

Collaboration and Leadership

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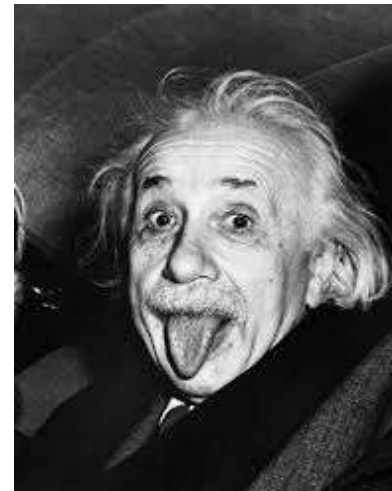
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Leadership in science

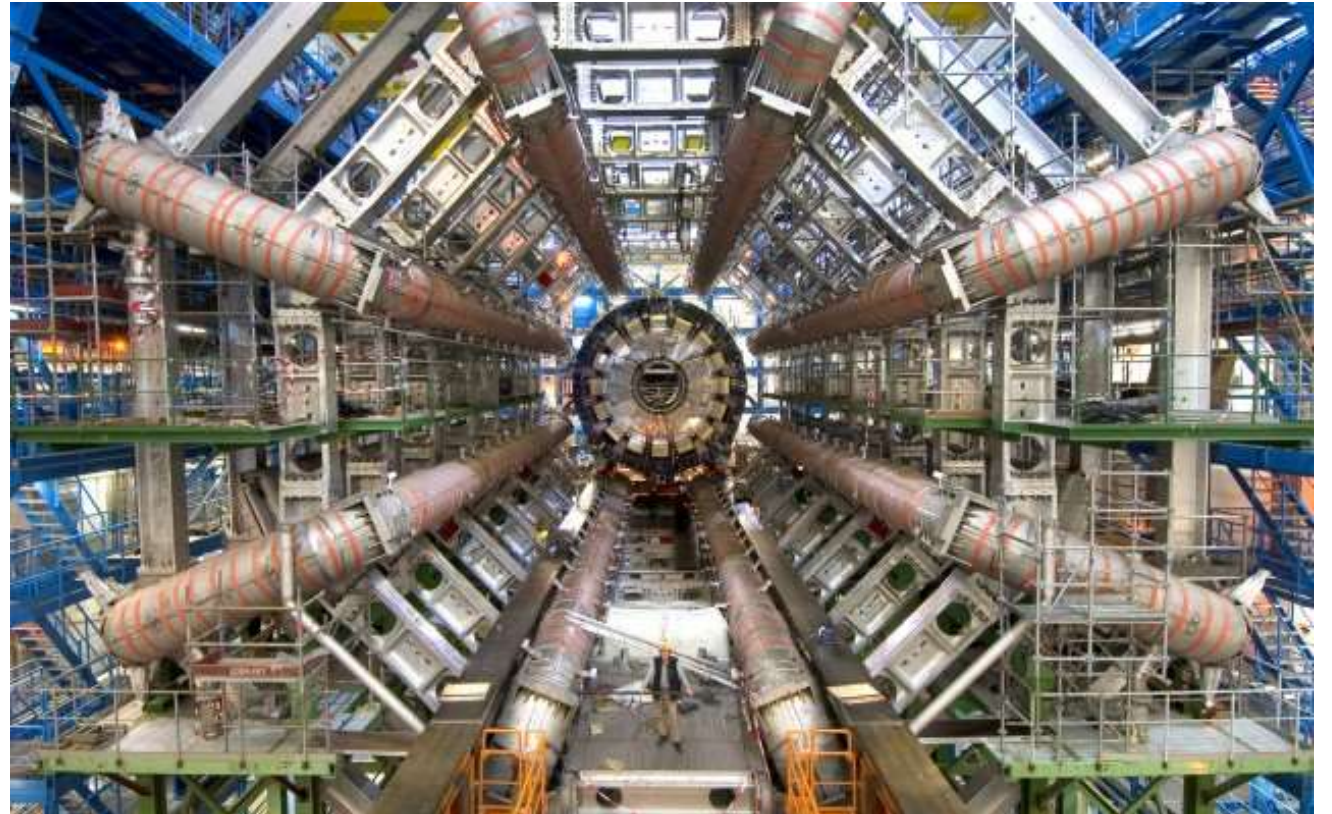
The traditional idea of scientific leadership

- Popular characterizations of (western) scientific history is full of scientific “leaders”



But science has changed, its more...

- collaborative, with bigger teams
- international
- expensive

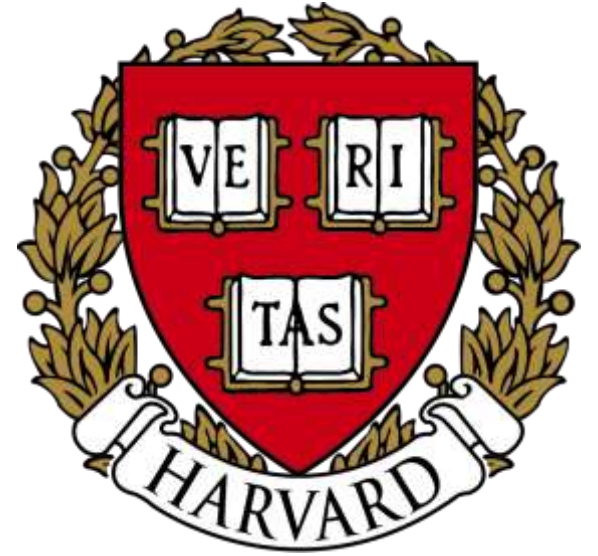
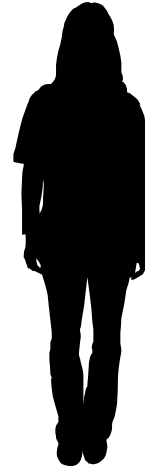


What does leadership mean in
global, collaborative science?

The many faces of ~~mobility~~
leadership

Who/what do we think of as “leader”?

- People?
- Institutions?
- Countries?



What makes them a leader?

Leadership in an *activity measure*

- *Who produces the most publications?*
- *Who receives the most citations?*
- *Who builds most on the most recently published literature?*



Leadership in *expenditure*

- Who spends the most money?



Leadership in *contribution*

- Who contributes the most to international publications?
- Authorship indicates leadership
 - First
 - Last
 - Corresponding
- (ICMJE 2012 ; Moya-Anegón et al. 2013; Larivière et al. 2016; Costas & Iribarren, 2007; Van Leeuwen 2009; Chinchilla et al, 2016).

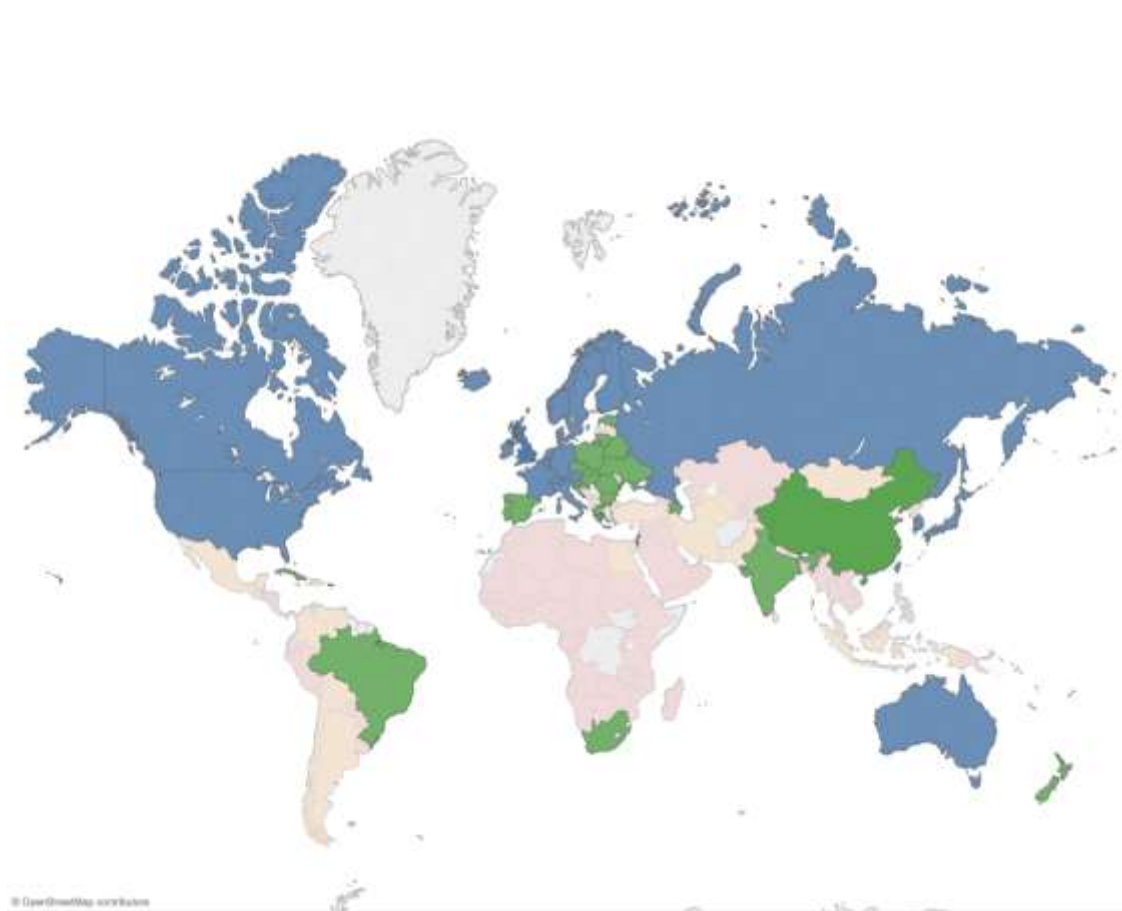


Many ways of thinking about
leadership

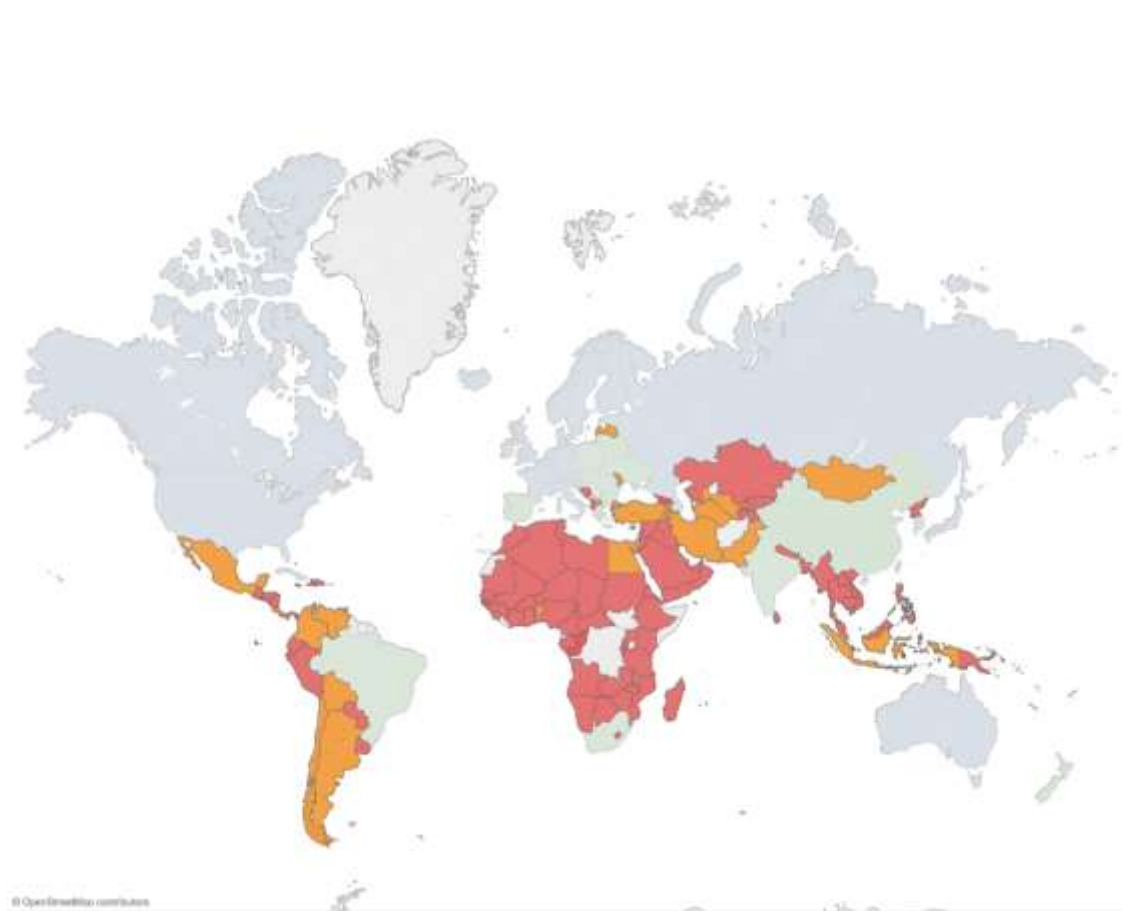
But here, we are concerned
mostly with *contribution* at the
country-level

Country's leadership, mobility,
and collaboration has been
studied, but...

