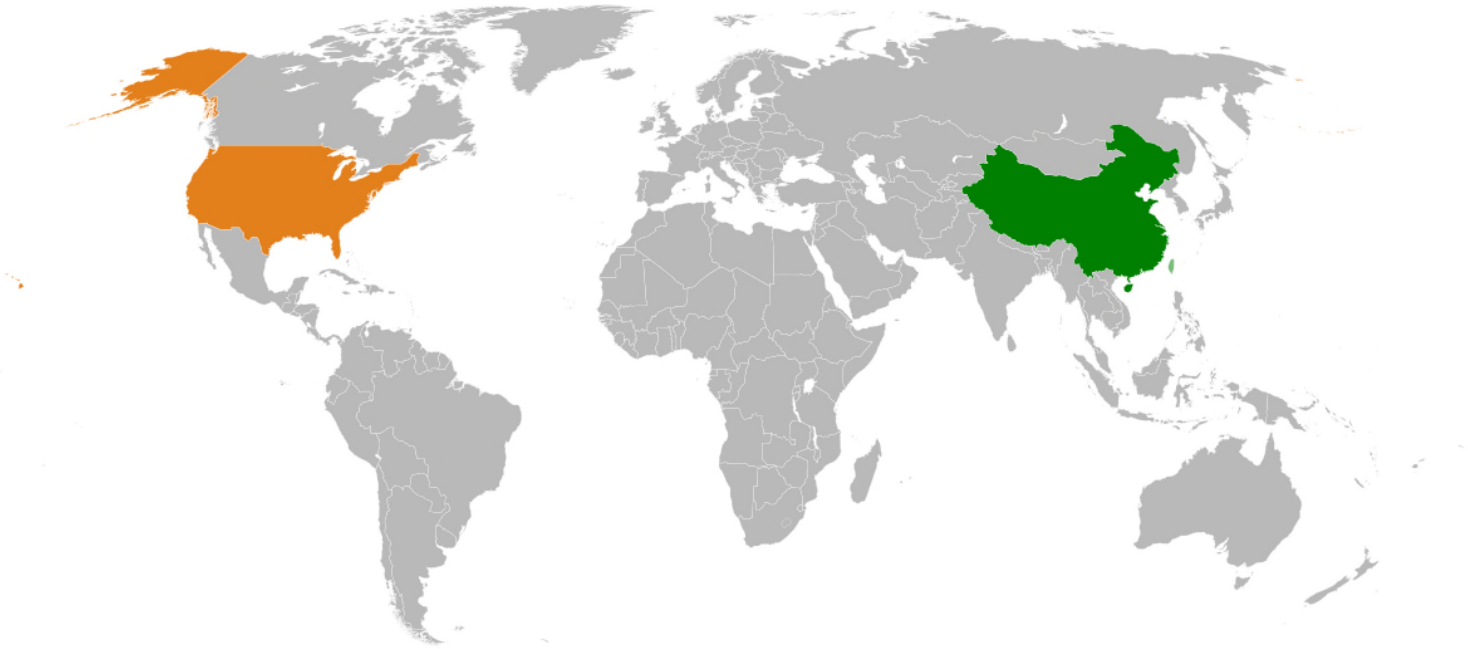

Source: The Economist, 28 January 2017

# Economic globalisation losing momentum

- Foreign Direct Investment as share of global GDP peaked in 2007 and is now back to mid 1990s level.
- Cross-border supply chains are politically vulnerable.
- Shift from labour-intensive to capital-intensive manufacturing (AI etc) reduces offshoring
- Potential of national tax breaks and reductions in tariffs largely exhausted: diminishing returns and political pushback. Little multilateral appetite for further liberalization.
- Smarter local companies nuance local markets better, differentiation of some global products. Financial performance of multinationals no longer outstrips that of nation-bound companies, *except* in the tech sector. Multinational share of total profits down from 35% to 30% in last ten years.

# From opening up to the New Cold War

How did it come to this? *OR* It had to happen some time…



# The Cold War has economic, technological, political, ideological, military dimensions

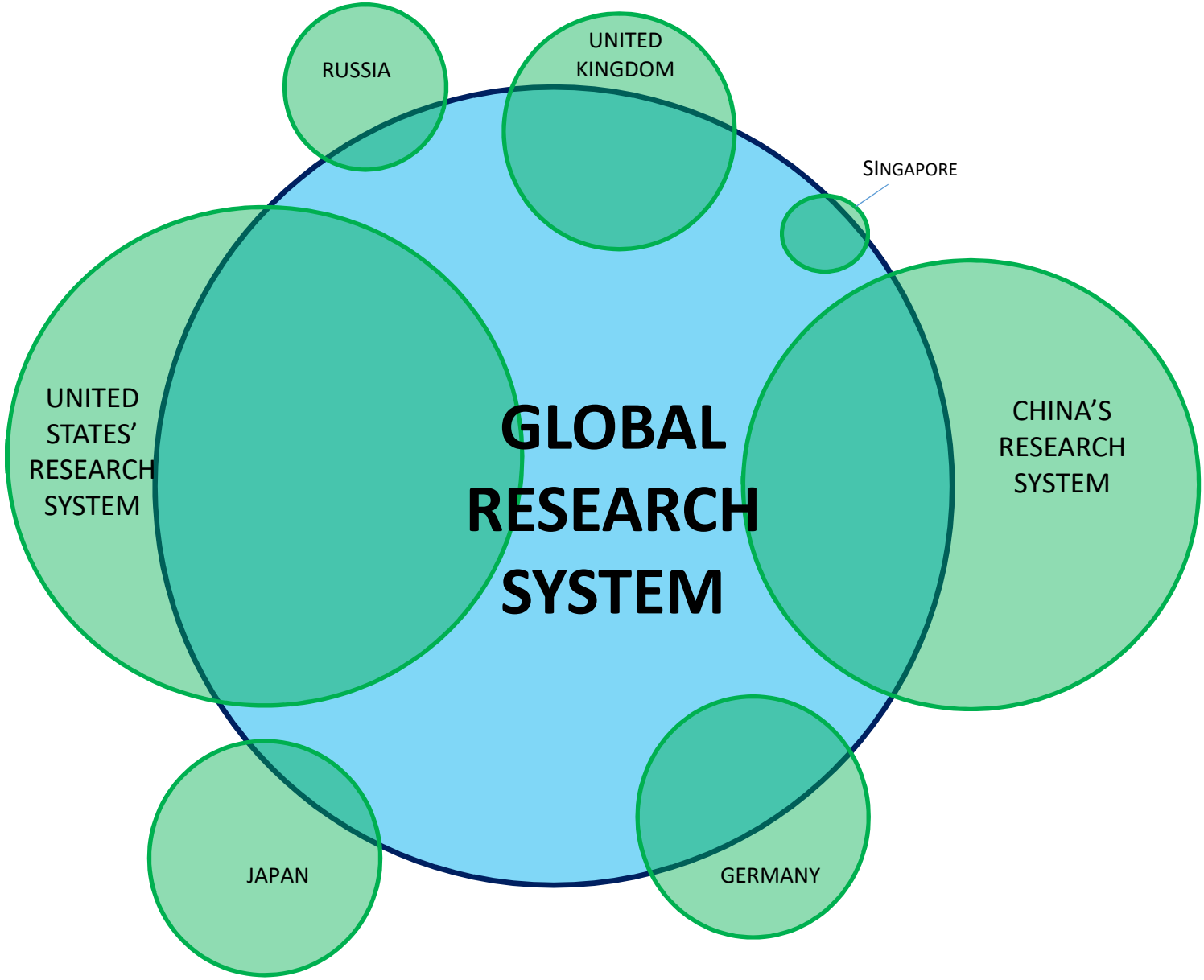
and inevitably affects universities and research

# GLOBAL RESEARCH SYSTEM

(that is, how it looked at the time the New Cold War was emerging)

# The global research system

- The global research system consists of structures, institutions, agents and their activities: global publications, worldwide disciplinary forums and networks, and collaborations and citations that support the production and circulation of codified knowledge.
- It developed in the 1990s out of the Internet, synchronous data transfer and global publishing.
- It intersects with autonomous national research systems, to an extent that varies, without fully absorbing them.
- It is now the primary source of innovations, linking with industry in different countries at many points. Firms develop commercial knowledge goods out of research from anywhere, not just from their own countries.




"The choice of scale … always has normative implications"

- Conrad (2016), *What is Global History?,* p. 156

# National and global science

- The global research system is transformative. In over half of all countries, the pattern of national scientific activity is more determined by the pattern of global activity, than vice versa.

  **Wagner, C., Park H. and Leydesdorff, L. (2015). The continuing growth of global cooperation networks in research: A conundrum for national governments. *PLoS ONE*, 10 (7): e0131816. doi:10.1371/journal.pone.0131816.**

