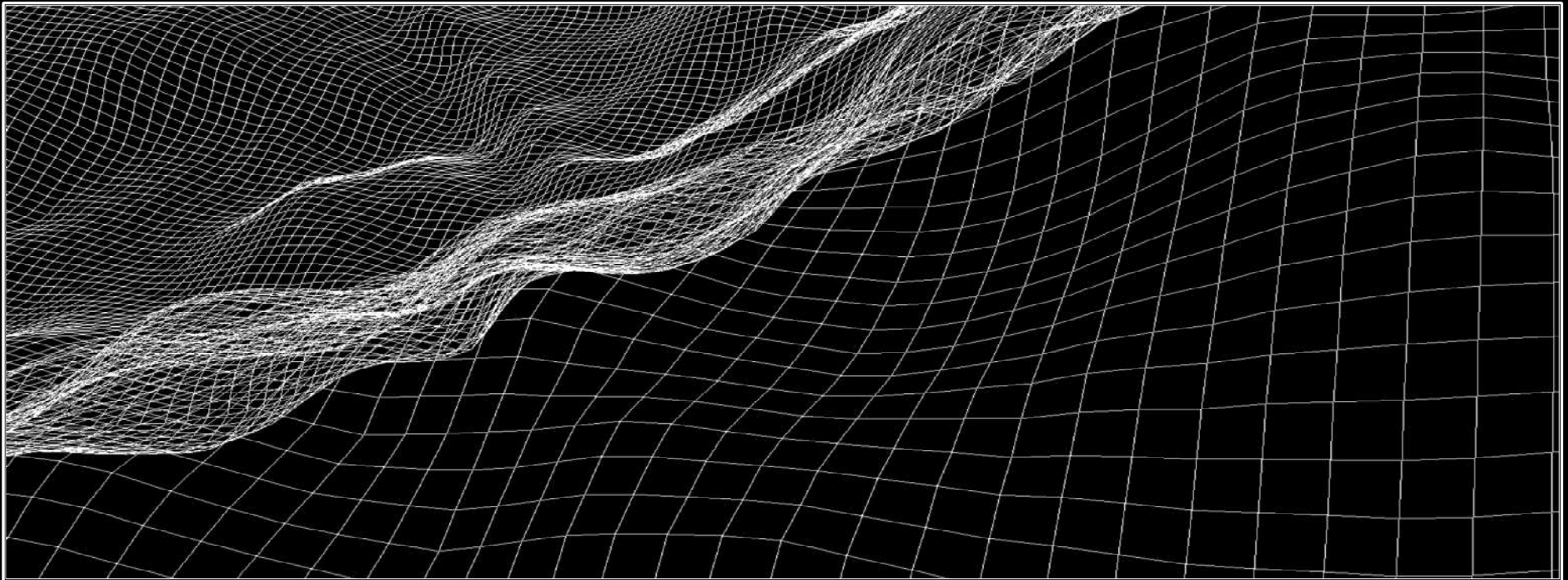
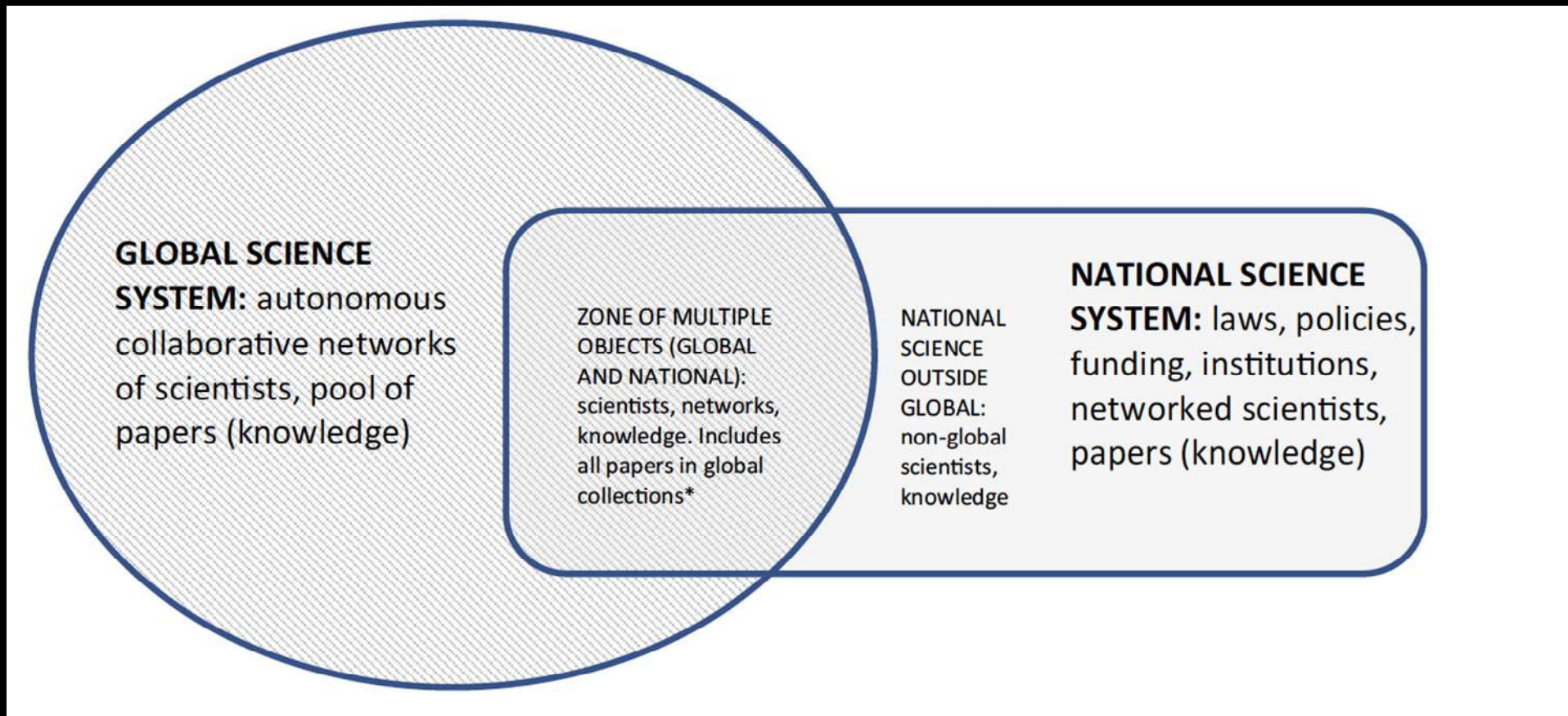