Well-studied “elite” countries



Understudied Periphery



Moving away from the elite

To understand the **global** system of science, we need to move **away from the “elite”** and towards a comprehensive analysis of international scientific partnership



Goal: Investigate the costs/benefits of international collaboration and leadership in science for countries

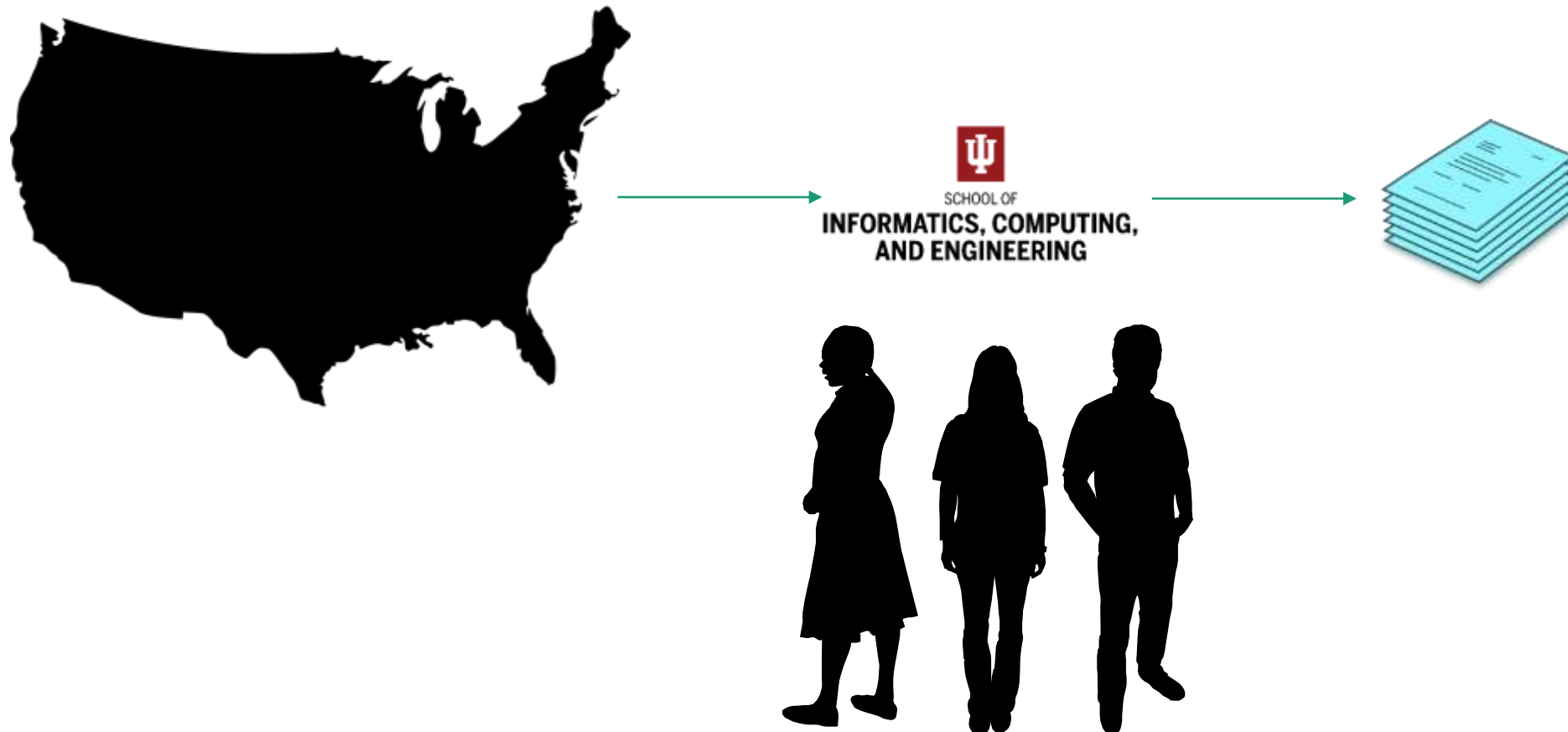
While bringing non-elite countries into the fold and assessing the impact of

Terminology and considerations

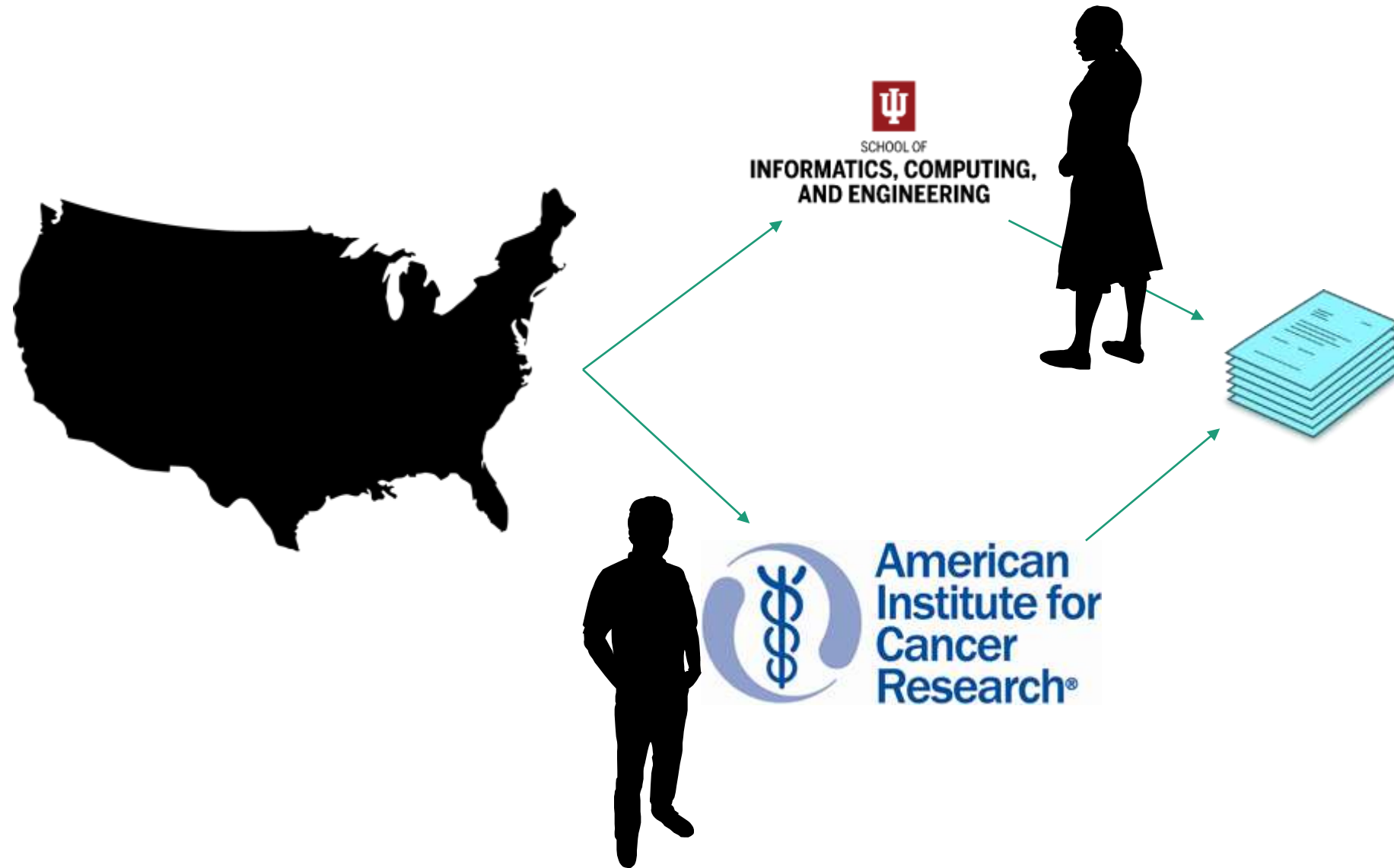
3 categories of collaboration

Defined at the *publication level*

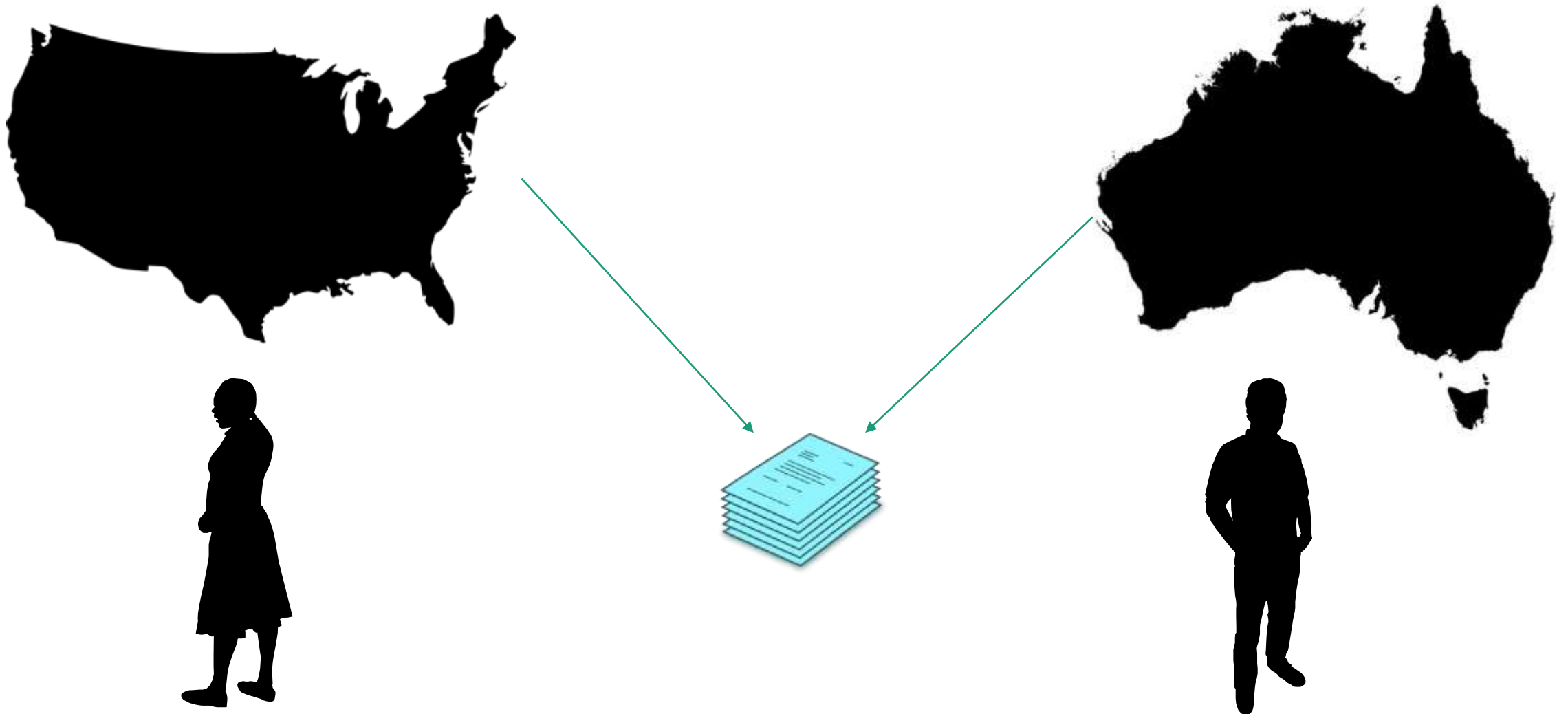
No collaboration



Domestic collaborations



International collaboration



Operationalizing leadership:

Corresponding, first, or last
authorship...

Leadership relative to size

Leadership relative to size...

