Data and Case Studies: Science Research in Australia

John Bartlett

Director ACDS National Research Forum

Tracking Evolution and Productivity of Australian University Science: Research and Translation – the need for robust data

- **Monitoring**:
  - Impact(s) of (for example) COVID-19, loss of international students (etc) on productivity.
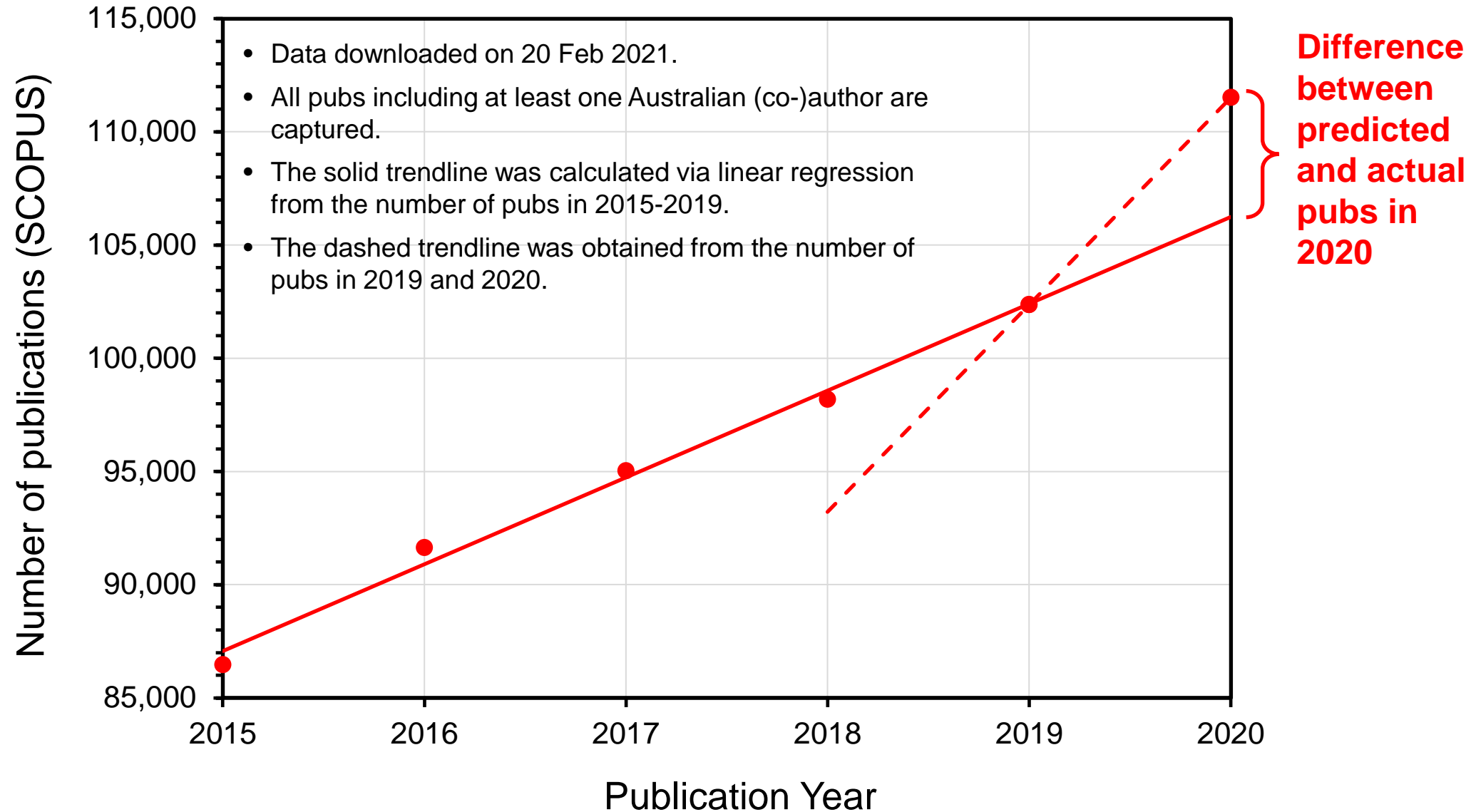 - Impact(s) of internal University processes on productivity;

- **Benchmarking**:
  - Establish baseline for evolution of research productivity, outcomes and translation with time;
  - Measure impacts of COVID-19 on national research productivity, translation etc;
  - Measure impacts of one-off funding injections (e.g. $1B injection in 2021);
  - Measure impacts of Government Policy (e.g. JRG Package).