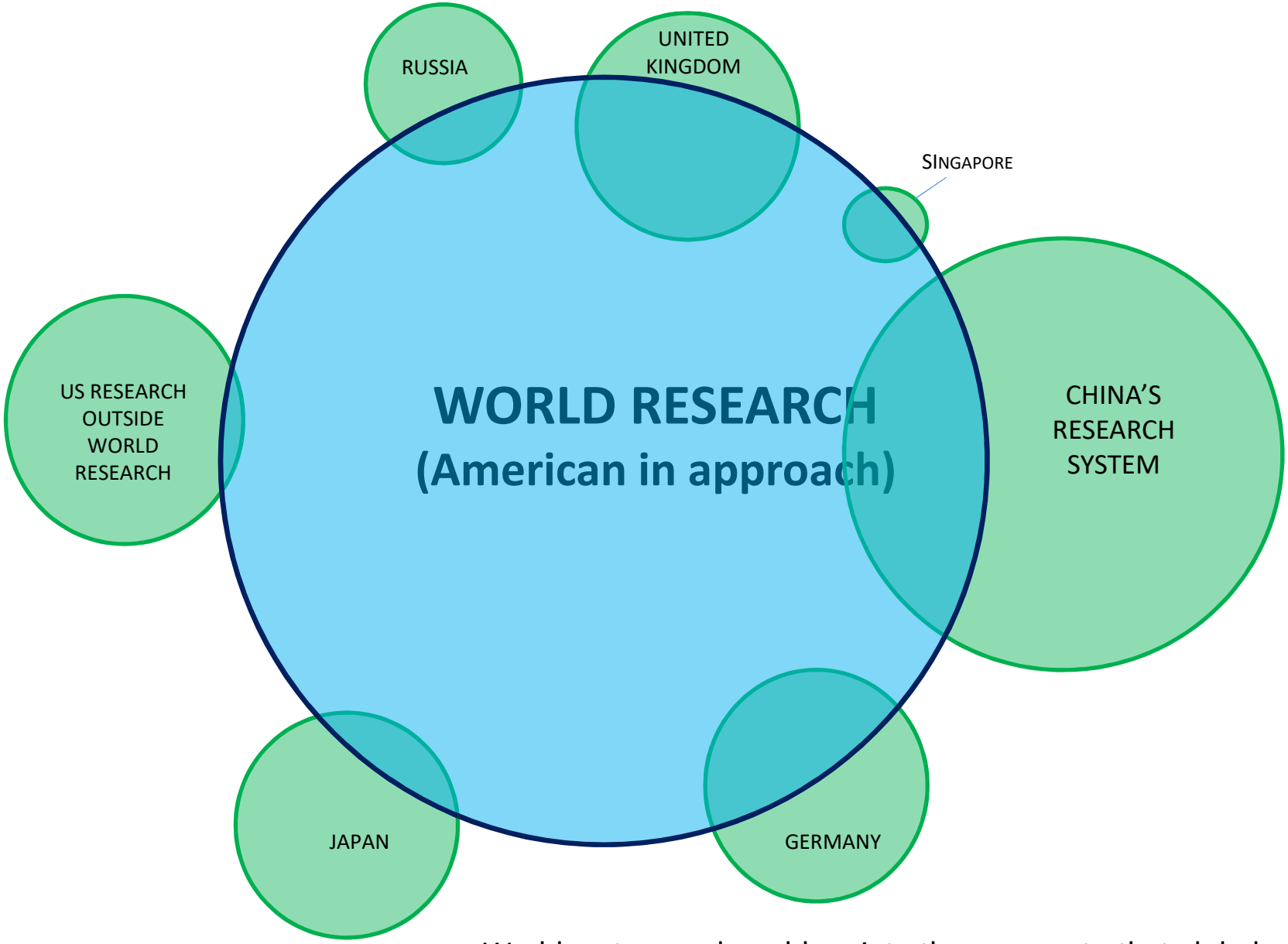
- Investment in science has no necessary correspondence to national industry – the investment 'leaks' into global system. So no government's national investment makes sense
- Disciplinary lop-sidedness is fostered by both national and global science. National governments favour STEM *and* non-STEM disciplines are more nation bound. Doctoral studies by Xie Meng and Xin Xu point to global/ national dilemmas in social sciences and humanities in China.

# Alternative interpretations of the global research system

1. Global research is a *competition between countries* to secure advantage in the 'arms race in innovation'.
2. Global research is a *competition between individual universities* for prestige, resources, students and talent.
3. Global research is a *network* of researchers, universities and countries, in which relations are open, cooperative and 'flat'. It expands continually in nodes, links and activities.
4. (World systems theory): Global research is a *worldwide hierarchy* of power, like finance or the military. Countries at the global centre dominate and exploit the periphery.
5. (Institutional theory): Global research is patterned by *universal imitation* based on a 'global script' from a 'world society' embodying primarily Western/American practices.

# The centre-periphery model of the global research system

**Altbach, P. G. (2009). Peripheries and centers: Research universities in developing countries. *Asia Pacific Education Review*, 10 (1), 15–27**




World-system and world society theory equate that global pool of activity with essentially American activity. Though it is true that American influence exceeds the American share of research

# TENDENCIES IN GLOBAL SCIENCE SYSTEM

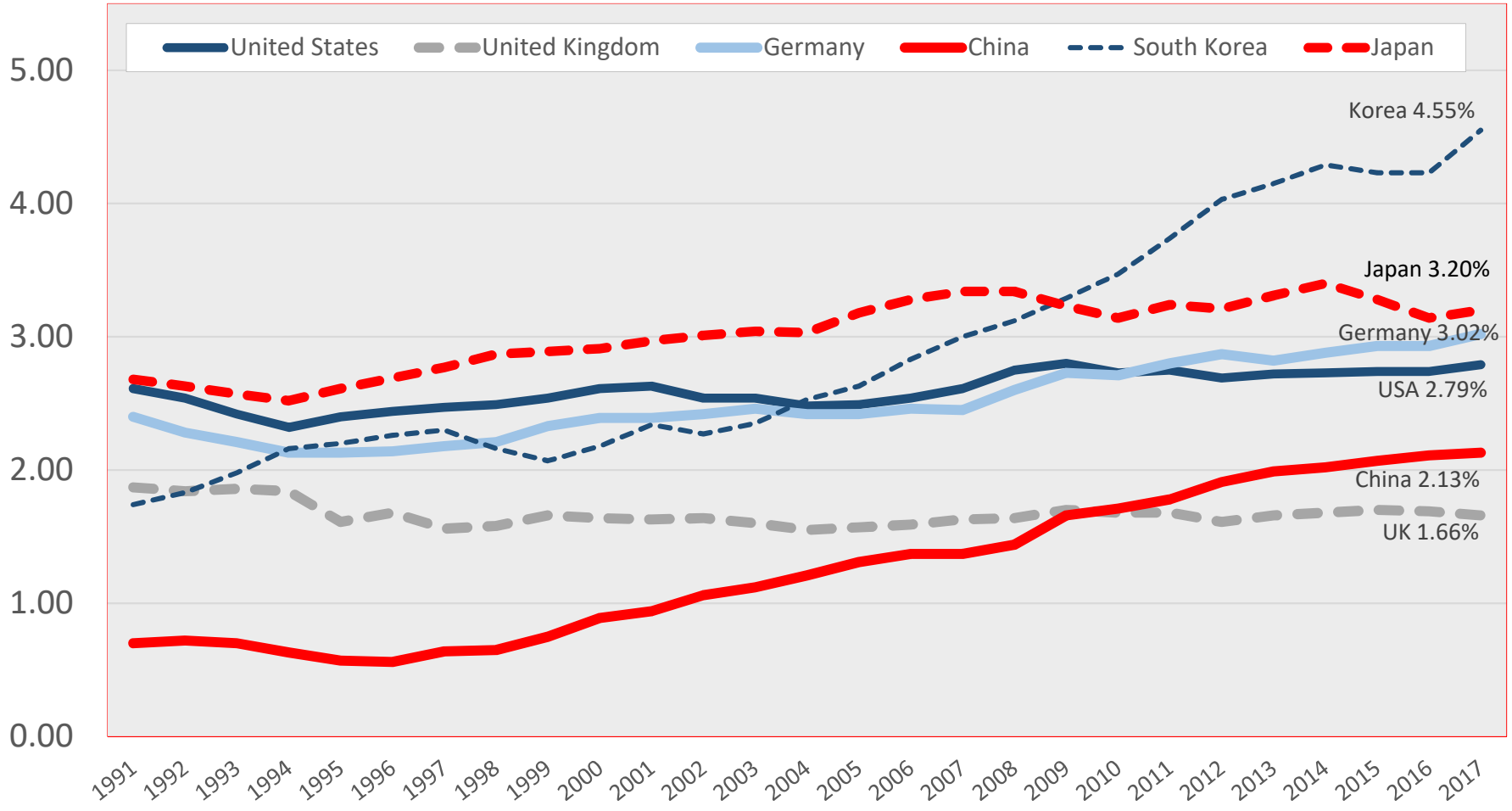
# Main tendencies in global research

- Growth of R&D funding
- Growth of scientific outputs
- Spread of scientific capacity across the world
- Growth of networked international collaboration (co-authorship)
- Changing geo-politics: pluralisation of science power

# GROWTH OF R&D FUNDING AND RESOURCES FOR RESEARCH

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

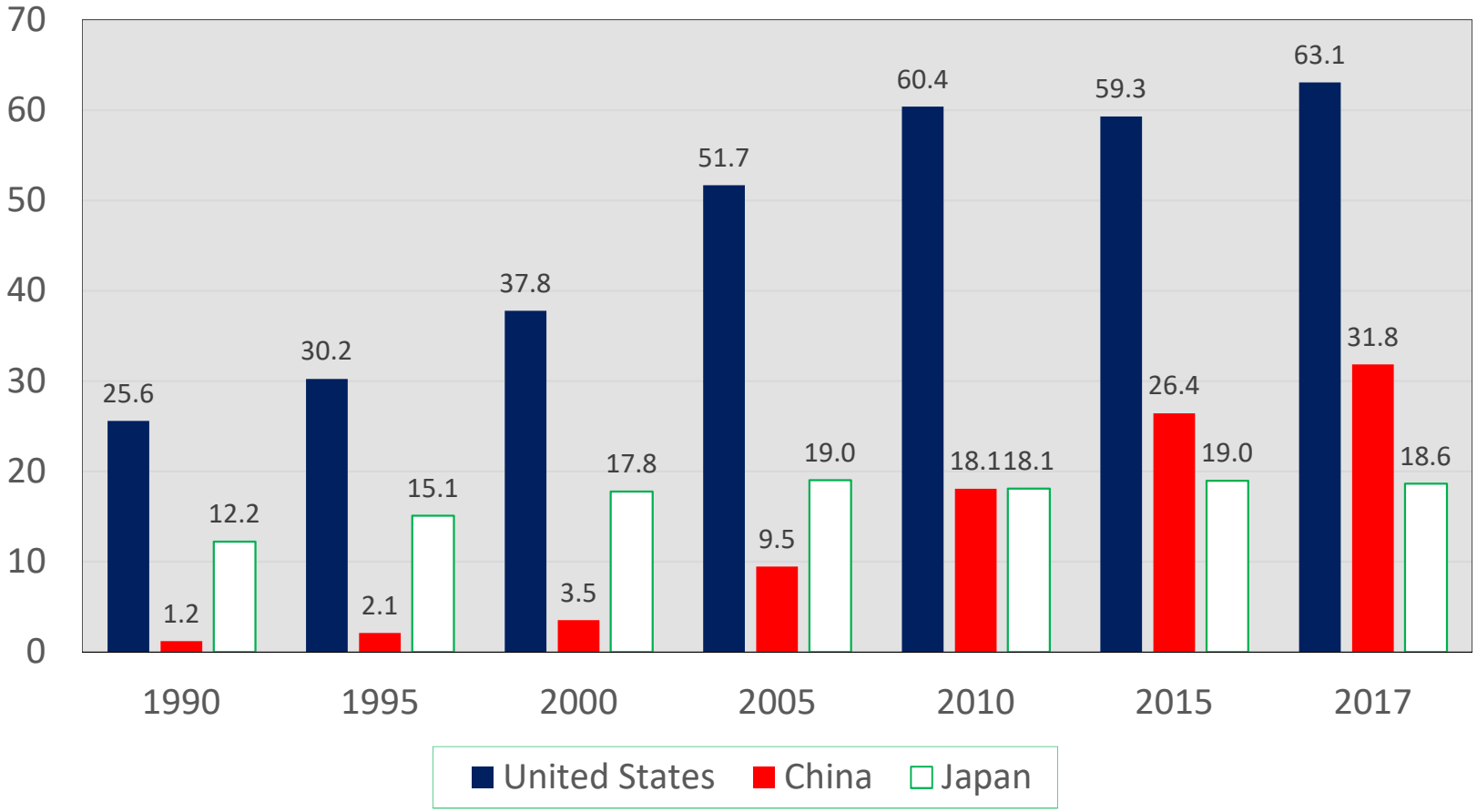
## USA, UK, Germany, China, Japan, South Korea