8 total

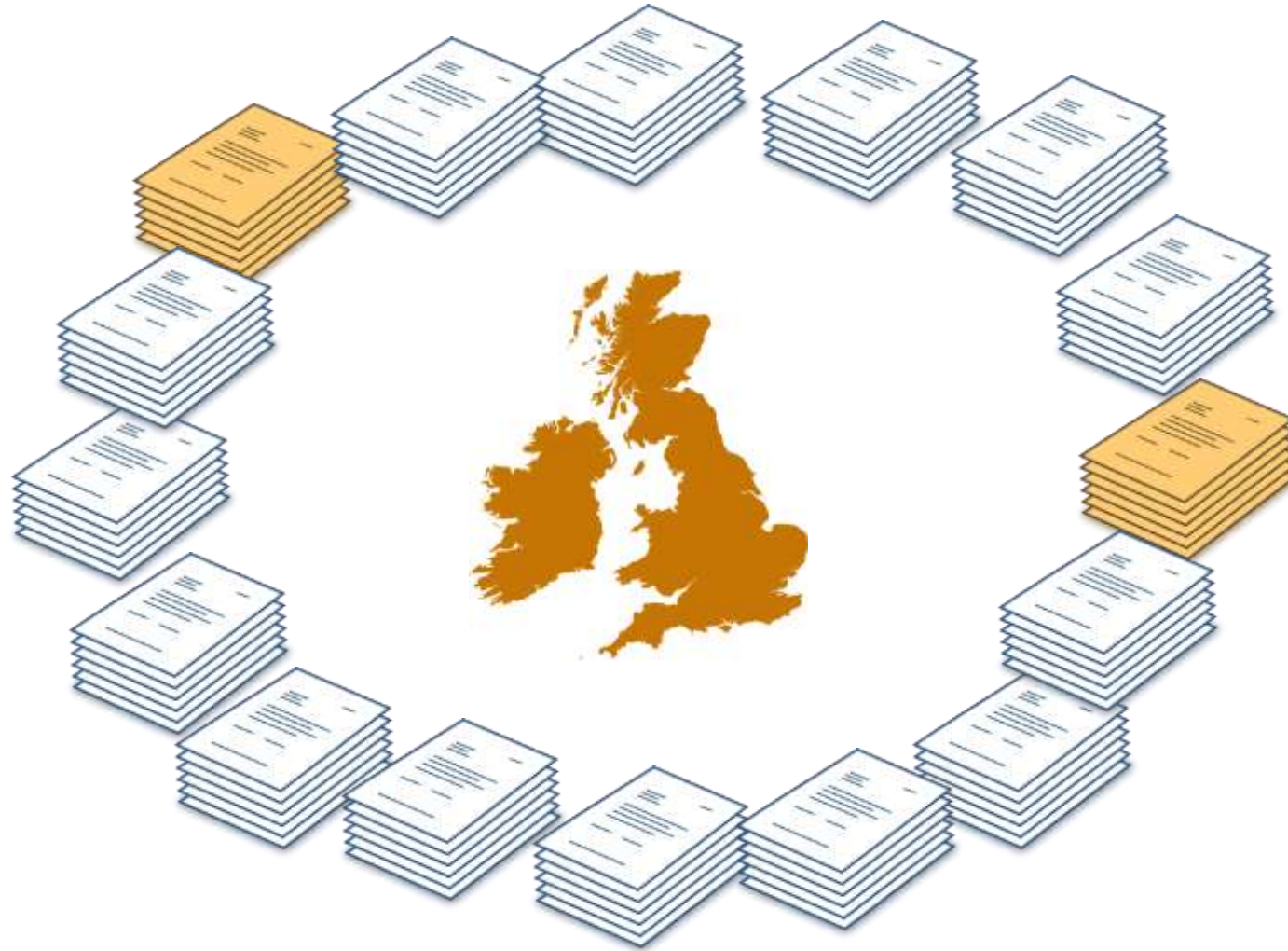
2 leading



Leadership relative to size...

16 total

2 leading



Data and methods

Web of Science

Period: 2000 – 2016

papers, reviews and conference proceedings

19,460,980

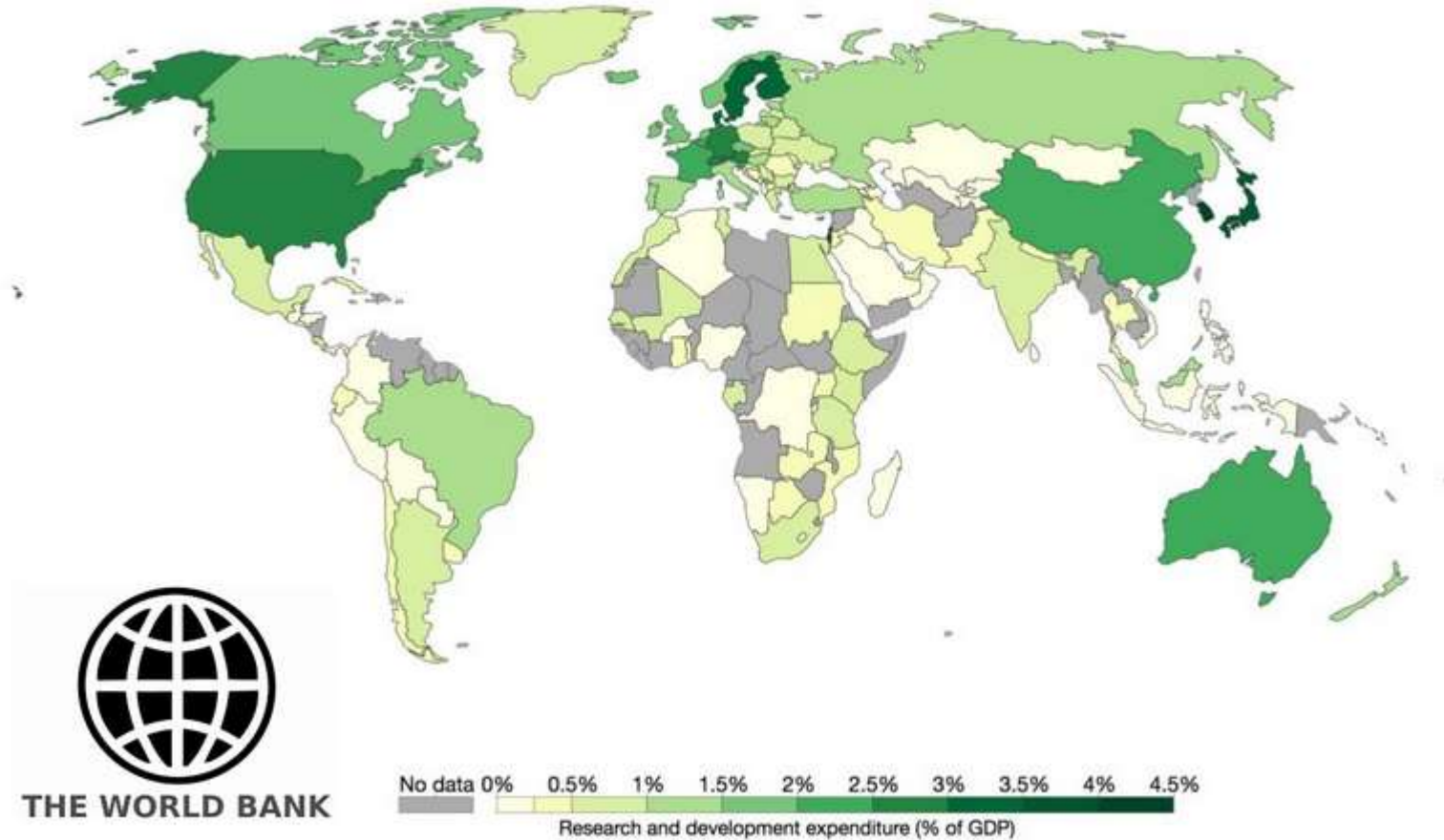


100 Countries



Research and development expenditure (% of GDP)

Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development.

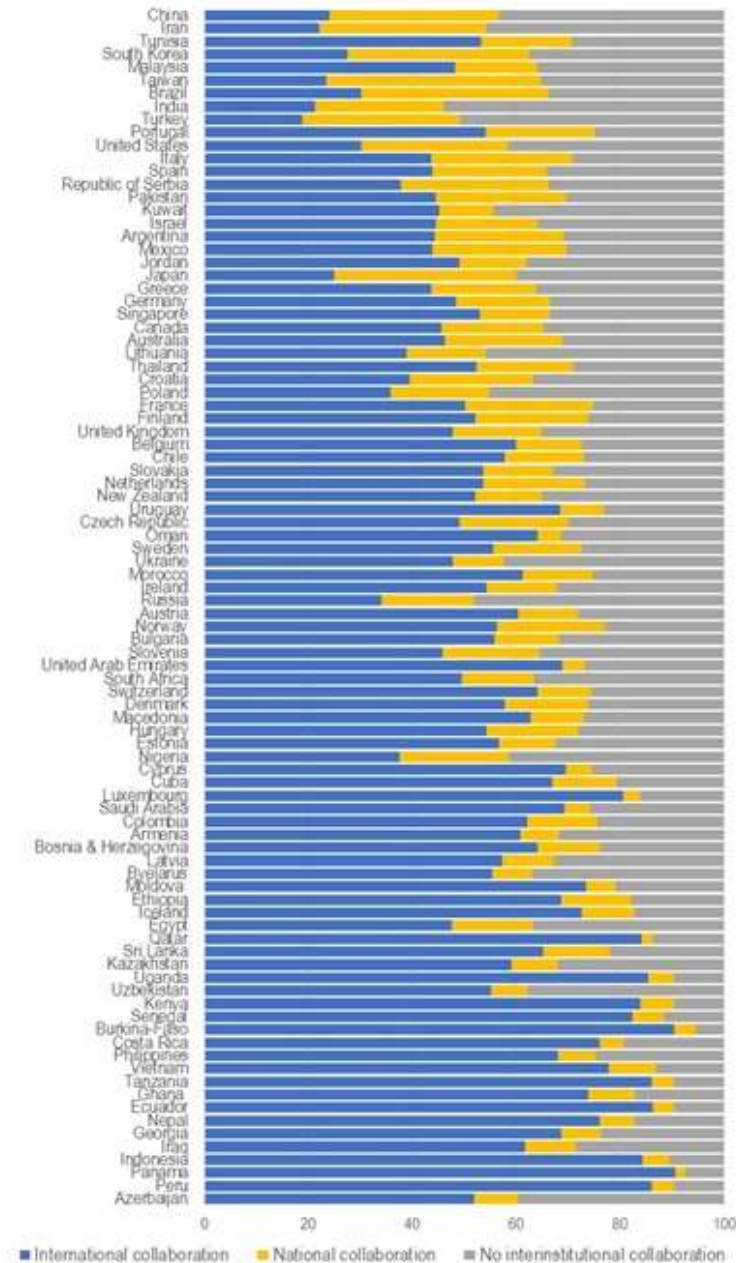


Source: World Bank – WDI: Research and development expenditure (% of GDP)