- **Lobbying**:
  - Credible, impactful, verifiable, "incontestable" (and preferably publicly-available) data for lobbying Government;
  - The power of impactful data for lobbying Government – creation of the Australian Institute of Sport after the 1976 Olympics (no Au^0 for Australia); creation of the MRF in 2015;
  - Building a strong case for initiatives such as an Australian Science Research Translation fund.

Total Publications by Australian Universities (SCOPUS – all disciplines): 2015-2020

- Data downloaded on 20 Feb 2021.
- All pubs including at least one Australian (co-)author are captured.
- The solid trendline was calculated via linear regression from the number of pubs in 2015-2019.
- The dashed trendline was obtained from the number of pubs in 2019 and 2020.

Difference between predicted and actual pubs in 2020

Number of publications (SCOPUS)

Publication Year

…but what about outcomes in individual FOR areas?

01 Mathematical Science (7.6 %)
02 Physical Sciences (12.4 %)
03 Chemical Sciences (12.0 %)
04 Earth Sciences (3.9 %)
05 Environmental Sciences (4.6 %)
06 Biological Sciences (10.6 %)
07 Agricultural and Veterinary Sciences (4.1 %)
08 Information and Computing Sciences (13.3 %)
09 Engineering (29.7 %)
10 Technology (4.5 %)
11 Medical and Health Sciences (30.2 %)

12 Built Environment and Design (1.7 %)
13 Education (2.1 %)
14 Economics (2.0 %)
15 Commerce, Management, Tourism and Services (4.2 %)
16 Studies in Human Society (3.4 %)
17 Psychology and Cognitive Sciences (7.3 %)
18 Law and Legal Studies (0.7 %)
19 Studies in Creatives Arts and Writing (1.5 %)
20 Language, Communication and Culture (2.0 %)
21 History and Archaeology (1.1 %)
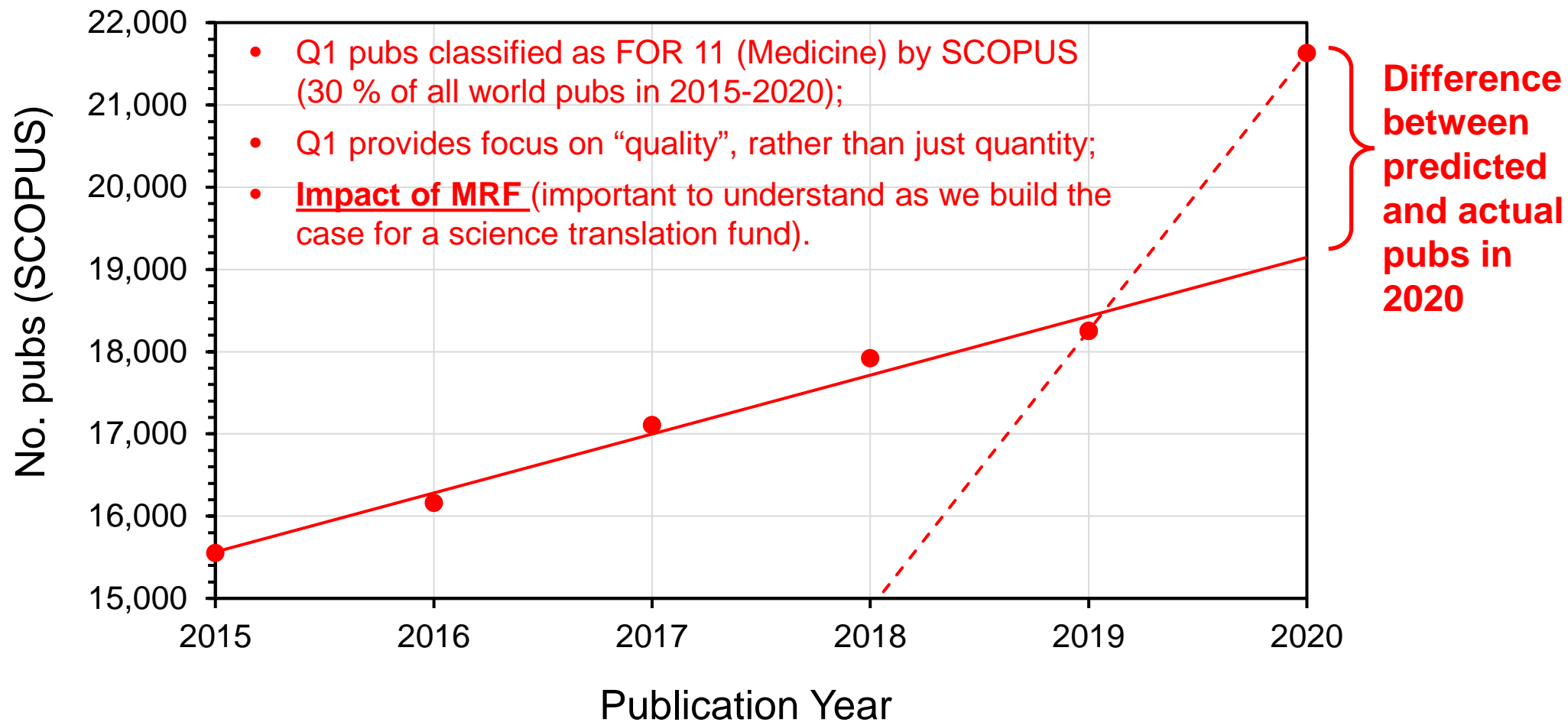22 Philosophy and Religious Studies (1.1 %)