Data: OECD

# Spending on R&D in higher education: 1990-2015 and 2017

constant 2010 USD $billion PPP




Data: OECD

# New doctoral degrees in largest doctorate producing countries: 2000 and 2014

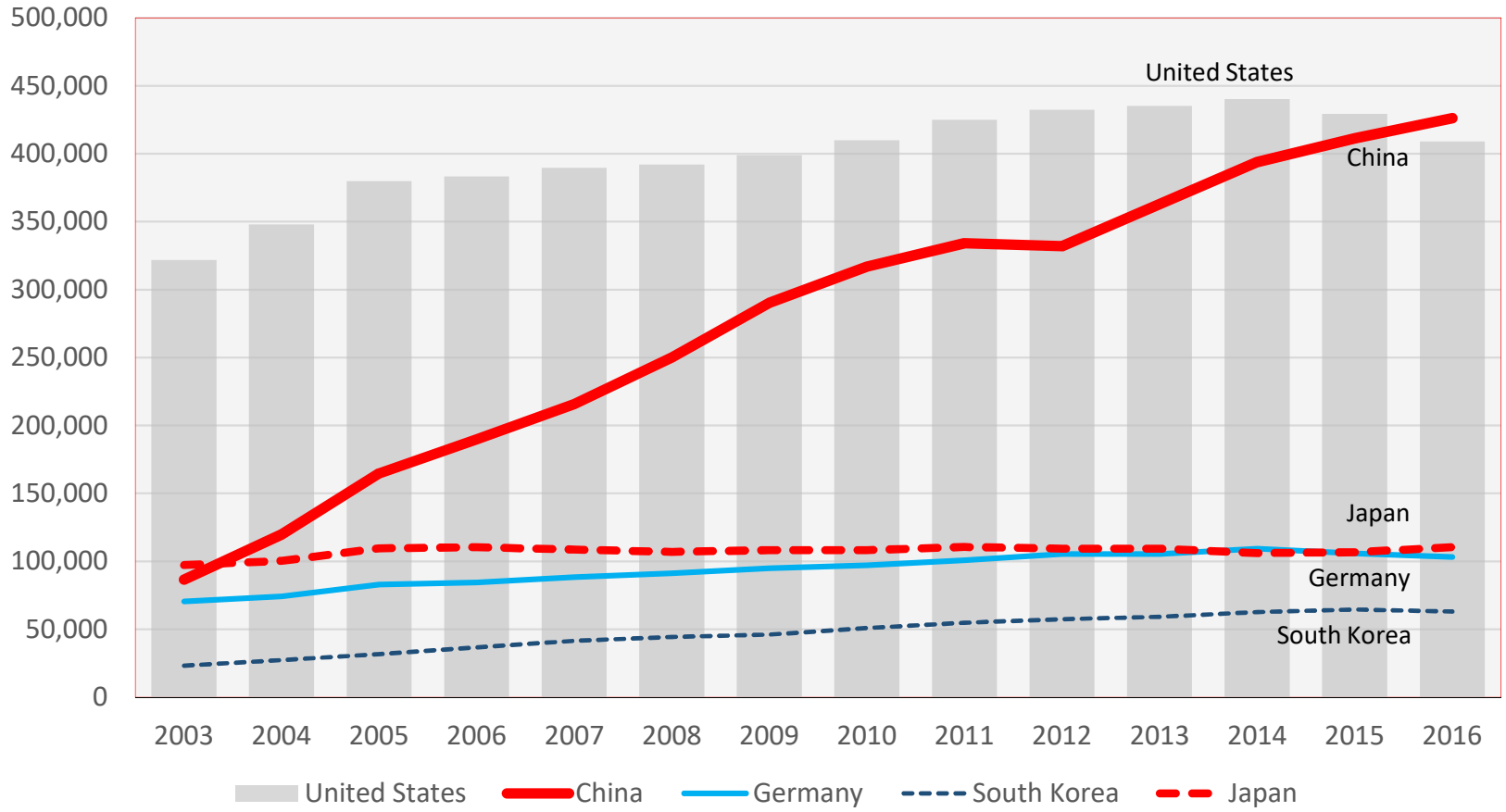
| | Doctoral graduates 2000 | Doctoral graduates 2014 | Annual change 2000-2014 |
|---|---|---|---|
| United States | 44.947 | 67,591 | 3.0% |
| China | 11,383 | 53,653 | 11.7% |
| Germany | 25,780 | 28,147 | 0.6% |
| United Kingdom | 11,566 | 25,020 | 5.7% |
| India | 11,296 | 21,830 | 4.8% |
| Japan | 15,357 | 15,045 | - 0.2% |
| France | 9903 | 13,729 | 2.4% |
| South Korea | 6143 | 12,931 | 5.5% |

Data: US National Science Board (NSB)

# GROWTH OF TOTAL OUTPUT OF SCIENCE PAPERS

# Annual number of published papers

United States, China, Germany, United Kingdom, Japan, South Korea: 2003-2016




Data: US NSB

# Universities producing over 5000 papers and 200 high citation (top 5%) papers: 2006-07 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

# Total science papers and papers in top 5% of research field by citation rate: Peking, Tsinghua and Zhejiang Universities: 2006-07 to 2014-17

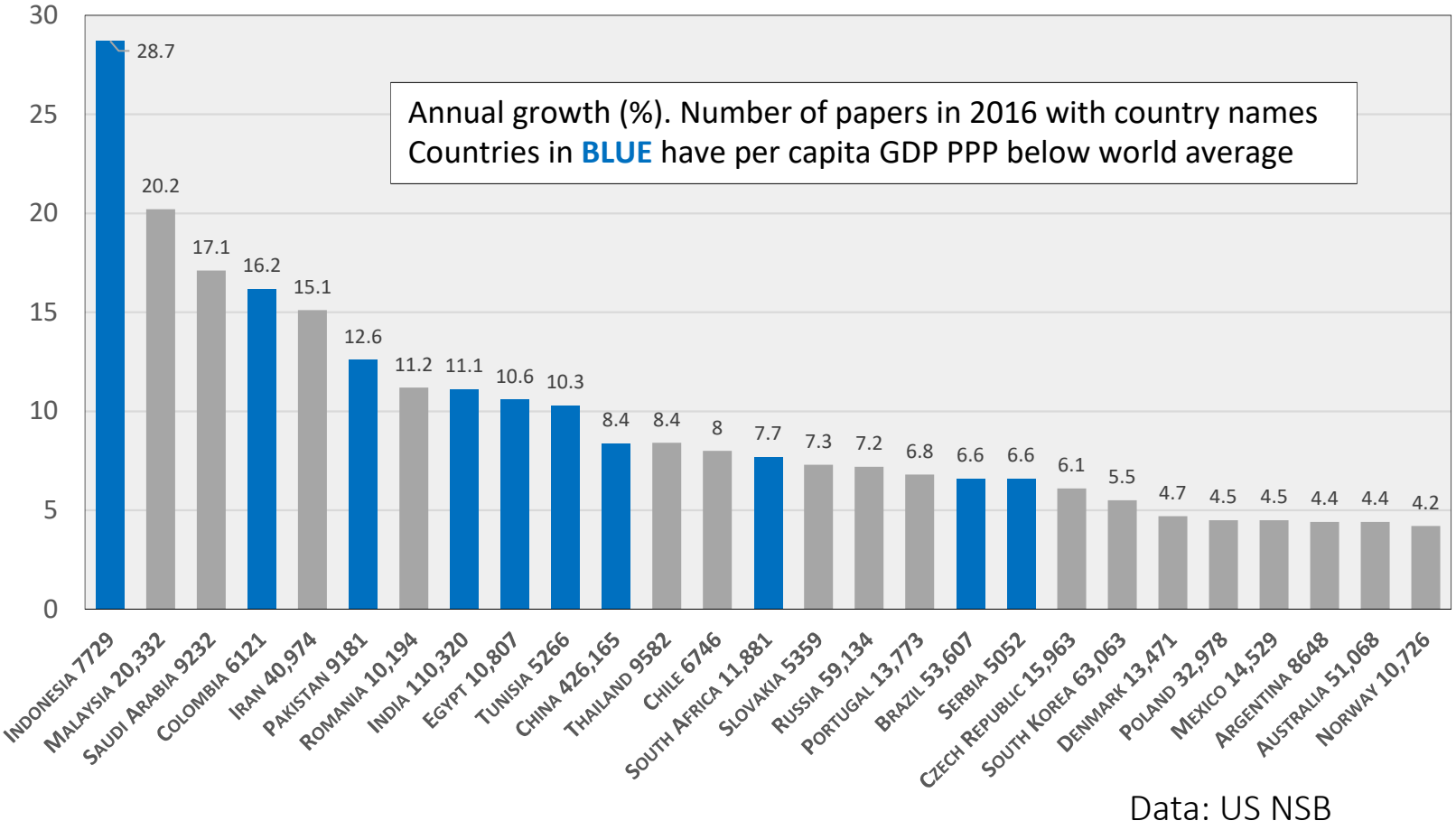
| | 2006-2009 | 2007-2010 | 2008-2011 | 2009-2012 | 2010-2013 | 2011-2014 | 2012-2015 | 2013-2016 | 2014-2017 |
|---|---|---|---|---|---|---|---|---|---|
| **Total number of papers in time period** | | | | | | | | | |
| Zhejiang U | 11,208 | 12,004 | 13,151 | 14,176 | 15,722 | 17,808 | 19,461 | 20,933 | 22,100 |
| Tsinghua U | 9515 | 9758 | 10,437 | 11,134 | 12,285 | 13,760 | 15,390 | 17,034 | 18,404 |
| Peking U | 7808 | 8605 | 9461 | 10,437 | 11,534 | 12,797 | 14,121 | 15,336 | 16,171 |
| **Number of papers in top 5% of their research field, by citation rate** | | | | | | | | | |
| Zhejiang U | 335 | 361 | 453 | 509 | 624 | 750 | 859 | 958 | 1092 |
| Tsinghua U | 402 | 450 | 491 | 546 | 633 | 763 | 939 | 1072 | 1270 |
| Peking U | 307 | 343 | 402 | 431 | 512 | 622 | 680 | 773 | 831 |