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Results

Collaboration profiles

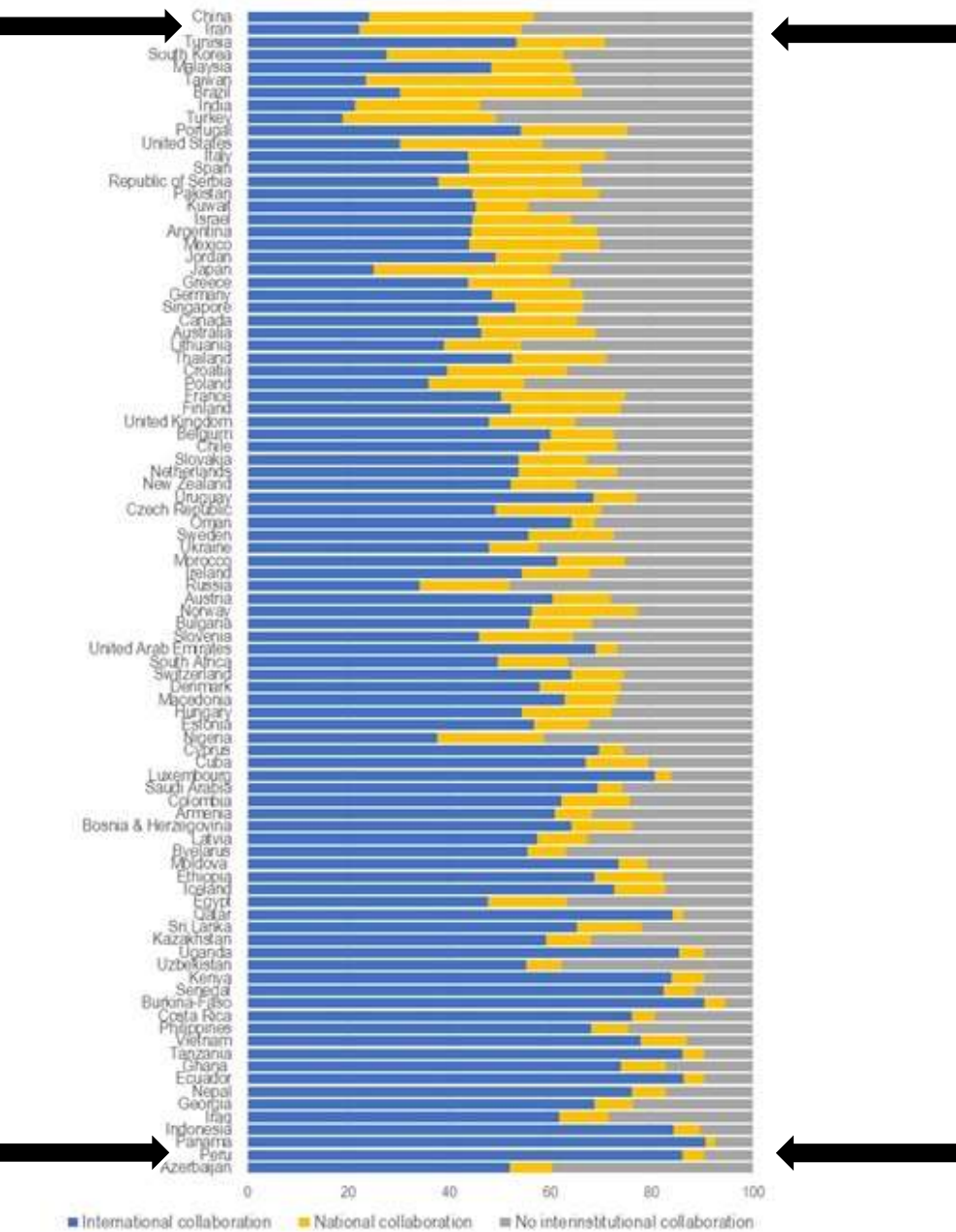


Blue = % International collaboration

Yellow = % National collaboration

Grey = % No collaboration

Collaboration profiles



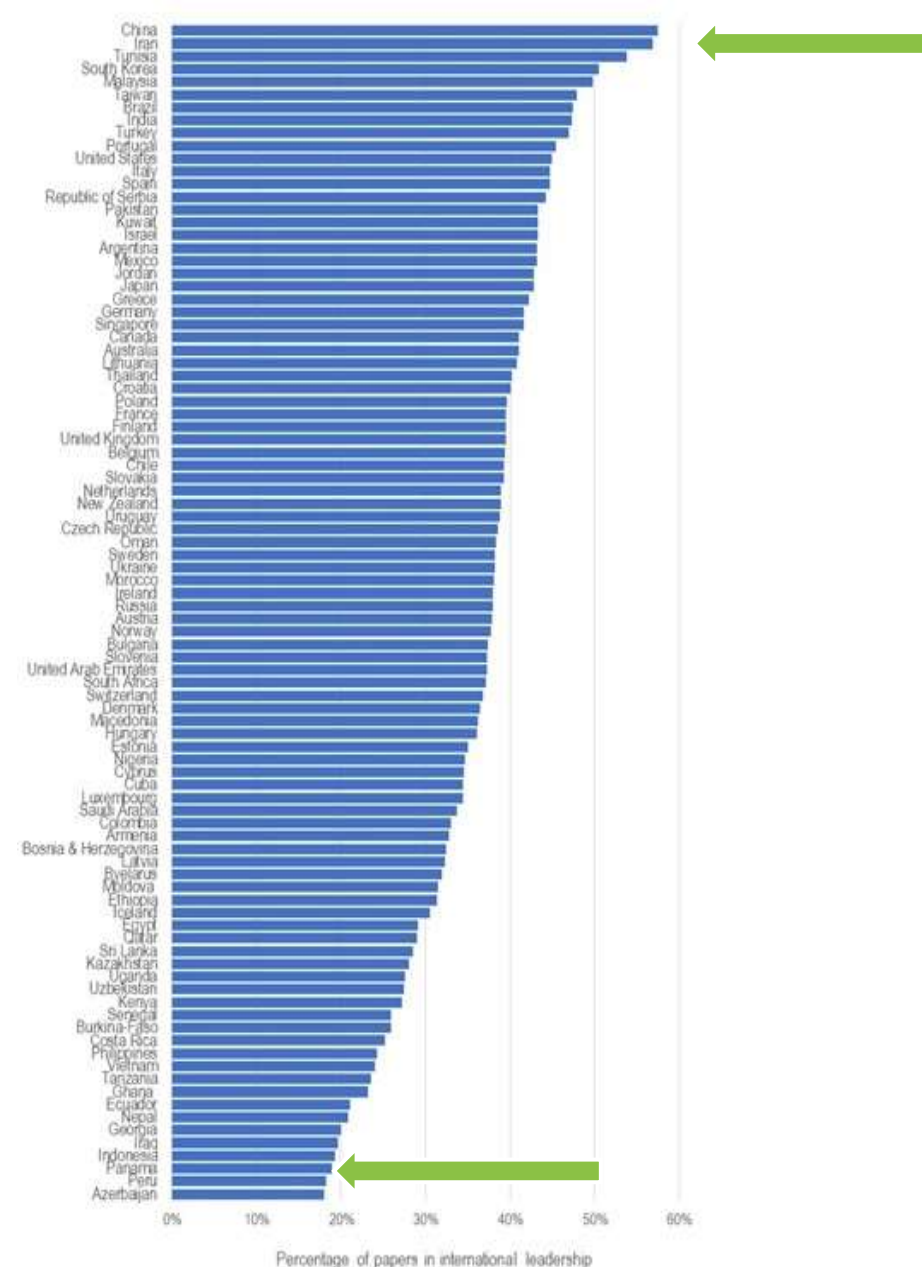
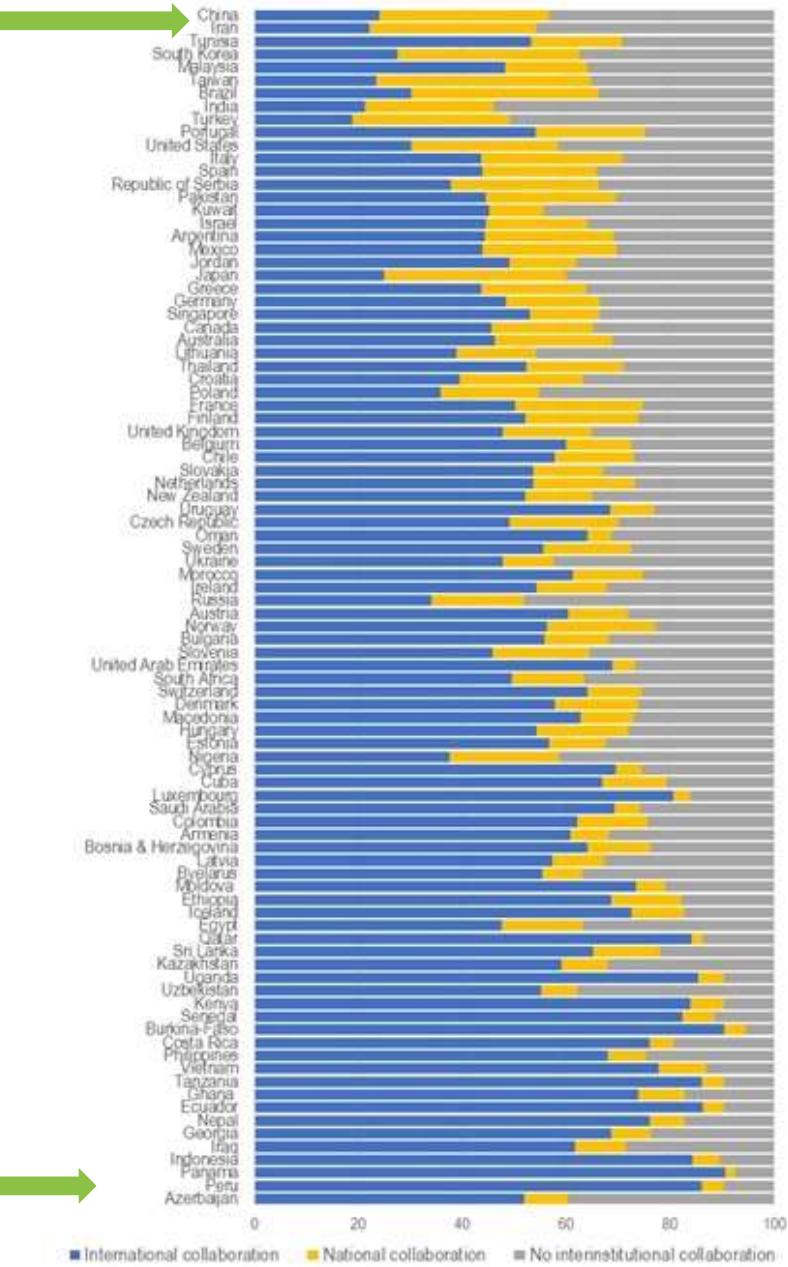
China:
Low international
collaboration

High domestic
collaboration

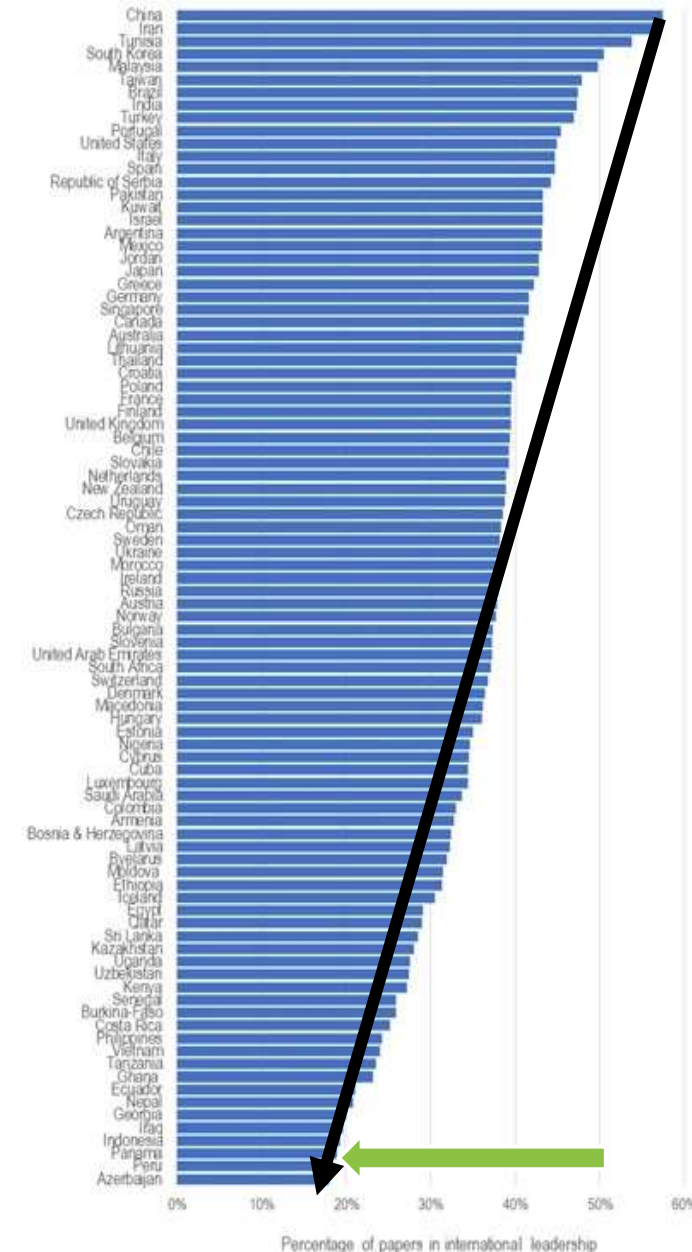
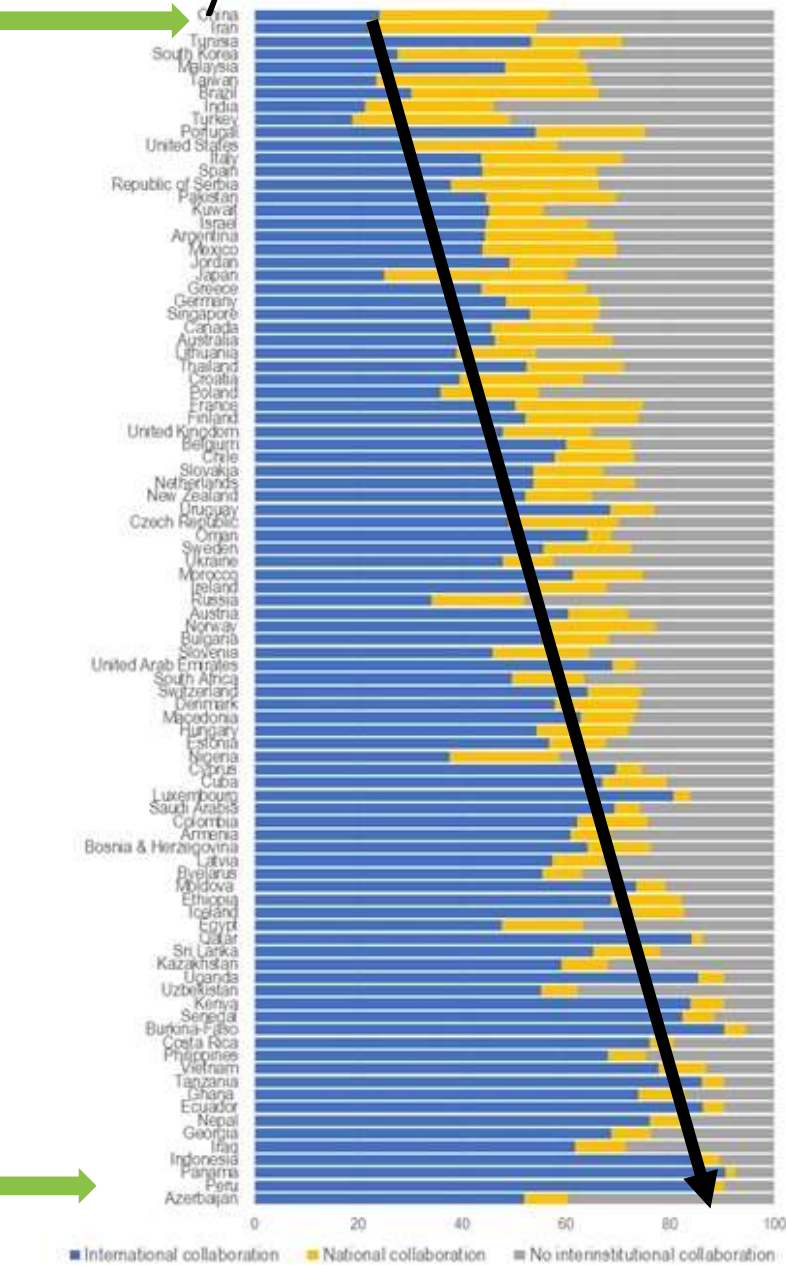
Peru:
High international collaboration