Fraction of total pubs in database (19,143,020 pubs from 2015-2020)

Benchmark Australia against the world from 2015-2020 in research productivity (Q1 pubs), translation, etc in 2-digit FOR areas
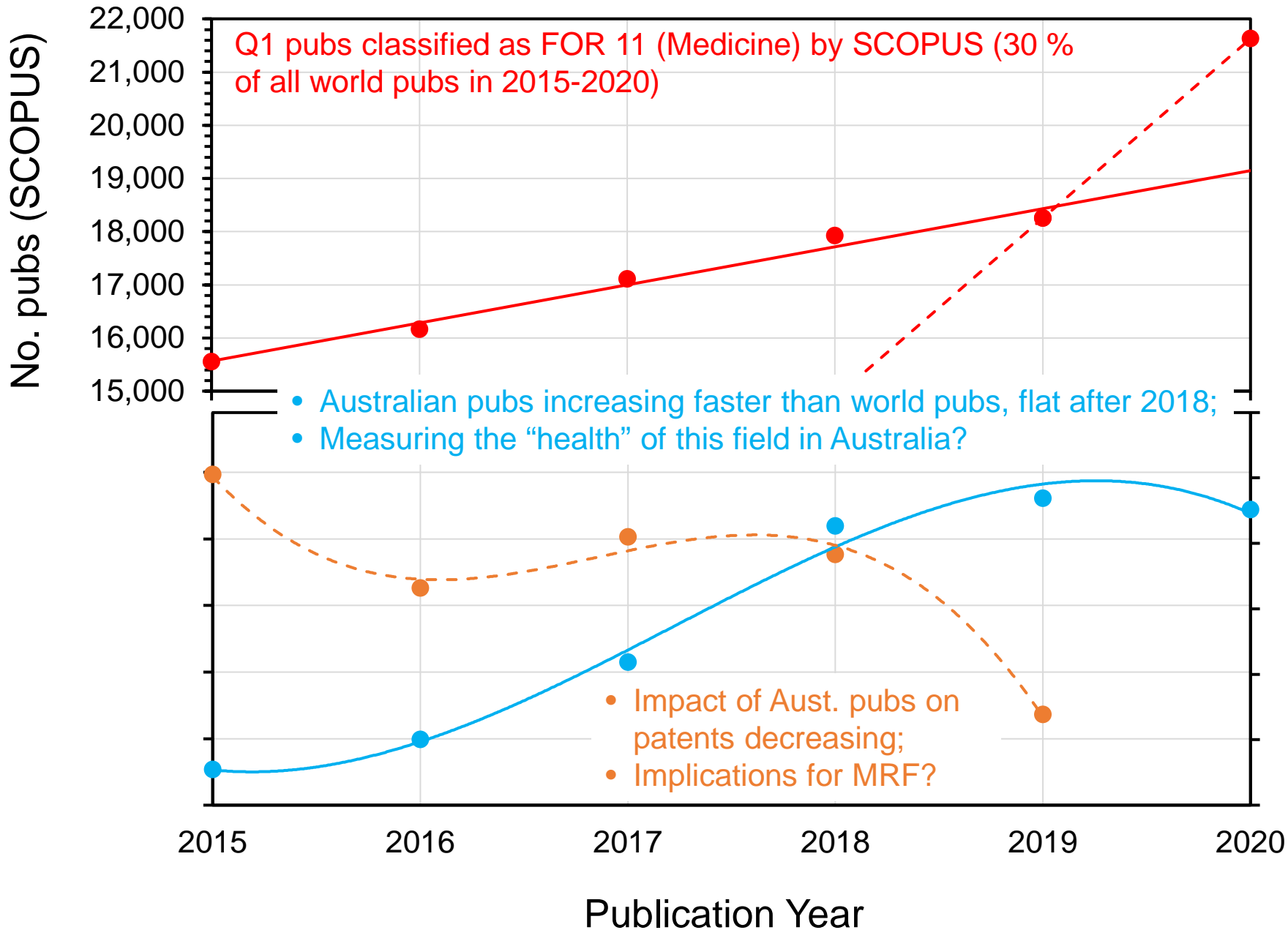
Establish baselines for monitoring our future evolution