Data: Leiden ranking

# SPREAD OF SCIENTIFIC CAPACITY ACROSS THE WORLD

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

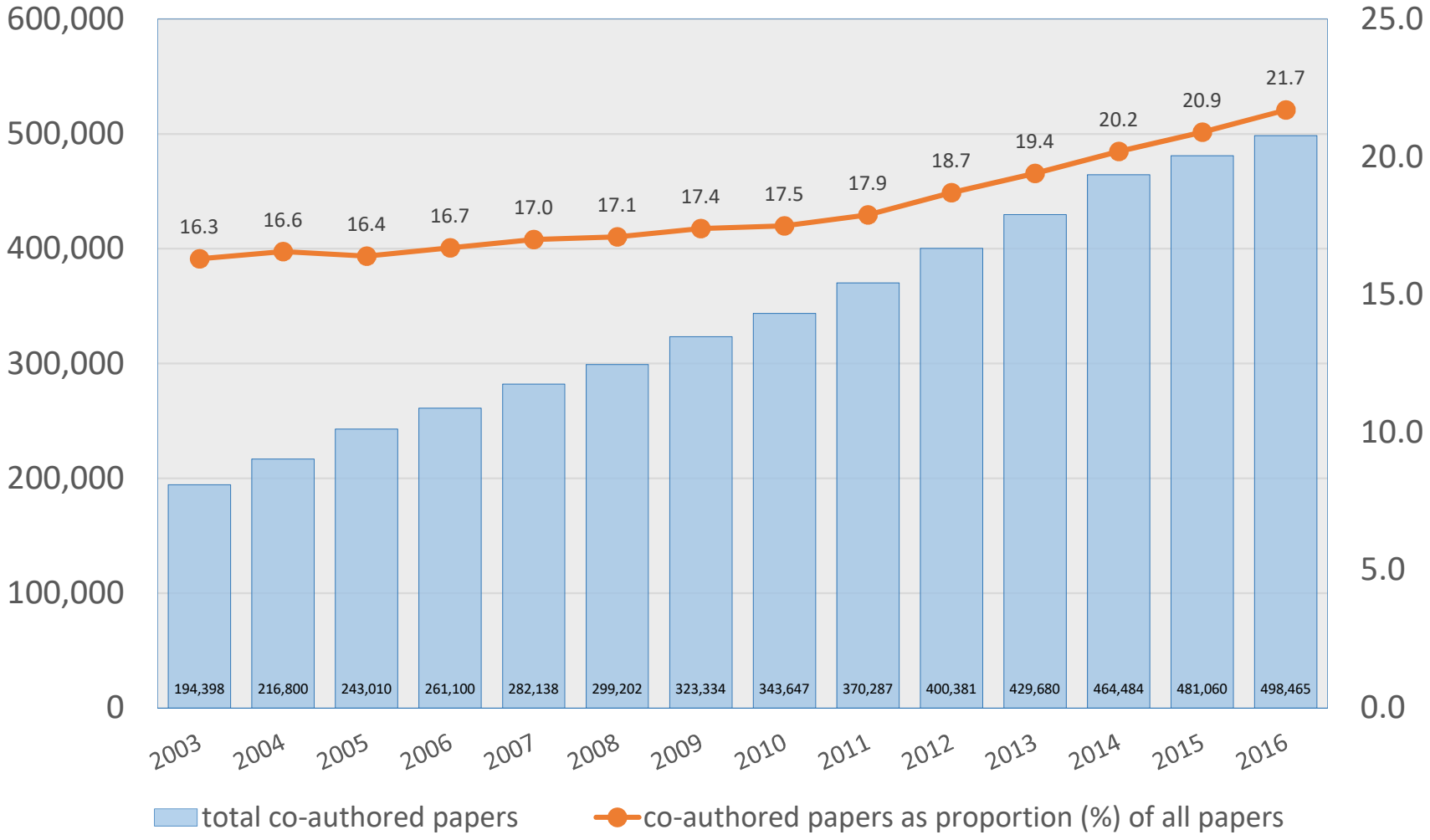
countries with growth rate above world average of 3.9% and producing more than 5000 papers in 2016




Data: US NSB

# GROWTH OF NETWORKED INTERNATIONAL COLLABORATION

# Growth in internationally co-authored science papers, all countries: 2003-2016




Data: US NSB

# 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

# Proportion of all science papers that were internationally co-authored, selected universities: 2006-09 and 2014-17

| Universities | 2006-09 % | 2014-17 % |
|---|---|---|
| **NORTH AMERICA** | | |
| U Toronto | 43.6 | 55.4 |
| MIT | 38.0 | 55.1 |
| UC Berkeley | 35.4 | 50.9 |
| Harvard U | 36.0 | 50.4 |
| Stanford U | 31.7 | 44.7 |
| **EUROPE** | | |
| ETH Zurich | 59.0 | 69.3 |
| U Cambridge | 50.6 | 67.9 |
| U Oxford | 54.5 | 67.4 |
| Heidelberg U | 48.7 | 60.3 |

| Universities | 2006-09 % | 2014-17 % |
|---|---|---|
| **CHINA** | | |
| U Hong Kong | 36.5 | 44.5 |
| Peking U | 32.6 | 37.1 |
| Tsinghua U | 22.8 | 34.8 |
| Shanghai Jiao Tong U | 20.9 | 30.3 |
| Zhejiang U | 21.8 | 29.5 |
| **EAST ASIA** | | |
| Nanyang TU | 44.5 | 65.7 |
| National U Singapore | 46.6 | 65.1 |
| U Tokyo | 28.2 | 38.0 |
| Seoul National U | 25.1 | 29.5 |

Data: Leiden ranking

# Larger national collaborations, 2016

Country pairs with over 6000 jointly-authored papers

| Country pair | Joint papers |
|---|---|
| **China-USA** | **43,968** |
| UK-USA | 25,858 |
| Germany-USA | 21,584 |
| Canada-USA | 19,704 |
| France-USA | 14,440 |
| Germany-UK | 14,200 |
| Italy-USA | 12,784 |
| Australia-USA | 12,127 |
| Japan-USA | 10,484 |
| **China-UK** | **10,472** |
| France-Germany | 10,084 |

| Country pair | Joint papers |
|---|---|
| France-UK | 10,079 |
| Italy-UK | 10,023 |
| South Korea-USA | 9553 |
| Spain-USA | 9530 |
| **Australia-China** | **9246** |
| Netherlands-USA | 9078 |
| Australia-UK | 8838 |
| Germany-Italy | 8821 |
| Switzerland-USA | 8455 |
| Germany-Switzerland | 8310 |
| France-Italy | 8182 |

| Country pair | Joint papers |
|---|---|
| Netherlands-UK | 8039 |
| Germany-Netherl. | 7746 |
| Brazil-USA | 7606 |
| **Canada-China** | **7245** |
| Germany-Spain | 6871 |
| India-USA | 6759 |
| **China-Japan** | **6706** |
| Canada-UK | 6685 |
| **China-Germany** | **6419** |
| Sweden-USA | 6383 |
| France-Spain | 6305 |

Data: US NSB

# Above average intensity of cross-border collaboration in research, 2016

**1.00** indicates that the number of co-authored publications between the pair of countries is at the level that is expected given their overall rates of collaboration with all countries. **1.50** indicates very high intensity of collaboration relative to the expected level, i.e. a significant 'bias' in favour of that pairing within the overall pattern of cross-border networks. **2.00** indicates relatively exceptional intensity

*Data - US Science and Engineering Indicators, National Science Foundation*

| UNITED STATES | |
|---|---|
| Israel | 1.33 |
| South Korea | 1.23 |
| China | 1.19 |
| Canada | 1.13 |
| Taiwan | 1.05 |
| Mexico | 1.04 |

| CHINA | |
|---|---|
| Singapore | 2.03 |
| Taiwan | 1.73 |
| Pakistan | 1.23 |
| United States | 1.19 |
| Australia | 1.15 |
| Japan | 1.09 |