Very little international work

Collaboration profiles -> Leadership



The more dependent on international collaboration, the less they are in leadership positions



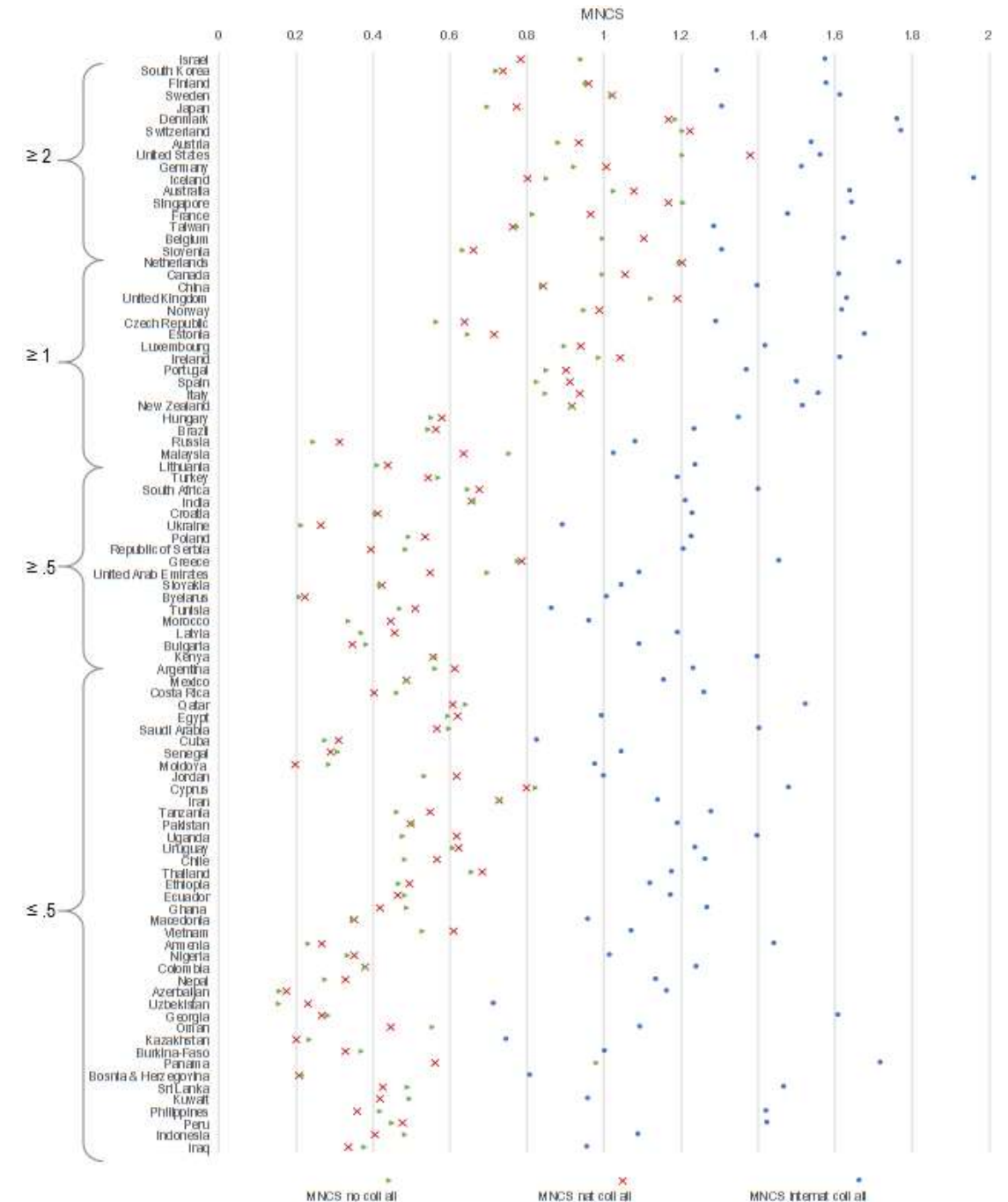
Citation score (MNCS) by collaboration type