Med. & Health Sci. Pubs (Q1, FOR 11) by Australian Universities

Chart axis title (y-axis): No. pubs (SCOPUS)

Chart axis title (x-axis): Publication Year

Chart text:
- Q1 pubs classified as FOR 11 (Medicine) by SCOPUS (30 % of all world pubs in 2015-2020);
- Q1 provides focus on "quality", rather than just quantity;
- **Impact of MRF** (important to understand as we build the case for a science translation fund).

Difference between predicted and actual pubs in 2020

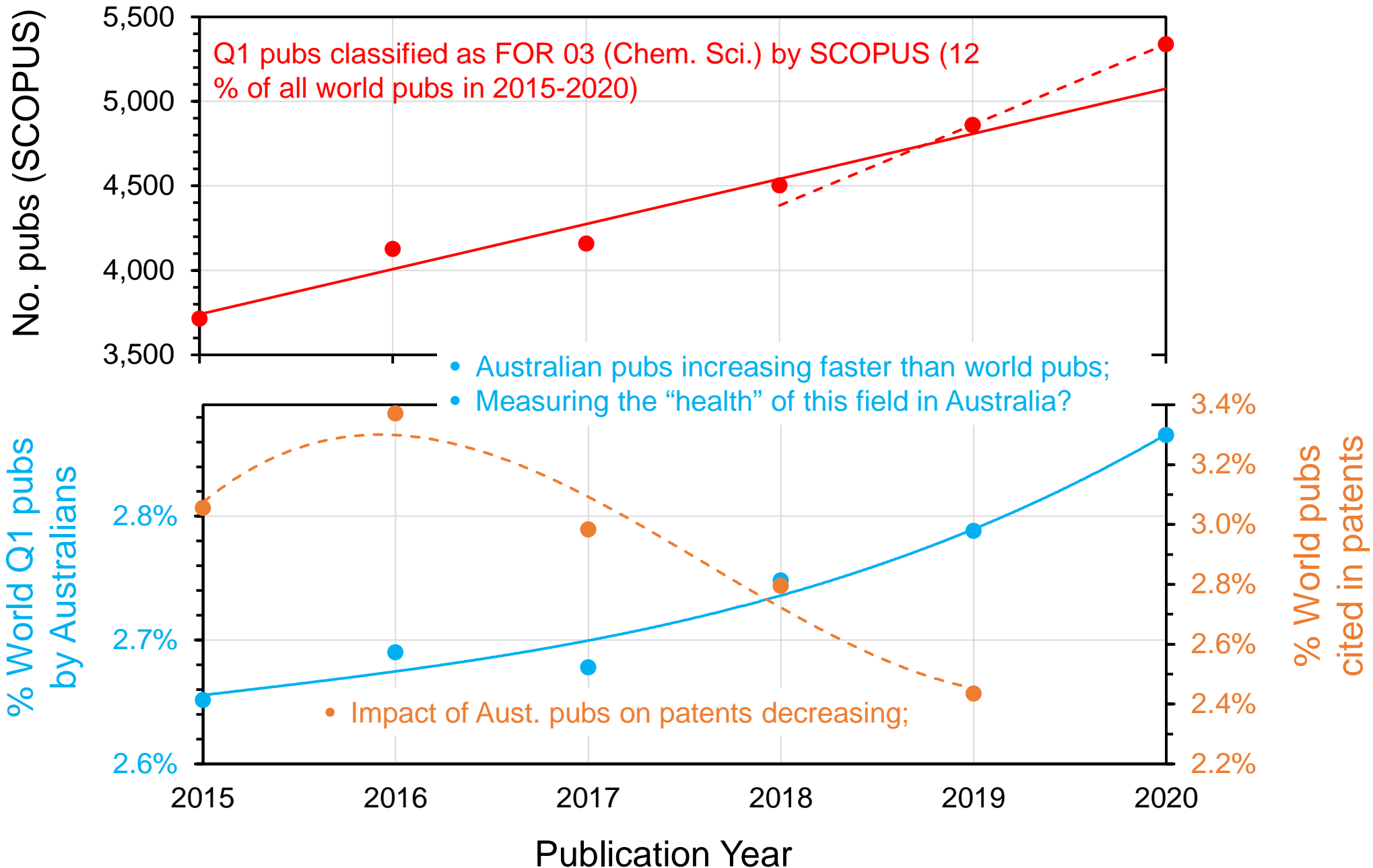…but how do we compare to the rest of the world (benchmark)?

…and what is the impact of these outputs in terms of "translation"?

Med. & Health Sci. Pubs (Q1, FOR 11) by Australian Universities

No. pubs (SCOPUS)

Q1 pubs classified as FOR 11 (Medicine) by SCOPUS (30 % of all world pubs in 2015-2020)

• Australian pubs increasing faster than world pubs, flat after 2018;
• Measuring the "health" of this field in Australia?

• Impact of Aust. pubs on patents decreasing;
• Implications for MRF?

Publication Year

Chem. Sci. Pubs (Q1, FOR 03) by Australian Universities

No. pubs (SCOPUS)

Q1 pubs classified as FOR 03 (Chem. Sci.) by SCOPUS (12 % of all world pubs in 2015-2020)

Australian pubs increasing faster than world pubs; Measuring the "health" of this field in Australia?

% World Q1 pubs by Australians

% World pubs cited in patents

Impact of Aust. pubs on patents decreasing;

Publication Year

Biol. Sci. Pubs (Q1, FOR 06) by Australian Universities

Q1 pubs classified as FOR 06 (Biol. Sci.) by SCOPUS (11 % of all world pubs in 2015-2020)

Australian pubs now decreasing compared to world pubs; Measuring the "health" of this field in Australia?

Impact of Aust. pubs on patents now increasing;

No. pubs (SCOPUS)