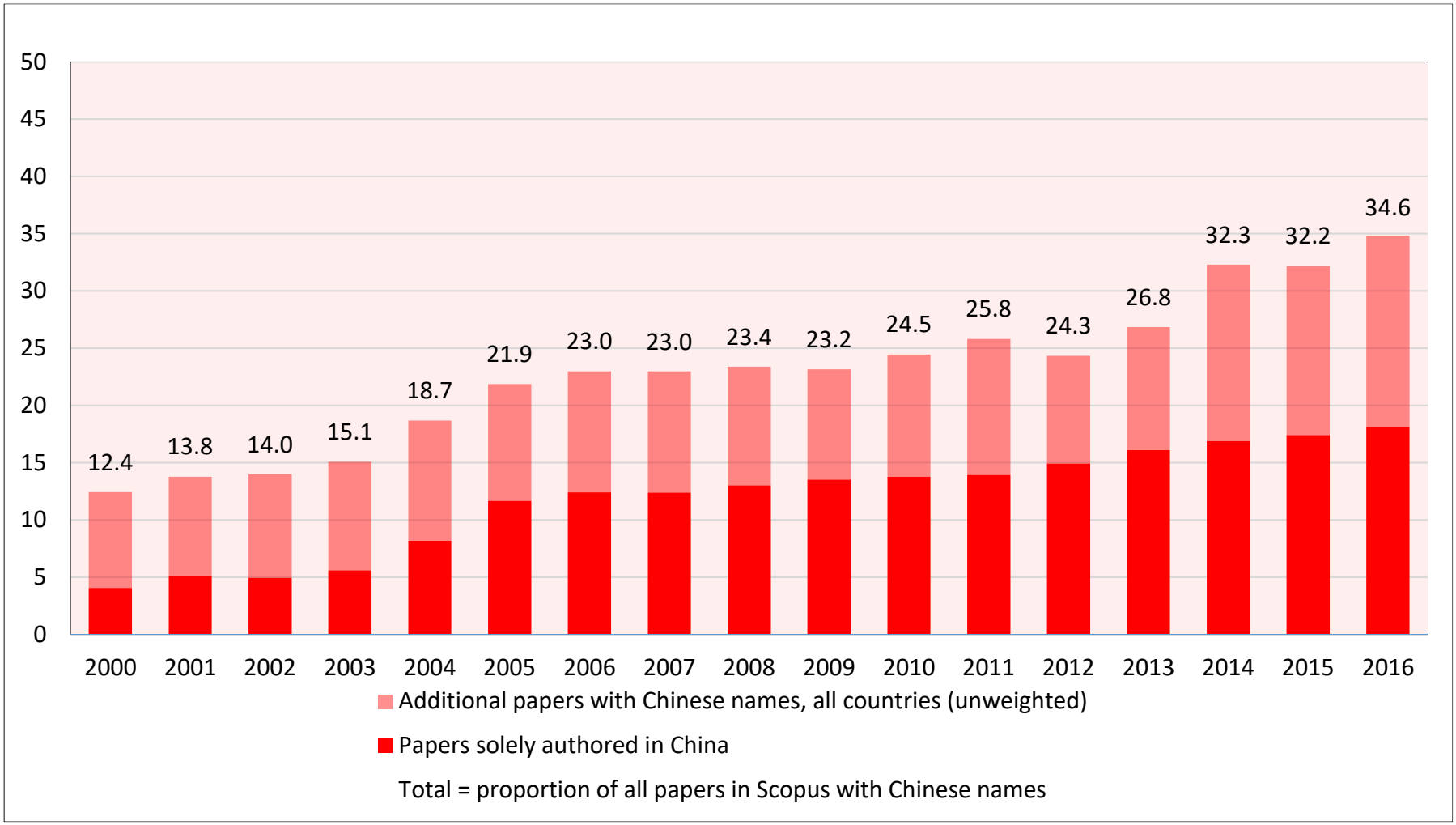
| JAPAN | |
|---|---|
| Thailand | 3.28 |
| Taiwan | 2.16 |
| South Korea | 1.83 |
| Hungary | 1.57 |
| Malaysia | 1.56 |
| Russia | 1.11 |
| Egypt | 1.11 |
| China | 1.09 |
| Poland | 1.02 |
| Czech Republic | 1.02 |

Data: US NSB

# CHANGING GEO-POLITICS OF SCIENCE: MORE PLURAL POWER

# Growth of China-associated science papers

Proportion (%) of worldwide papers in Scopus: 2000-2016




Data: Xie and Freeman 2018

# 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 |

Data: Leiden ranking

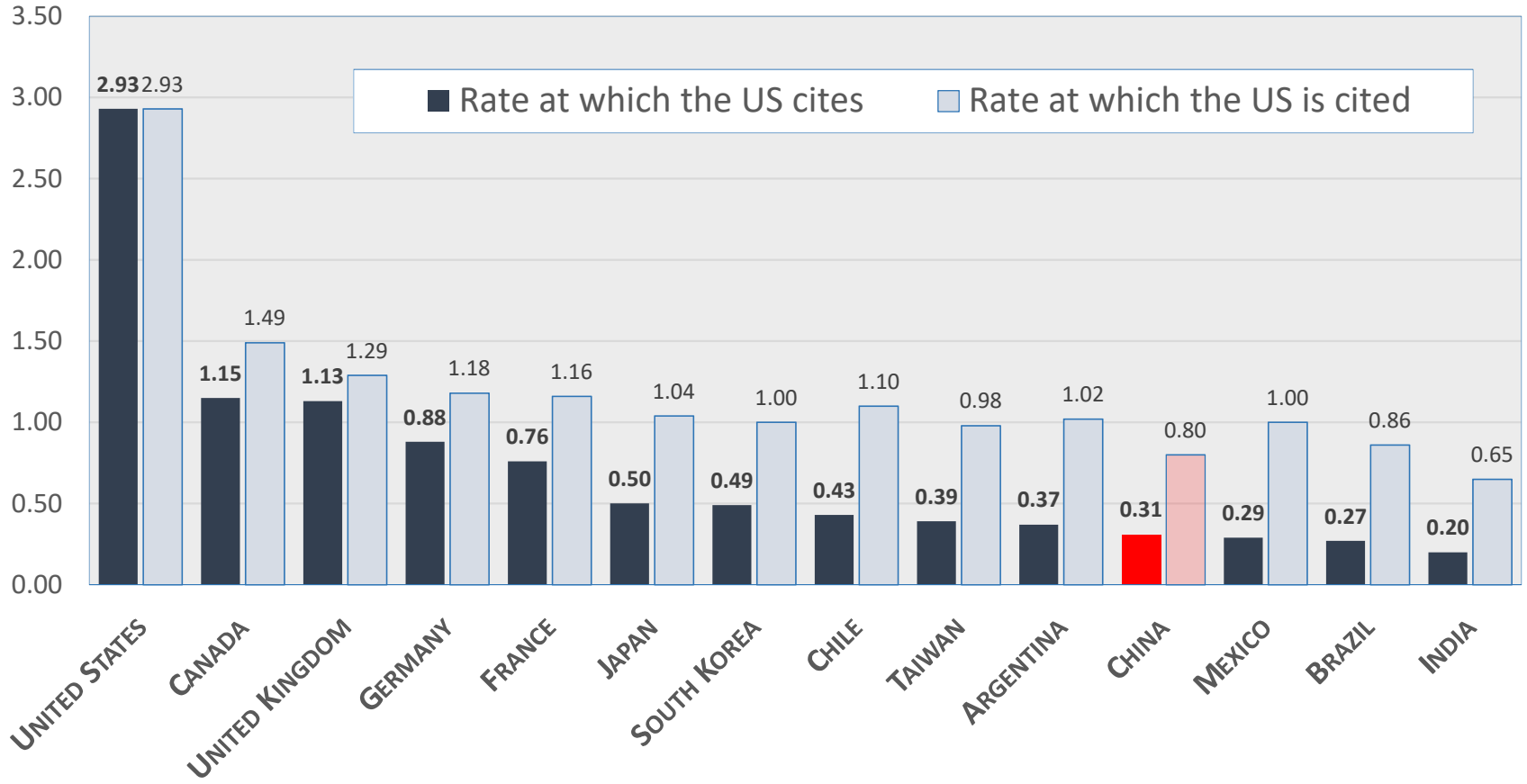
# Number and proportion of papers in top 10% of their field by citation rate, five discipline clusters, ZJU, THU, PKU, UC Berkeley: 2014-17

| | Number of papers in top 10% in 2014-17 | | | | Proportion of all papers that were in top 10% | | | |
|---|---|---|---|---|---|---|---|---|
| | Zhejiang | Tsinghua | Peking | Berkeley | Zhejiang % | Tsinghua % | Peking % | Berkeley % |
| **Physical sciences and engineering** | 1017 | 1500 | 749 | 1040 | 11.7 | 13.5 | 12.9 | 23.3 |
| **Mathematics and computing** | 298 | 447 | 173 | 164 | 11.2 | 13.1 | 13.5 | 18.2 |
| **Biomedical and health sciences** | 545 | 188 | 477 | 483 | 7.6 | 11.6 | 7.3 | 21.0 |
| **Life and earth sciences** | 346 | 251 | 243 | 389 | 11.2 | 14.8 | 12.4 | 20.0 |
| **Social sciences and humanities** | 44 | 60 | 81 | 295 | 8.2 | 10.8 | 11.7 | 18.2 |
| **ALL DISCIPLINES** | 2250 | 2446 | 1713 | 2371 | 10.2 | 13.3 | 10.6 | 21.1 |

Data: Leiden ranking

# Hegemony: Who cites US, who is cited by US

The rate at which papers by authors from selected countries are cited by papers with authors from United States, compared to the rate that these countries cite United States authors, science and engineering papers, 2014. world average = 1.00