X-axis = MNCS

Blue dot = international collaboration

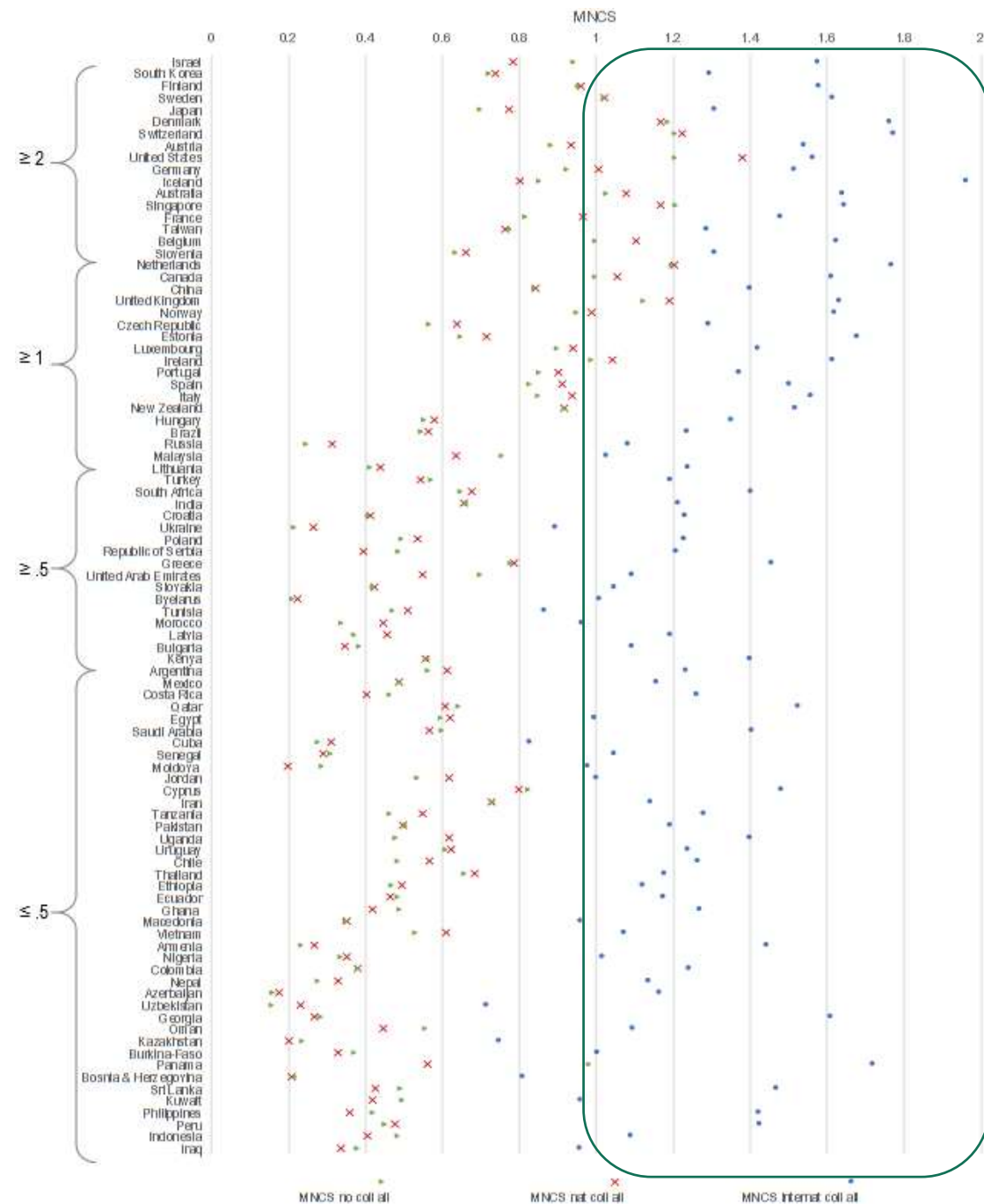
Red x = National (domestic) collab

Green triangle = No collaboration

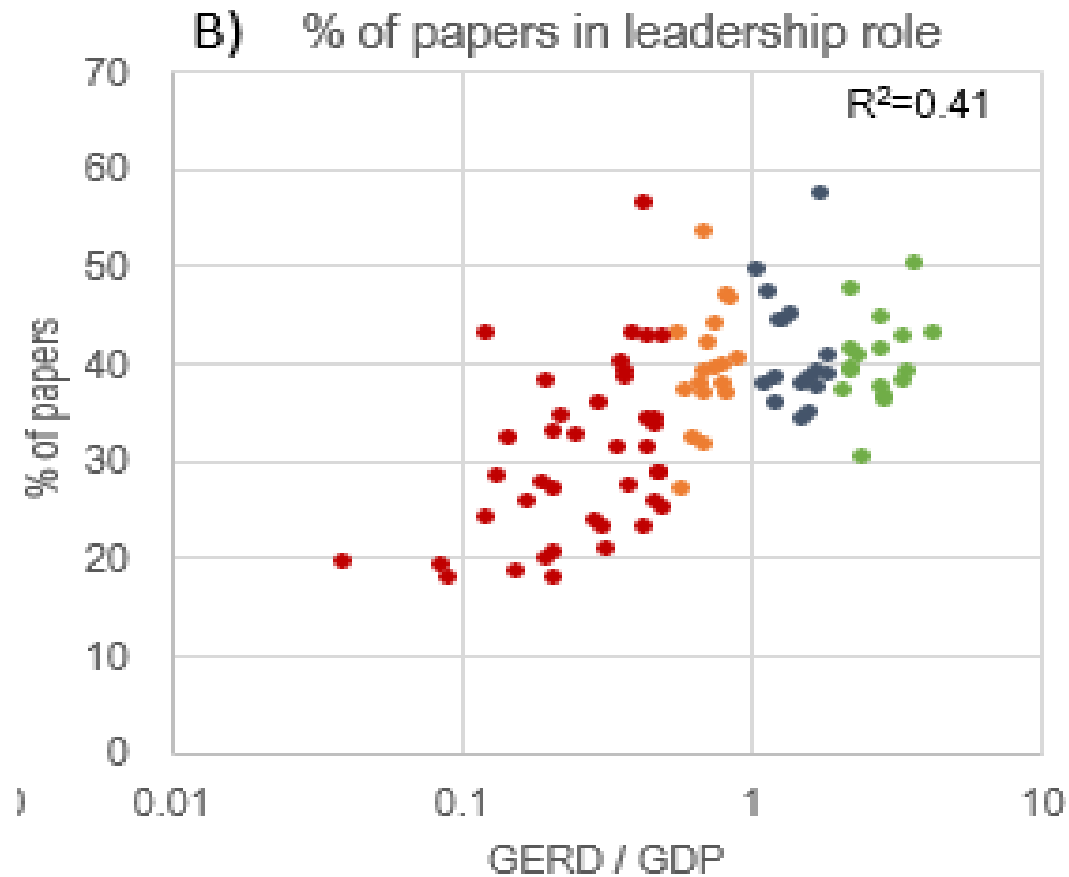


International collaboration results in high-impact research

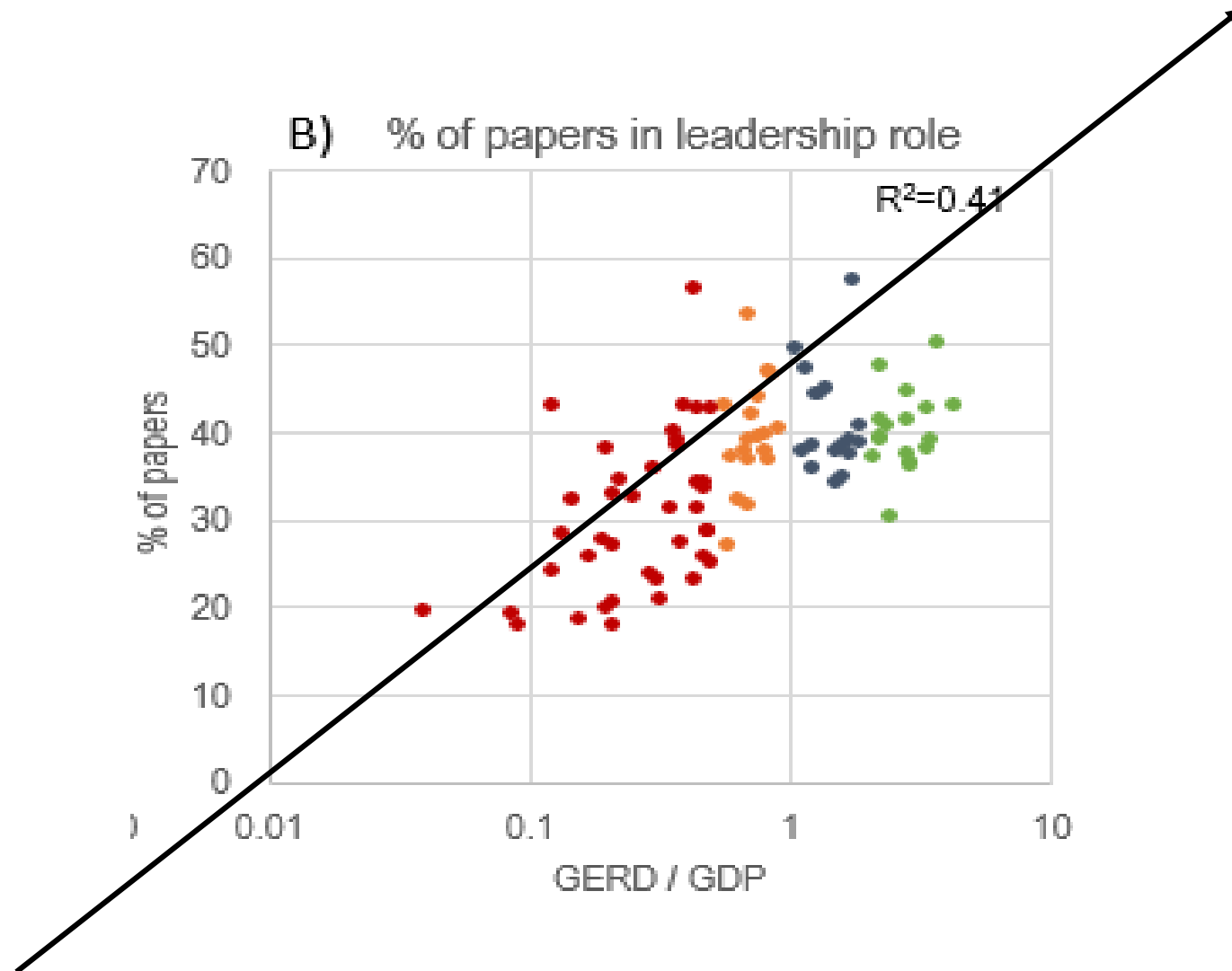
Notice that the blue dots (international collaboration) have a higher citation score than other dots



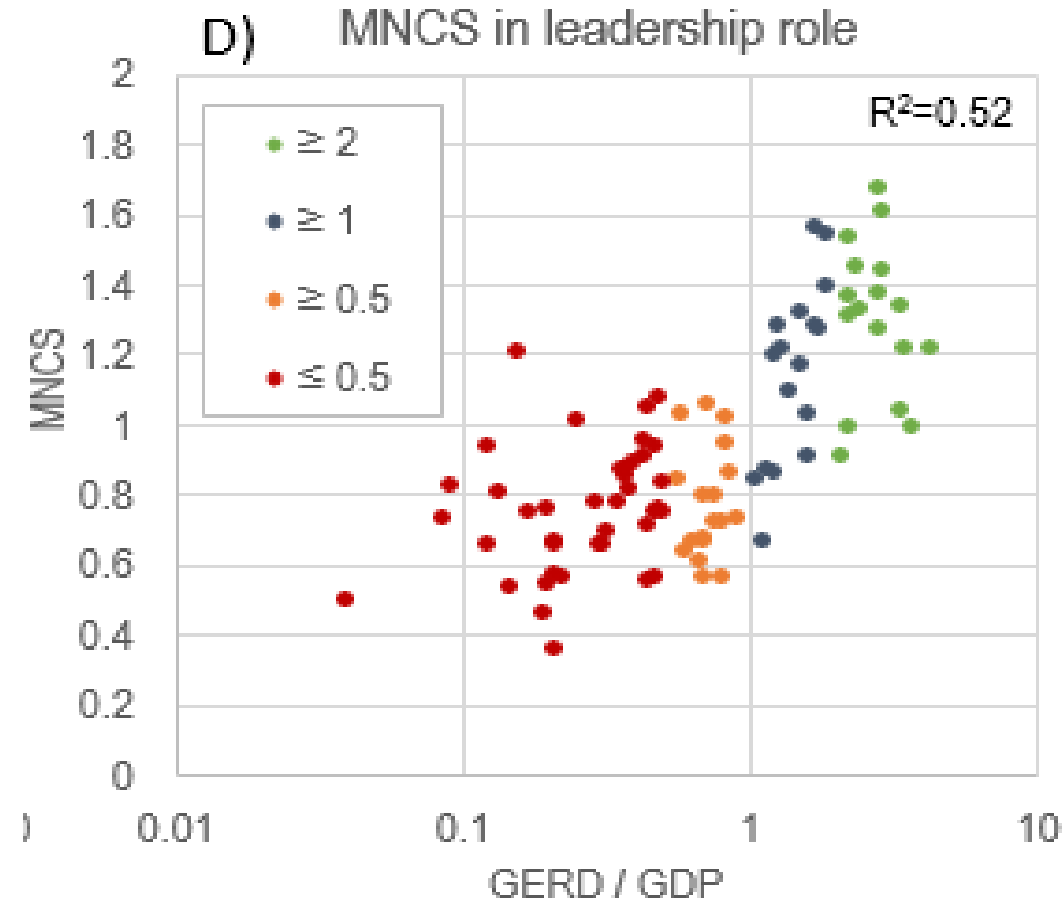
% of international publications in leadership role and proportion of country's research expenditure



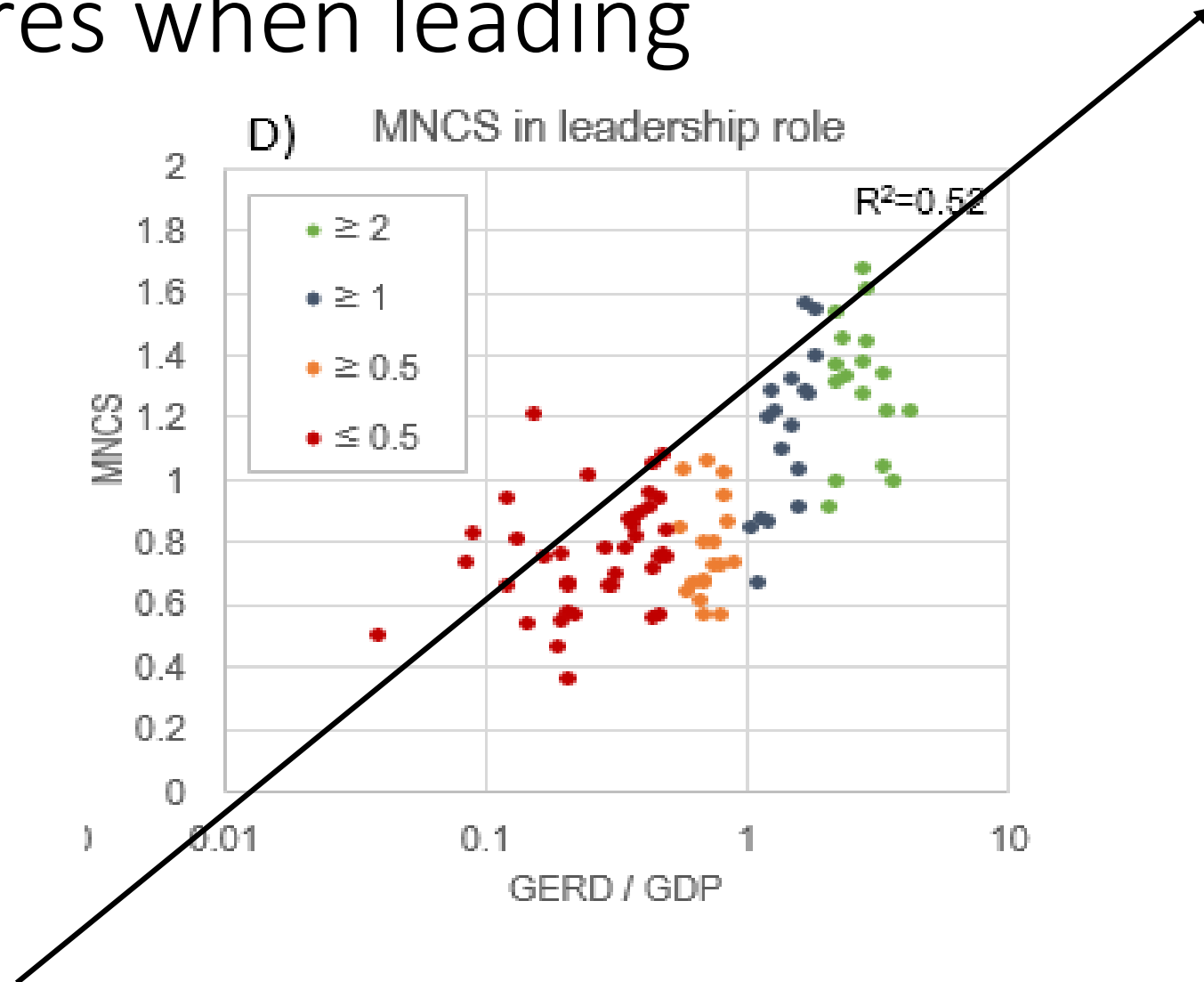
Scientifically “rich” countries are most often leaders



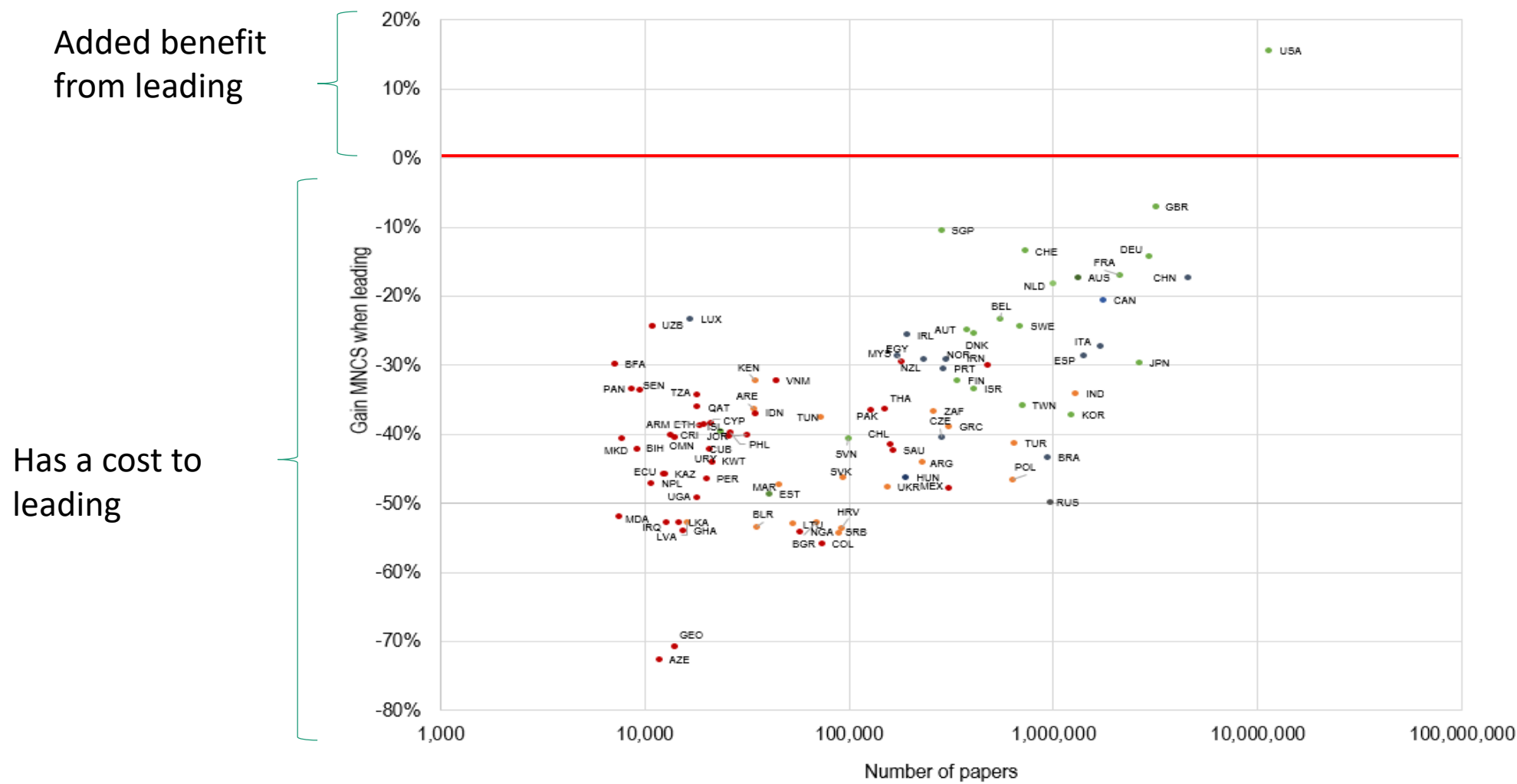
Now citation score (MNCS) by proportion research expenditure