Global science in a world of nation states: Do those who pay the piper call the tune?

Simon Marginson, University of Oxford
IREG-2021, Jeddah, 15 November 2021





Global science and national science: two distinct and overlapping science systems

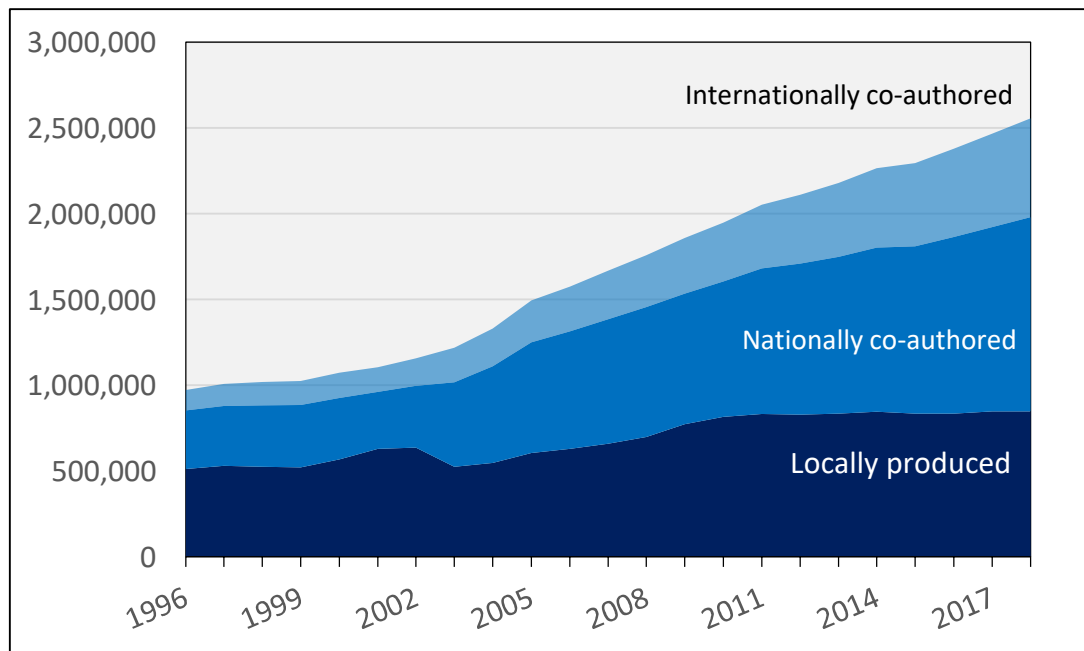
- 'The global network has a culture, pathways, and norms of communication specific to its structure, and diverging from national, regional, or disciplinary norms' - Wagner, Whetsell and Leydesdorff, 2017, p. 1646.