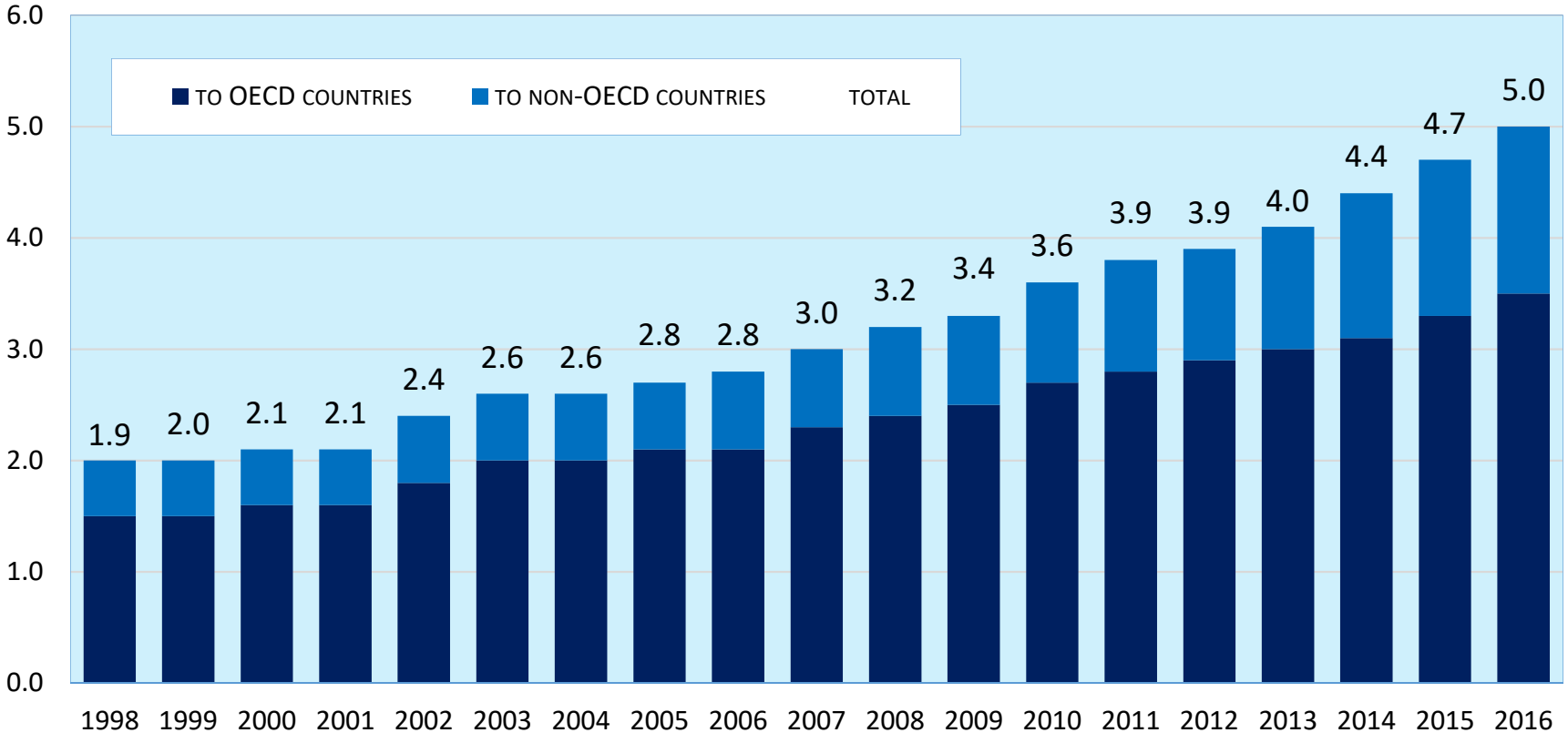

Data: US NSB

# More complex than centre-periphery model, with at least two very strong nodes (USA stronger), and networked groupings

# GLOBAL MOBILITY

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

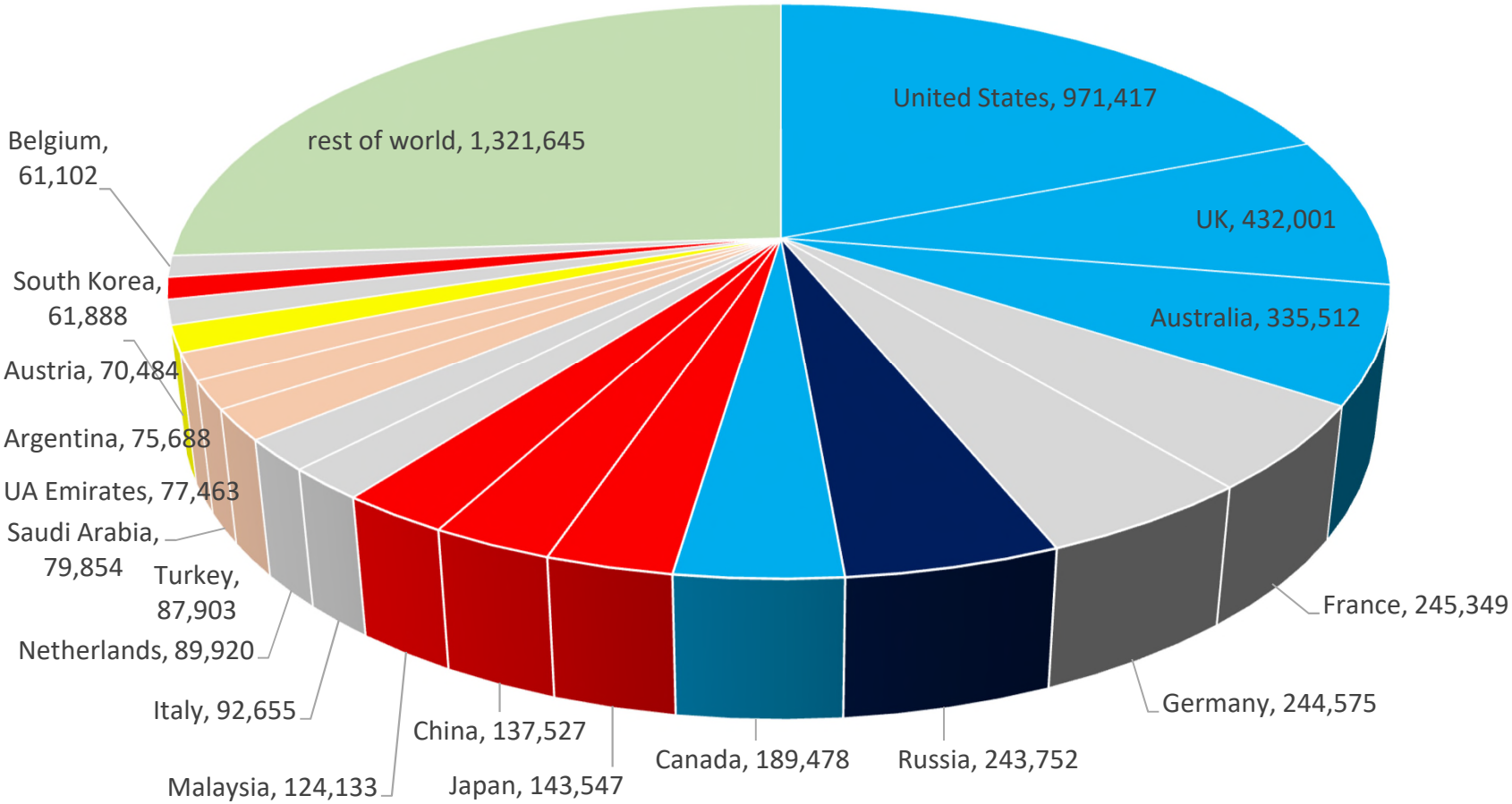
OECD data 2018



# International tertiary students compared to home country students (2016)

| Country | outgoing students 2016 | total students 2016 | mobile students as proportion of total |
|---|---|---|---|
| China | 866, 072 | 43,886,104 | 1.97% |
| India | 301,406 | 32,391,800 | 0.93% |
| Germany | 119,088 | 3,043,084 | 3.91% |
| South Korea | 104,972 | 3,204,348 | 3.28% |
| Nigeria | 95,731 | data n.a. | data n.a. |
| France | 90,543 | 2,480,186 | 3.65% |
| Kazakhstan | 90,187 | 623,534 | 14.46% |
| Saudi Arabia | 90,178 | 1,622,441 | 5.56% |
| Vietnam | 82,159 | 2,307,361 | 3.56% |
| Ukraine | 77,263 | 1,689,724 | 4.57% |
| United States | 72,690 | 19,288,424 | 3.77% |
| Italy | 65,421 | 1,815,950 | 3.60% |
| Malaysia | 64,861 | 1,336,550 | 4.85% |

# Distribution of incoming students: 2016, OECD data



# Larger commercial and non-commercial receiving ('export') countries, 2016

| Largely commercial | |
|---|---|
| Australia | 335,512 |
| UK (non-EU students only) | 290,738 |
| Malaysia | 124,133 |
| New Zealand | 53,854 |
| Canada (some subsidies) | (189,478) |
| Russia (some subsidies) | (243,752) |
| Netherlands (non-EU only) | (89,920) |

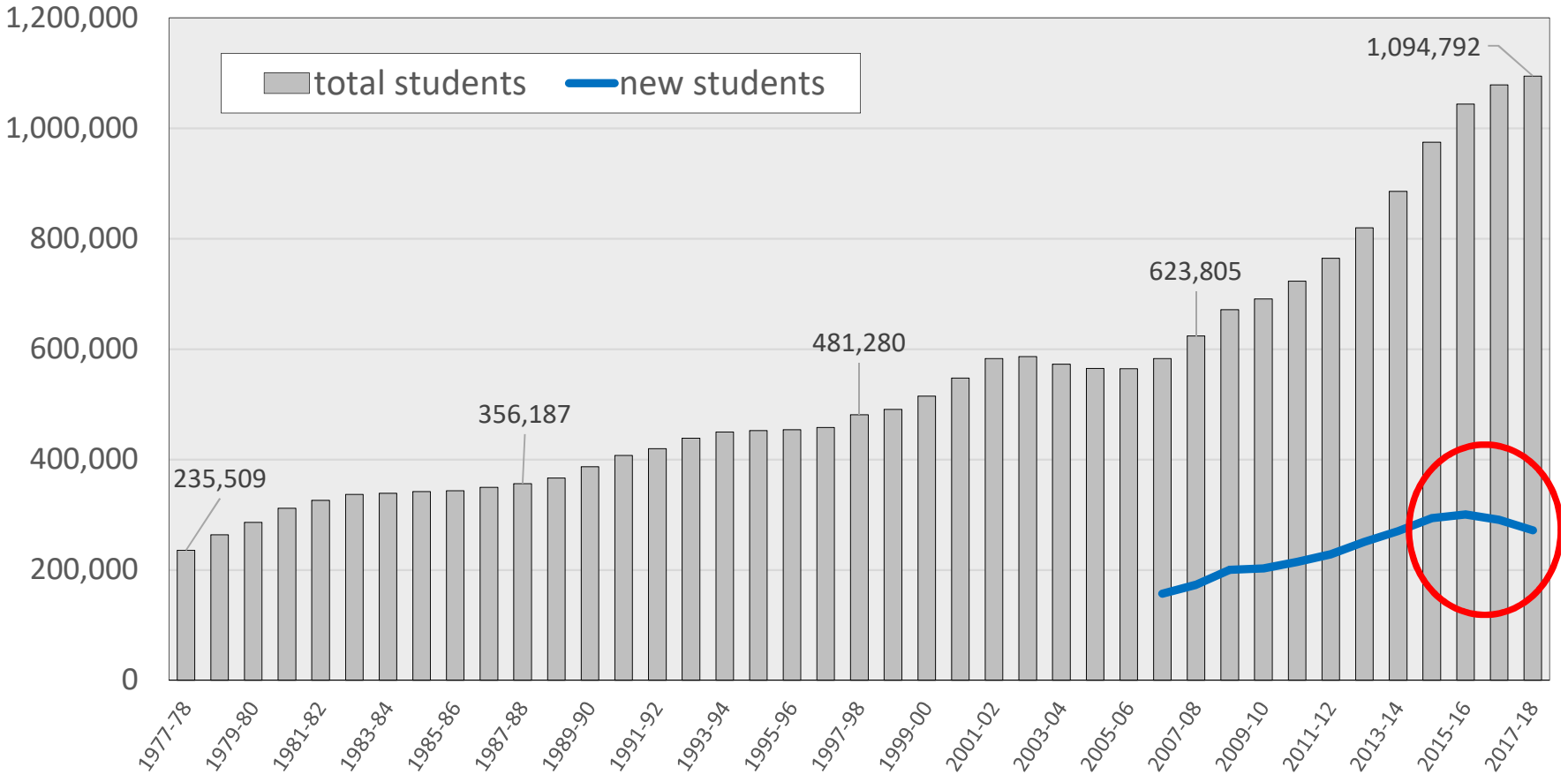
| Largely non-commercial | |
|---|---|
| Germany | 244,575 |
| Japan | 143,547 |
| China | 137,527 |
| Italy | 92,655 |
| Argentina | 75,688 |
| Austria | 70,484 |
| South Korea | 61,888 |

| Recently introduced fees | |
|---|---|
| France (non-EU, subsidies) | (245,348) |
| Finland (non-EU only) | (23,197) |