Scientifically “rich” countries also have higher citation scores when leading



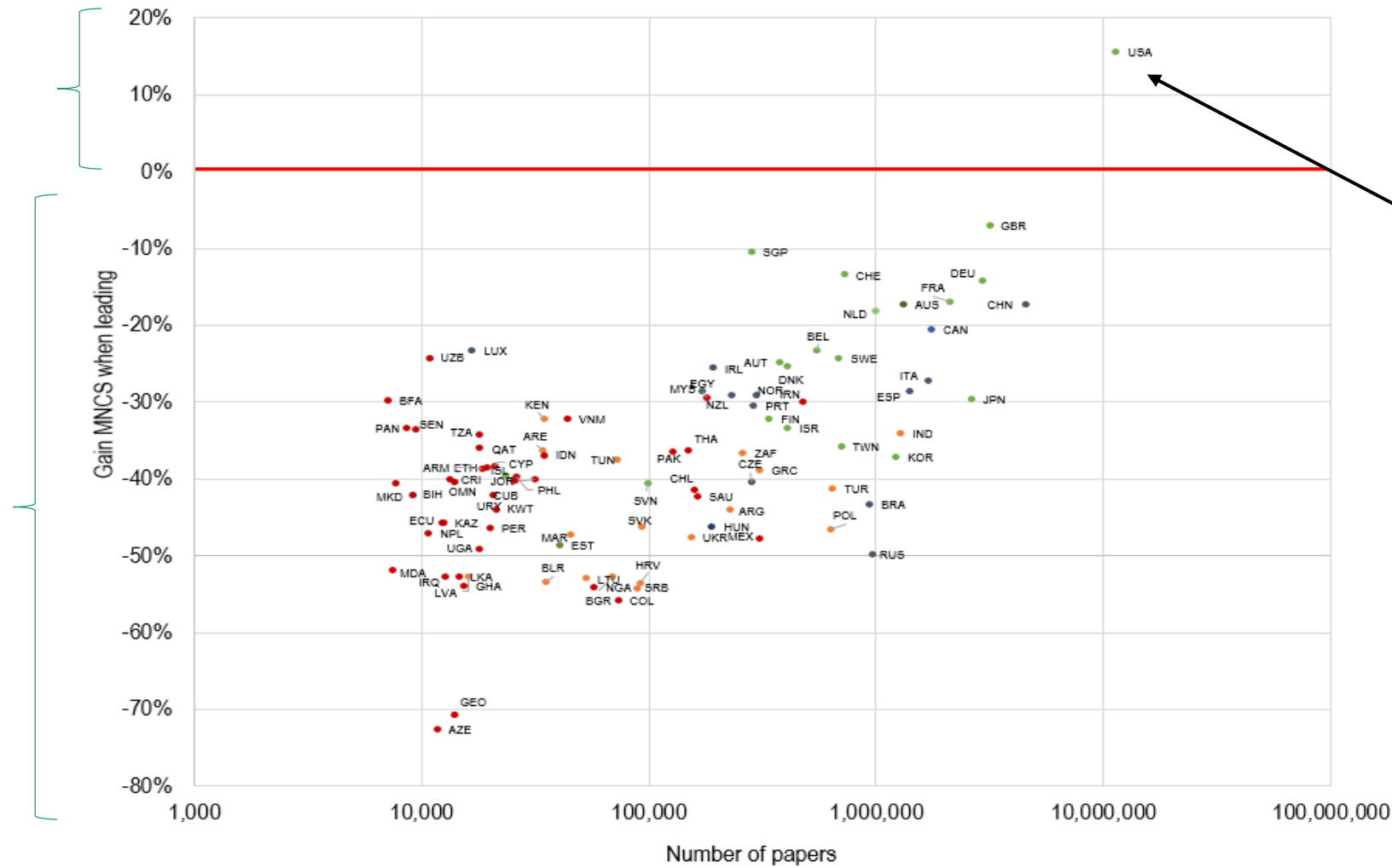
Does leading give a citation benefit over not leading, in an international collaboration?



Only the U.S.A. sees a citation *advantage* from leadership

Added benefit
from leading

Has a cost to
leading



International collaboration has
benefit, but leadership rarely
gives additional benefit

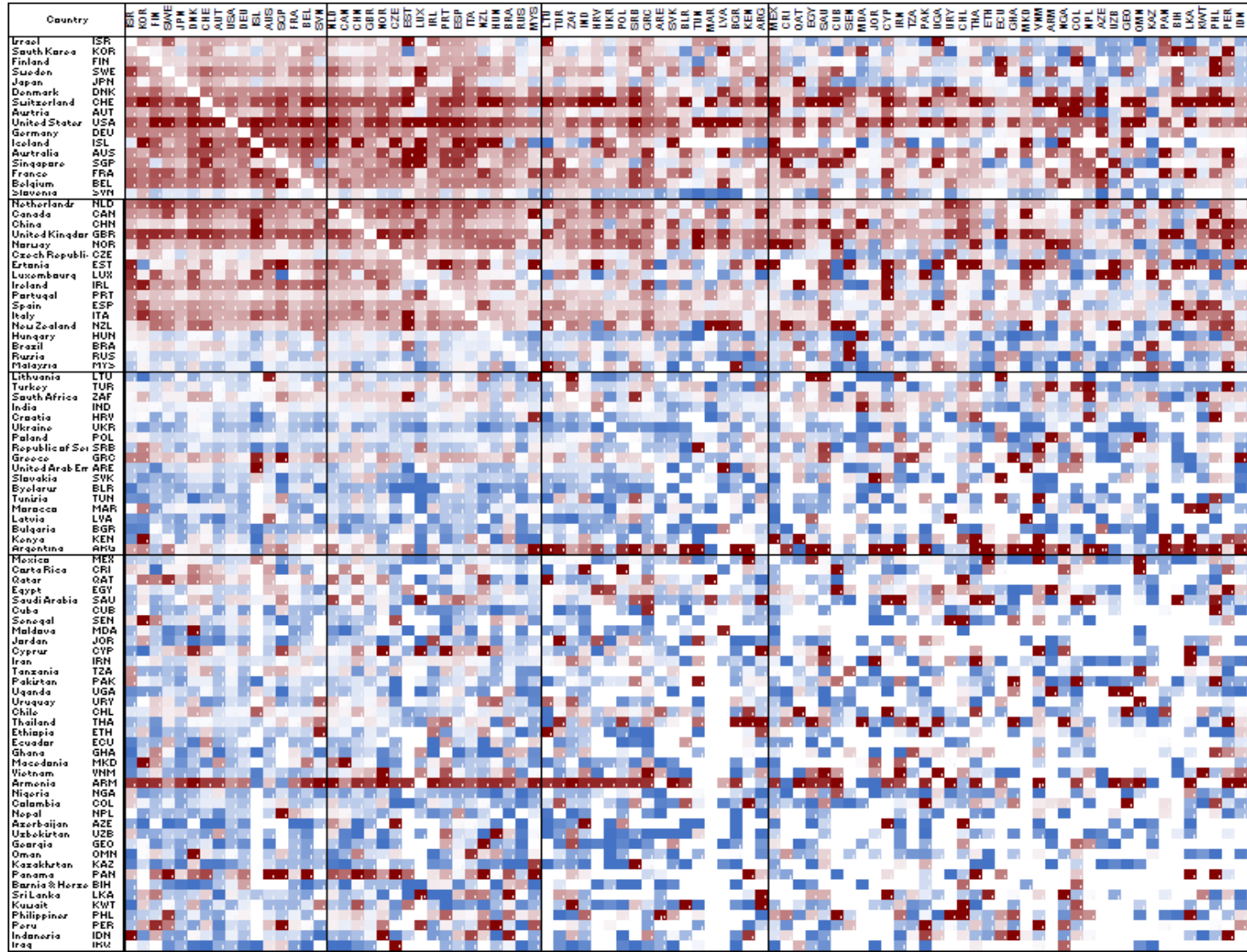
But its complicated...

Heterogeneity...

Non-leading
country

Red = high citation percentile
Blue = low citation percentile

Leading
country



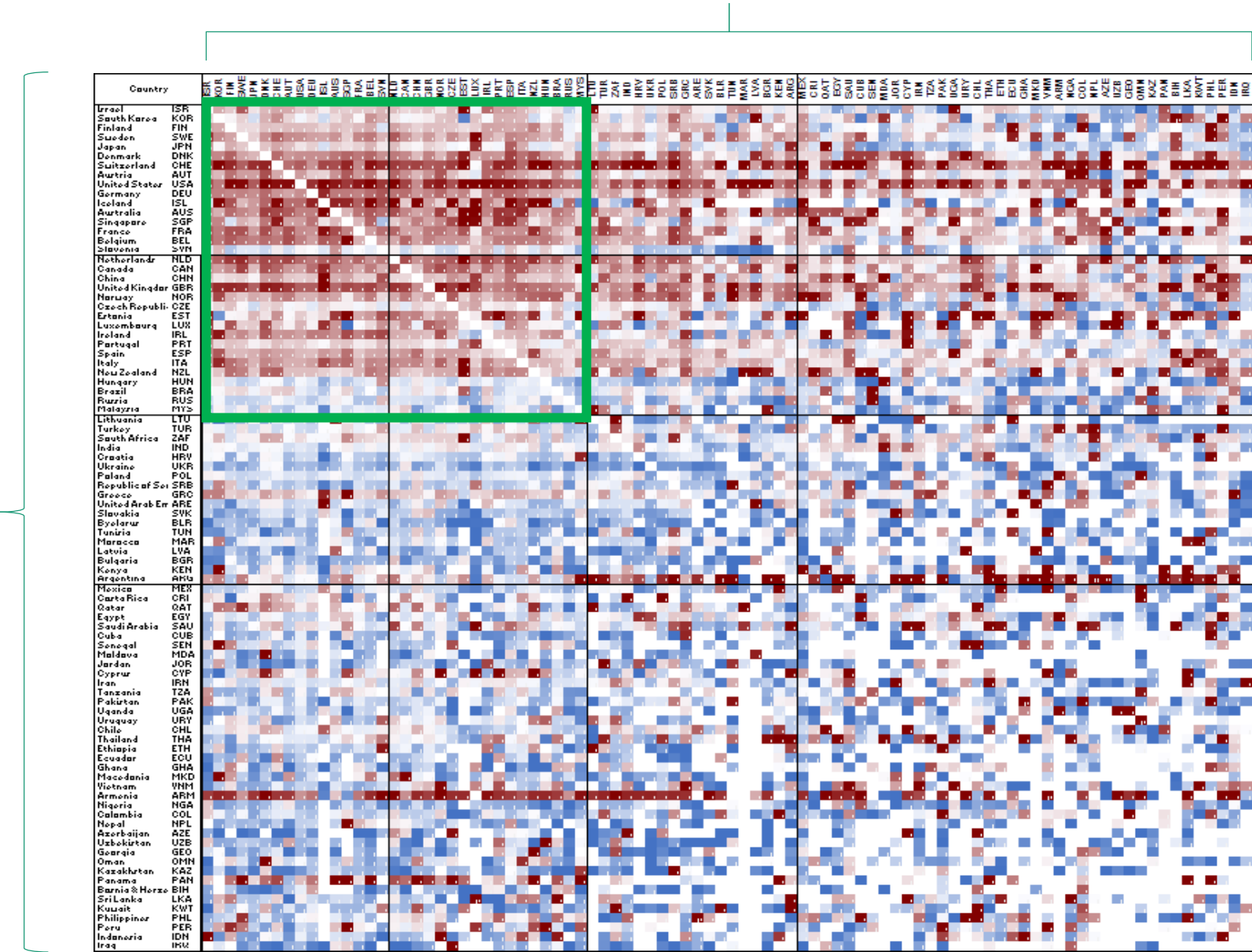
Heterogeneity...