Distinction between national and global science

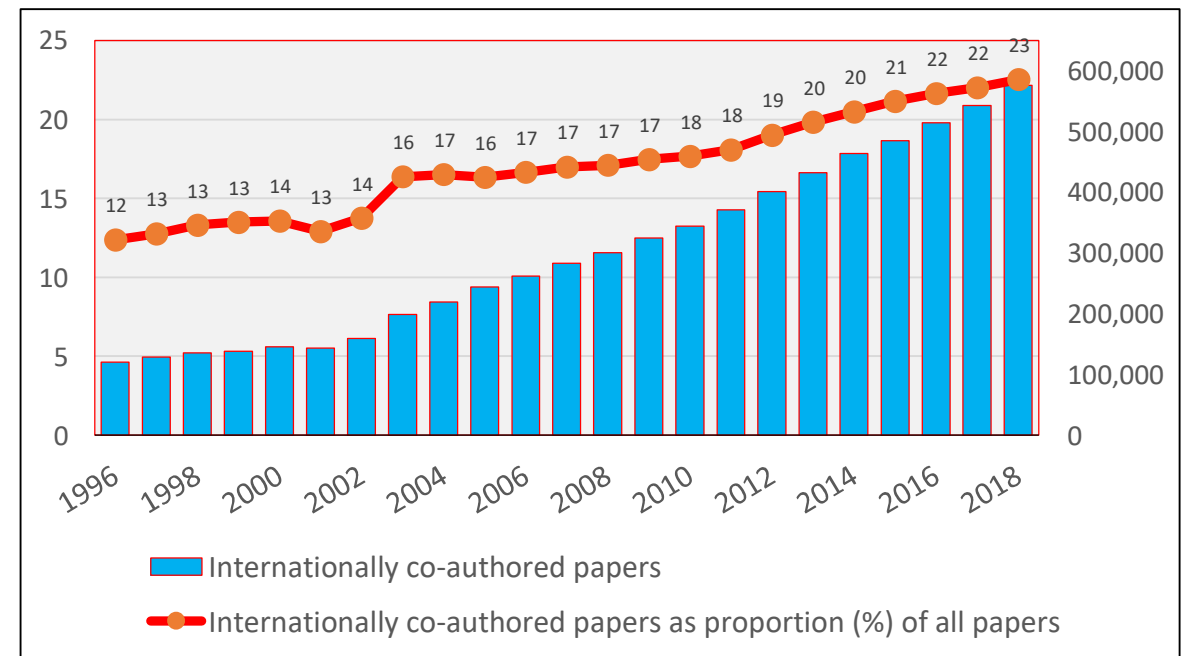
	Global science system	National science system
Core components	Knowledge, people, networked communications, norms and practices	Nation-state ordered and resourced institutional structure of science activity
Enabling conditions	Resources, institutions, and (often national) agencies/policies/rules	Political and economic stability and policy commitment to science activity
Main functions	Production and circulation of new knowledge via networked activity	Legal, political, financial conditions of science. Some knowledge, applications
Boundary	World society	Nation-state
Normative centre	No normative centre	Nation-state
Knowledge contents	Papers published in journals admitted by Web of Scienc and Scopus	Most contents of global journals plus further nationally circulated materials
Social relational	Collegial groups of scientists operating in networks	Government agencies, research organisations, networked scientists
Collective loyalty	Diffuse: disciplinary community as persons and as shared knowledge	Concentrated: national and institutional authorities
Regulation	Local self-regulation on the basis of global collegial scientific norms	National law, official regulation, policy, financing systems, cultural norms
How this system affects the other system	Knowledge potential of global science stimulates state funding	National resources, institutions and personnel underpin global science

The internationally collaborative share of science papers continues to increase (and for the most part this has been seen as ‘win-win’ with national science)

Total science papers in Scopus, by type of collaboration, world: 1996-2018



Internationally co-authored papers in Scopus, all countries: 1996-2018



Yet science is funded by governments for whom the abiding purpose is not global cooperation, new ideas or scientific careers, but national security and prosperity, in a world that oscillates between a bordered Westphalian order of nations and a Hobbesian competition of all against all