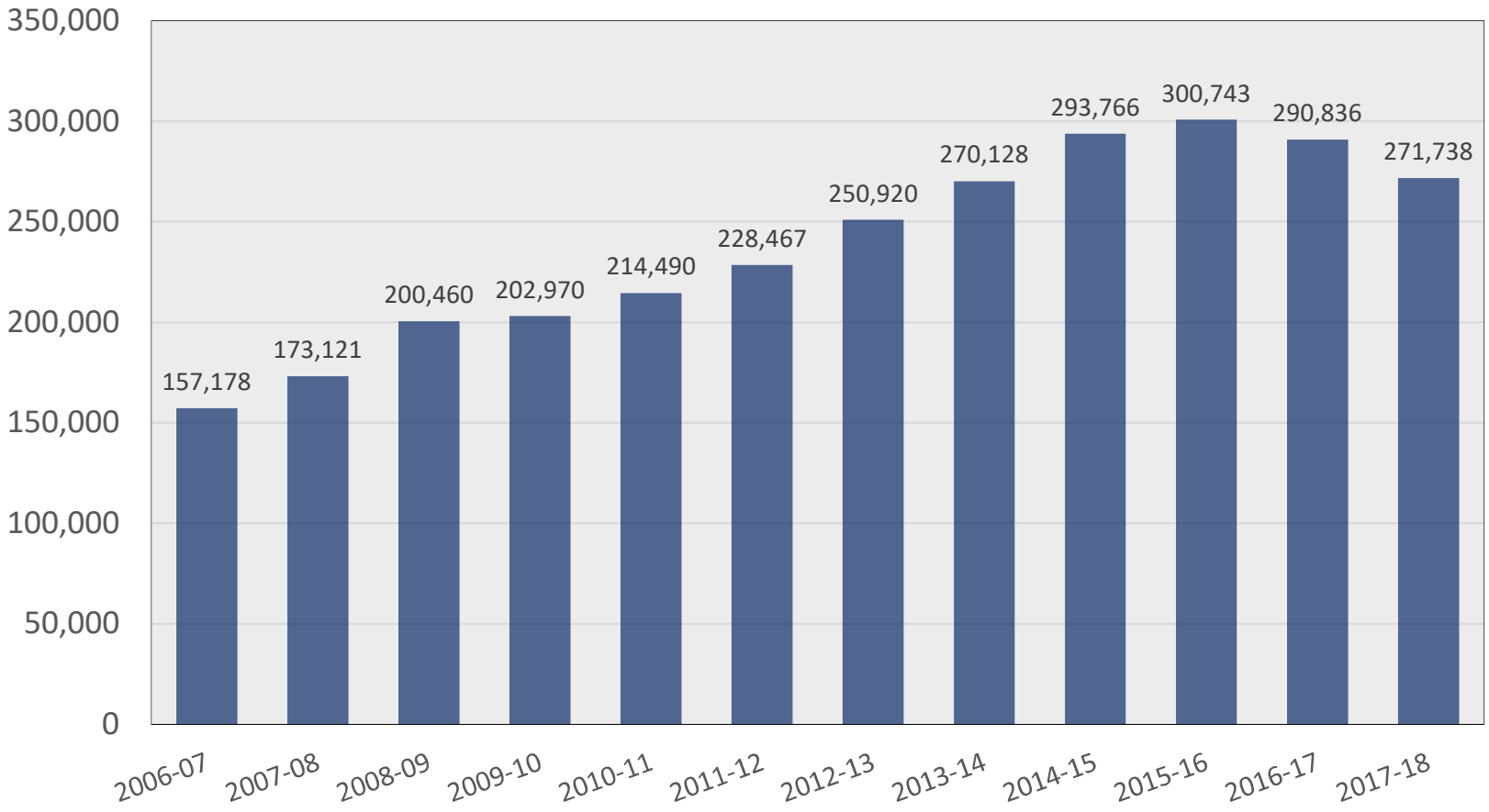
| Mixed approaches | |
|---|---|
| US (many subsidies) | (971,417) |

There is a significant number of intermediate cases, countries that charge international students more than domestic students but at below commercial (profit-making) levels

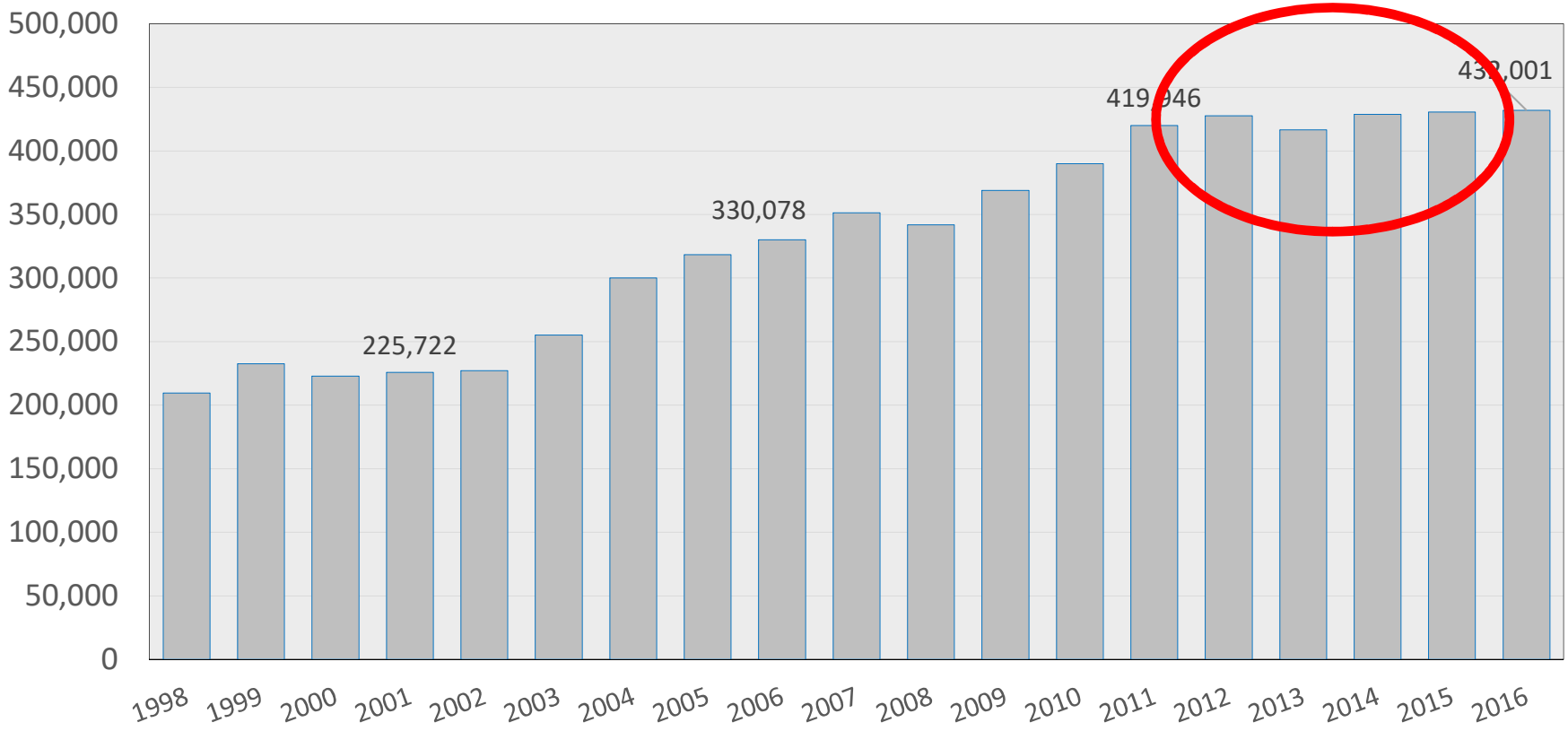
# International students, United States: IIE data, 1977-78 to 2017-18