Non-leading country

Red = high citation percentile
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Leading country

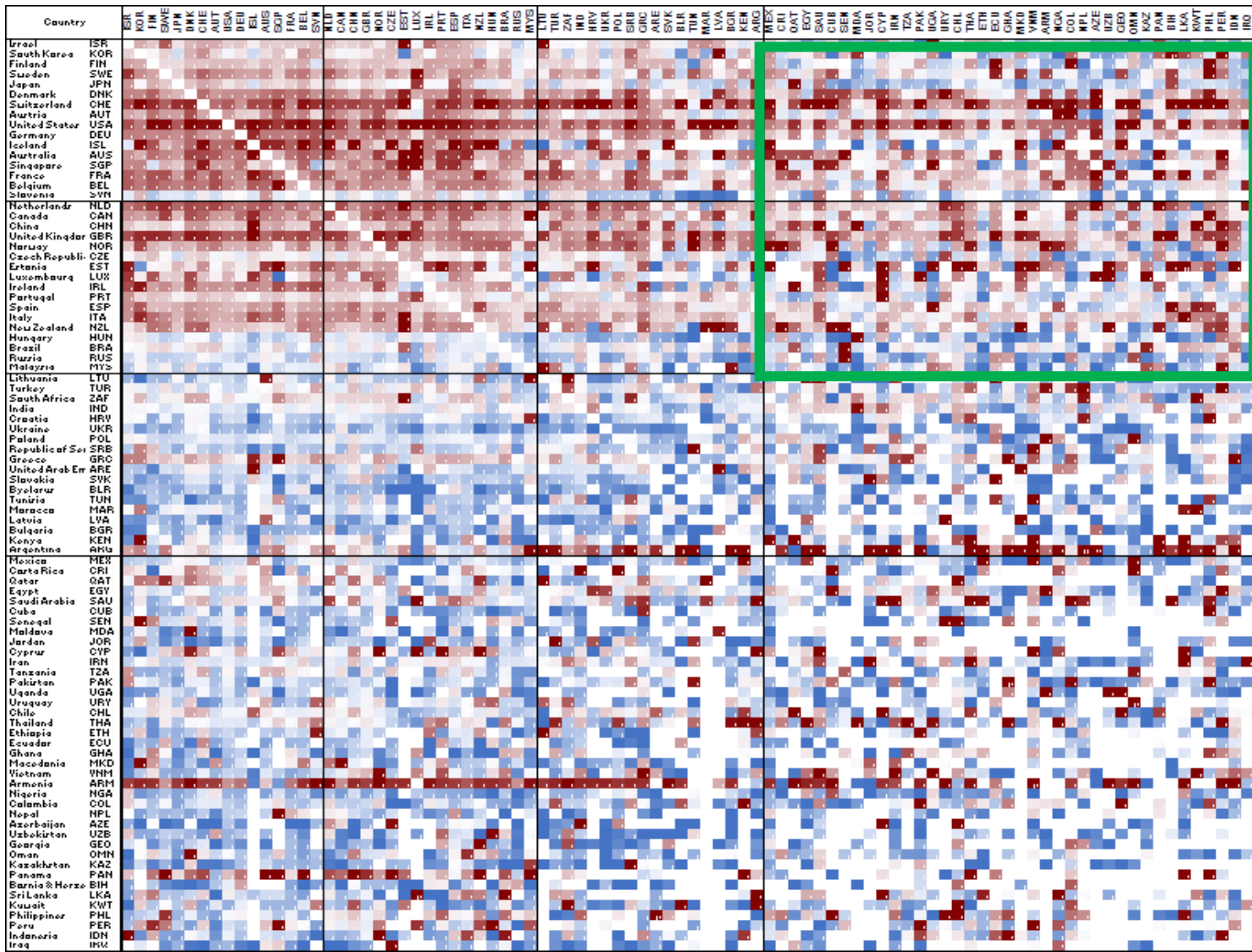
Strong collaborations



Heterogeneity...

Non-leading
country

Red = high citation percentile
Blue = low citation percentile



But not as strong
collaboration between
high and low investment
countries

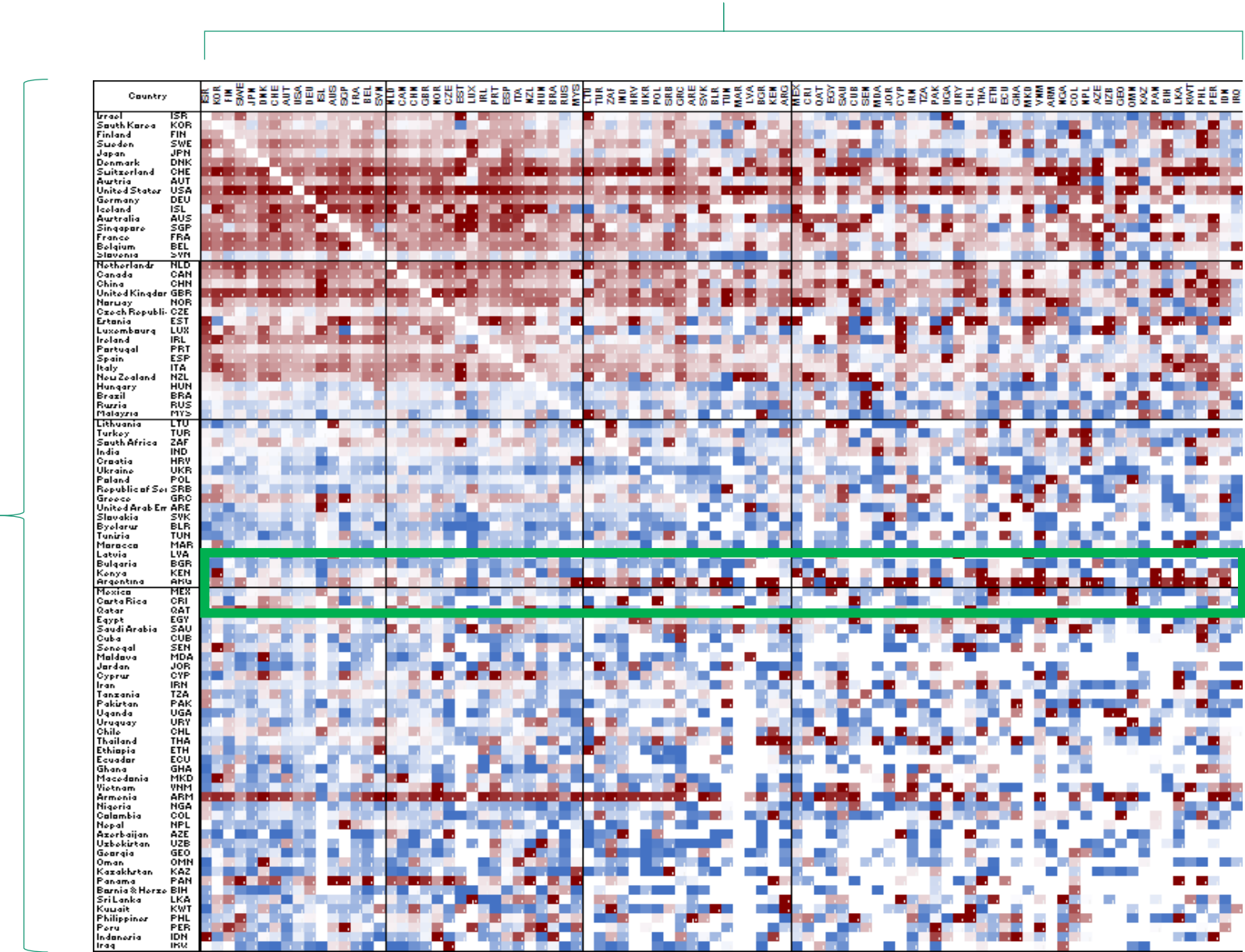
Leading country

Heterogeneity...

Non-leading country

Red = high citation percentile
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Leading country



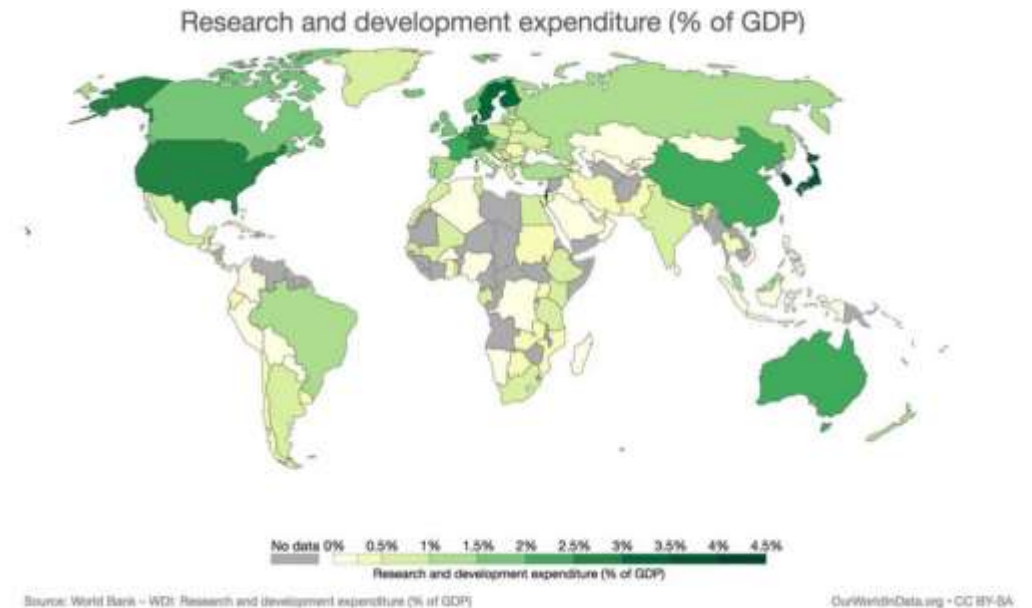
Argentina

A regional leader?

Summary of findings

Summary (1): Money Matters

- The greater the research activity and investment, the more ***internalized*** the production
- But these countries likely to lead when they do collaborate
- Low-investment, low-activity nations are highly international, less likely to lead

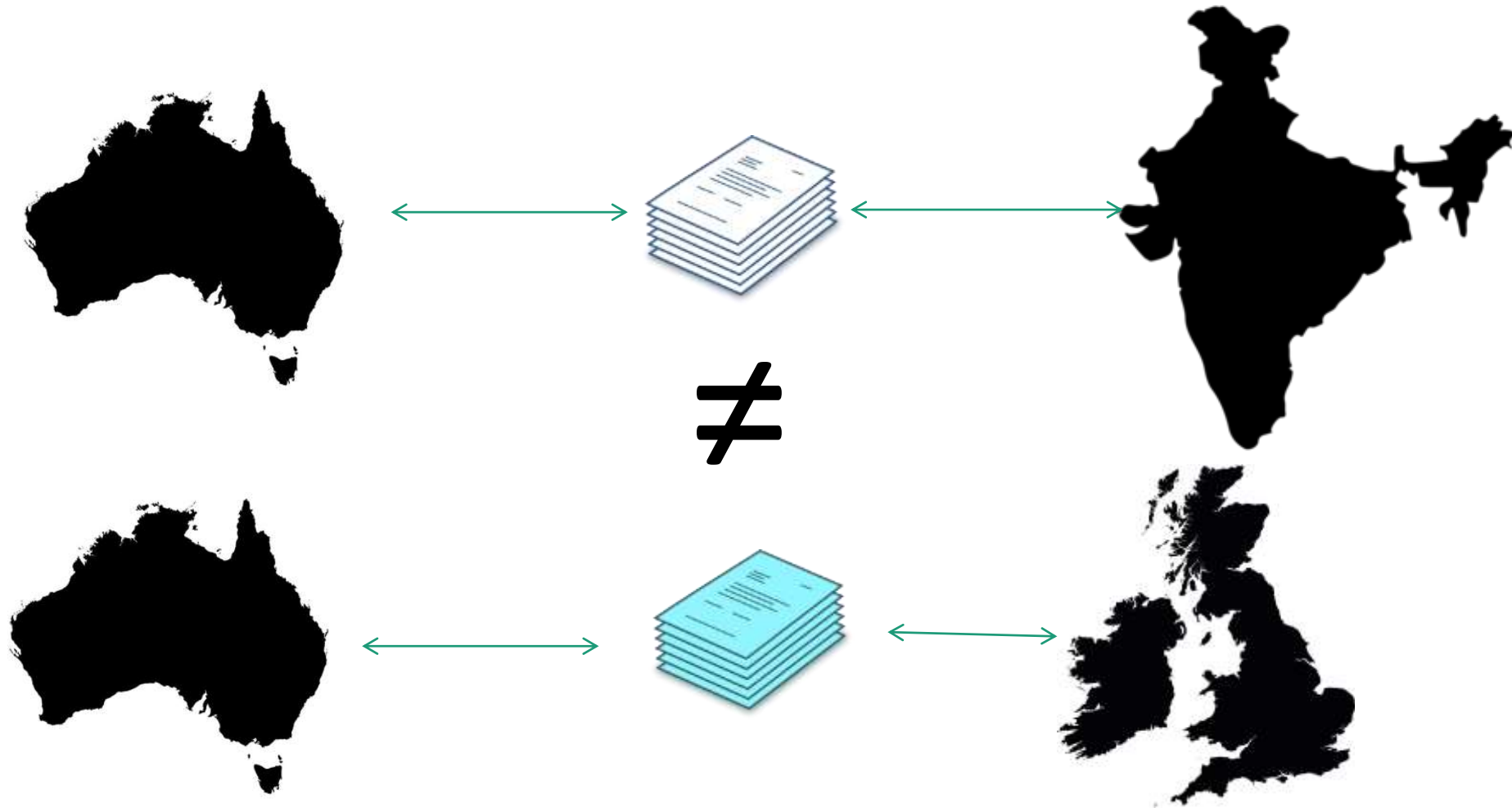


Summary (2): Collaboration and leadership

- International collaboration almost always has benefits to citations
- But leading on publications rarely offers much more benefit



Summary (3): Not all partnerships are equal



Closing thoughts

What detail do we lose with bibliometrics?



What about disciplinary specialization?

Tropical Medicine



Experimental Physics



Who sets the agenda?

- “Following” leads to more citations
- Is the “periphery” able to set their own agenda and follow their own priorities?



Thanks!

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