% World Q1 pubs by Australians

% World pubs cited in patents

Publication Year
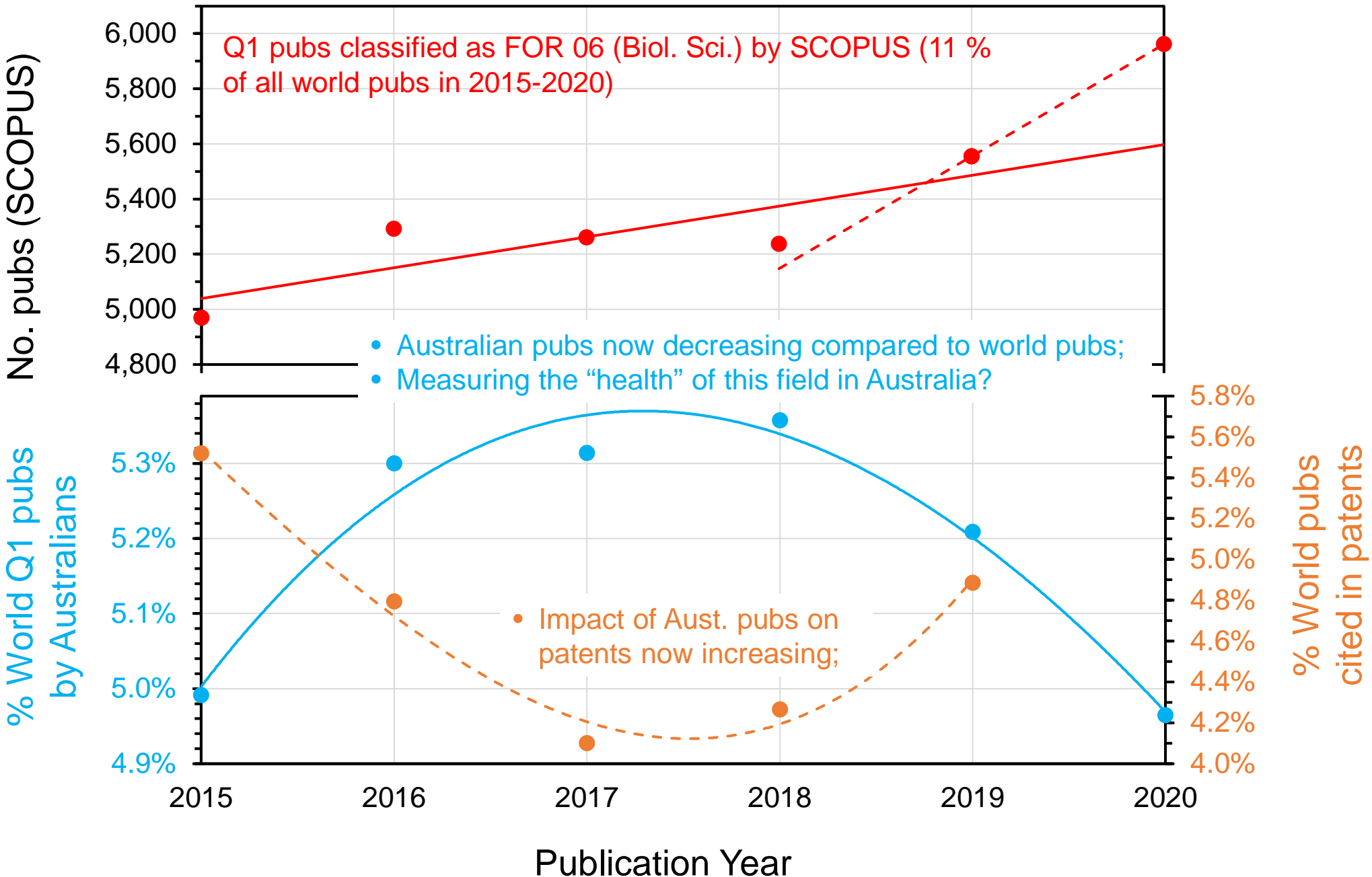
Extent of our collaborative networks – collaborations in 2020
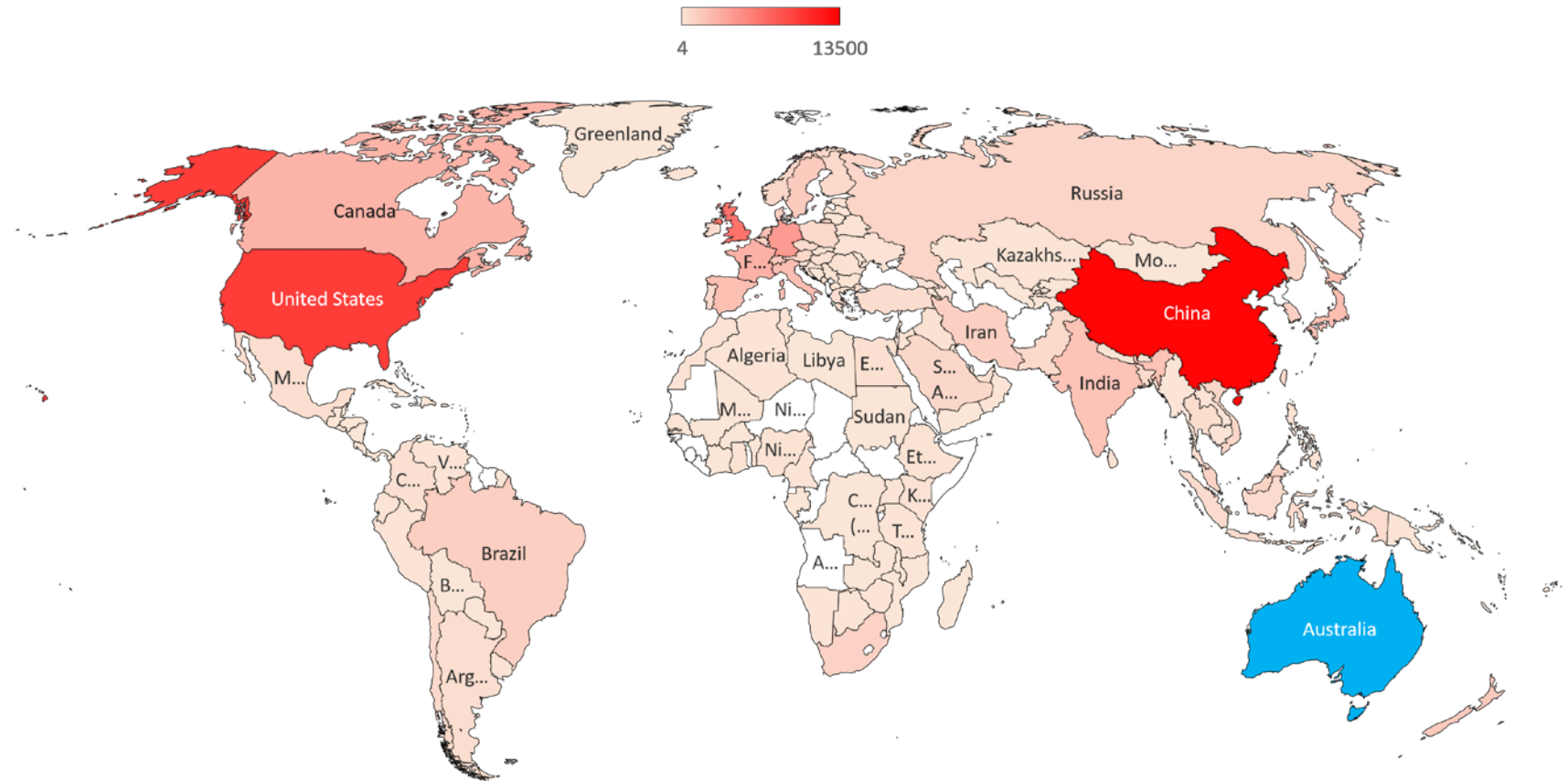
- In 2020, we published papers with collaborators in 160 countries;
- Top 10 countries consistent since 2015 – China, USA, UK, Germany, France, Canada, Japan, Italy, Spain, Netherlands, although…
- China overtook the USA as our largest collaborator (by volume of pubs) in 2018;
- Number of countries with whom we've published over 500 papers increased from 29 in 2015 to 39 in 2020

Questions

- What types of data and case studies should the ACDS acquire and curate to ensure that we can (for example):
  - Monitor the short-, medium- and longer-term impacts of COVID-19 on our research quality and productivity (including our HDR students);
  - Monitor the short-, medium- and longer-term impacts of the loss of International student income;
  - Track the impact(s) of the JRG package;
  - Foster strong, sustainable and productive relationships between Australian University Science and Industry
  - Build a robust case for an Australian science research translation fund;
  - Lobby for a sustainable balance between support for fundamental and translational research;
  - Define the value proposition for enhanced support of Australian University Science to Government;
  - Etc.
- What else should we aspire to achieve with robust data and compelling case studies?