# New international students, United States: IIE data, 1977-78 to 2017-18



# International students, UK: UNESCO data, 1998-2016



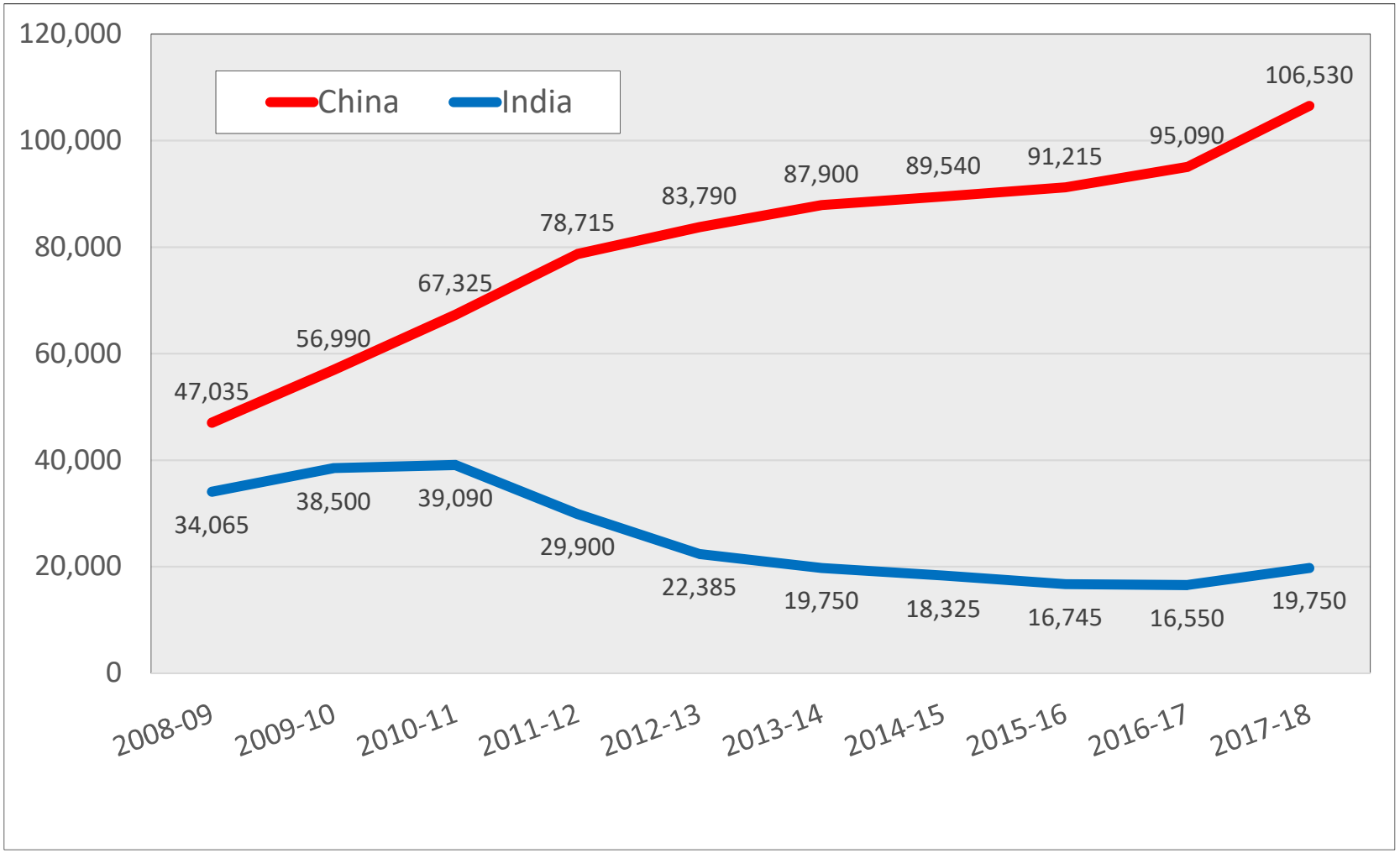
# Students entering UK, by country:

2011-12 and 2017-18, HESA data

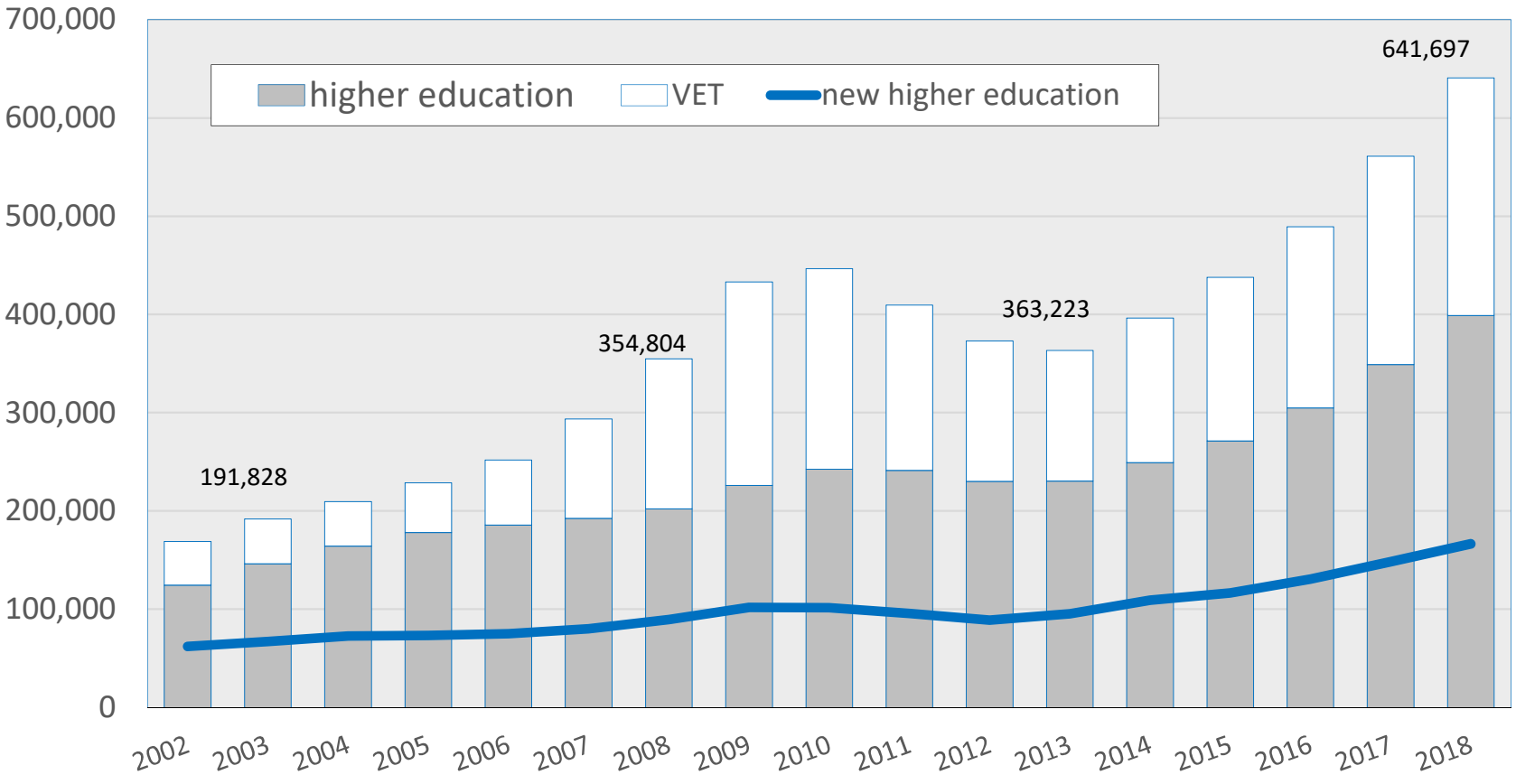
| Country of origin | 2011-12 | 2017-18 | % change 2011-12 & 2017-18 |
|---|---|---|---|
| China | 78,715 | 106,530 | +35.3% |
| India | 29,900 | 19,750 | - 33.9% |
| United States | 16,335 | 18,885 | + 15.6% |
| Hong Kong SAR | 11,335 | 16,350 | + 44.2% |
| Malaysia | 14,545 | 14,970 | + 2.9% |
| Italy | 8010 | 13,985 | + 74.6% |
| France | 12,835 | 13,660 | + 4.1% |
| Germany | 15,985 | 13,545 | - 15.3% |
| Nigeria | 17,620 | 10,540 | - 40.2% |
| Greece | 11,790 | 10,135 | - 13.8% |
| Spain | 5935 | 9630 | + 62.3% |
| Ireland | 15,075 | 9600 | - 36.3% |

# Students entering UK from China, India:

2008-09 to 2017-18, UK HESA data



# International students, Australia: AEI data, 2002-2018




VET = Vocational Education and Training

# Internationally mobile/ foreign [*] doctoral students as % of all doctoral students, 2015

Numbers in brackets = number of top 500 universities, ARWU 2018

| | |
|---|---|
| Luxembourg (0) | 87.0% |
| Switzerland (8) | 54.3% |
| New Zealand (4) | 46.2% |
| UK (39) | 42.9% |
| Belgium (7) | 42.3% |
| France (19) | 40.1% |
| USA (139) | 37.8% |
| Netherlands (11) | 36.2% |
| Sweden (11) | 34.0% |
| Australia (23) | 33.8% |
| Denmark (5) | 32.1% |
| Iceland (0) | 31.6% |

| | |
|---|---|
| Austria (6) | 27.0% |
| **OECD average** | **25.7%** |
| Ireland (4) | 25.4% |
| Canada (18) | 24.4% |
| Brazil* (6) | 22.4% |
| Portugal (4) | 21.2% |
| Norway (3) | 20.5% |
| Finland (4) | 19.9% |
| Japan (16) | 18.2% |
| Czech Rep.* (1) | 14.8% |
| Estonia (1) | 10.7% |
| Germany (36) | 9.1% |

| | |
|---|---|
| Slovak Rep.* (0) | 9.1% |
| Latvia (0) | 8.8% |
| South Korea* (10) | 8.7% |
| Slovenia (1) | 8.5% |
| Chile (2) | 8.4% |
| Hungary (0) | 7.2% |
| Turkey* (1) | 6.5% |
| Israel* (6) | 5.5% |
| Russian Fed.* (4) | 4.5% |
| Mexico (1) | 2.6% |
| Poland (2) | 1.9% |

Data: OECD

# CONCLUDING THOUGHTS

# Question marks over future mobility of students, researchers and knowledge

- Doubtful future of student mobility from China to US with possible increases in flows to other countries. *But* may be pushback against China in parts of Europe
- Open access regime in science is gathering strength *but*
  - Protocols: Need for agreed legal frameworks on science and IP
  - Networks: Danger of loss of single communications system.
  - Cold War Ideology: Sharing and access become 'spying', larger part of knowledge moves from 'sacred' to 'national interest' and out of global circulation.
  - Trump's restriction of mobility from Middle East and newer f visa refusals for researchers from China (now extended to education) blocks talent flows and potential collaboration.

**University departments, faculty and researchers can resist New Cold War mentality and sustain full collaboration, open exchange and mutual solidarity**