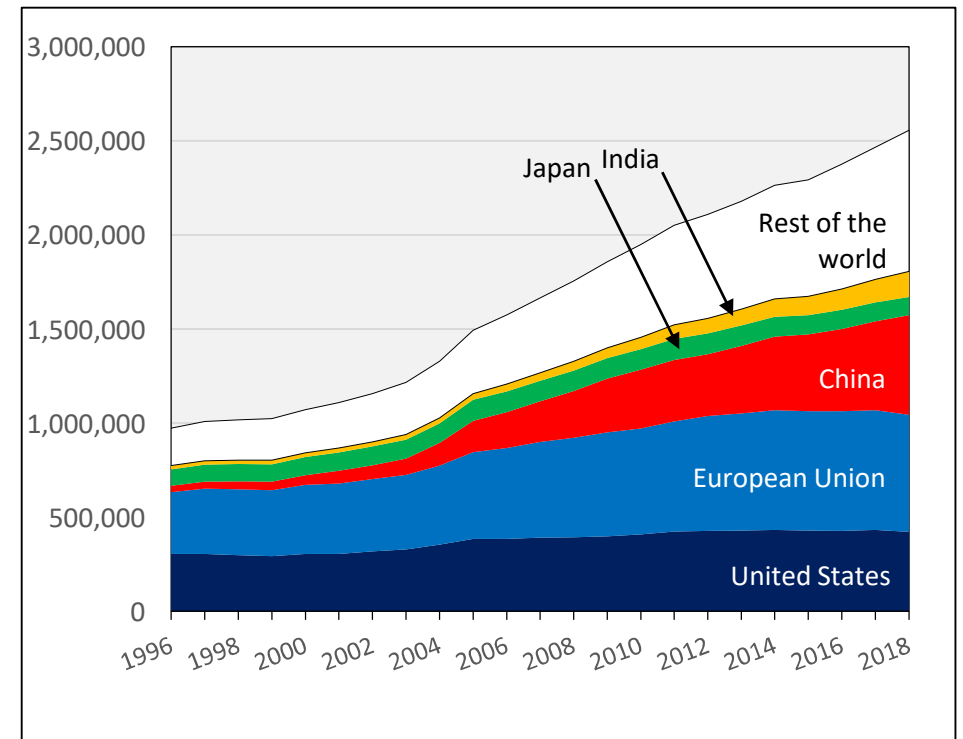


And in the context of a multipolar geo-political setting with increasingly open confrontation between US and China

- ‘The new swing of the pendulum ... is going to lead to a world where no one will be dominant... What is different about our time is that globalization forces us to live all jumbled together and yet we have very different visions of what this common world should look like. [Political scientist] Charles Kupchan writes: “The next world will hardly be the first one in which the different great powers operate according to different conceptions of order. But, due to the onset of global interdependence, it will be the first time that such a diverse set of orders intensely and continuously interact with each other.”’

- Bruno Macaes, *The Rise of Eurasia*, Penguin, 2018

Number of science papers in Scopus by world region: 1996-2018



China is now very strong in strategically important 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: 2016-2019 (*Leiden ranking*)

University	System	Physical sciences & engineering
Tsinghua U	CHINA	909
MIT	USA	683
Zhejiang U	CHINA	622
Nanyang TU	SINGAPORE	566
U Science & T.	CHINA	556
Harbin IT	CHINA	545
Stanford U	USA	541
Shanghai JT U	CHINA	513
Xi'an Jiaotong U	CHINA	512
Huazhong U S&T	CHINA	502
Harvard U	USA	487
National U	SINGAPORE	455
U Calif., Berkeley	USA	449
Peking U	CHINA	444

University	System	Maths & computing
Tsinghua U	CHINA	292
U Electronic S&T	CHINA	275
Harbin IT	CHINA	269
Huazhong U S&T	CHINA	231
Xidian U	CHINA	221
Beihang U	CHINA	215
MIT	USA	205
Zhejiang U	CHINA	194
Southeastern U	CHINA	193
Nanyang TU	SINGAPORE	187
Shanghai JT U	CHINA	178
Northwestern P. U	CHINA	164
Wuhan U	CHINA	161
Beijing IT	CHINA	159

The US-China collaboration has been especially important in global science, primarily in the physical sciences, engineering, computing and mathematical sciences

Country pair	Joint papers 2018	1996 = 1.00
China-USA	55,382	26.10
China-UK	14,763	21.74
China-Australia	13,138	46.42
China-Canada	9,449	18.75
China-Germany	8,206	14.03
China-Japan	8,024	9.47
China-Singapore	5,563	46.00
China-France	5,472	19.83



US-China science in the 'Asian century'

- After 1979 US-China Agreement on Cooperation in Science and Technology: 50 interagency agreements, thousands of programmes.
- 'China's special relationship with the United States in science has helped to propel it to the scientific frontier'
 - Packalen, M. (2019). Edge factors: scientific frontier positions of nations, *Scientometrics*, 118, pp. 804-805
- China's researchers led largest number of high citation joint papers 2016-2019
 - Lee, J. and Haupt, J., (2020). Winners and losers in US-China scientific research collaborations. *Higher Education*
- But US authorities' 'decoupling' strategy is now bearing down on joint appointments, restricting doctoral scholarships, fostering suspicion about motives of researchers



Unanswered questions

- Is the commitment of autonomous grass-roots science in the US sufficient to sustain cooperation, in the context of US authorities' determination to decouple US from China in science and technology?
- What way will the leading universities jump? Some have invested heavily in long-term US/China cooperation
- Will China remain committed to cooperation in science?
- How will Europe and other Asian nations respond?
- Will we have new alliance patterns and two separated worlds of S&T, with certain nations sitting between?
- What are the consequences for the global science system?