



The Australia-China science boom

James Laurenceson and
Michael Zhou

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University of Technology Sydney
PO Box 123
Broadway NSW 2007
Australia
✉ acri@uts.edu.au
🐦 [@acri_uts](https://twitter.com/acri_uts)
www.australiachinarelations.org

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Executive Summary

- In the mid-2000s Australia had delivered a China-led mining boom that continues today. Last year UTS:ACRI researchers drew attention to another China boom that was unfolding for Australia, one involving the creation of scientific knowledge. New data presented in this report show China has now overtaken the United States as Australia's leading international partner in producing scientific publications. In 2019, the number of Australian scientific publications involving a researcher affiliated with a Chinese institution grew by 13.1 percent. In comparison, the number involving a US-affiliated researcher declined by 0.3 percent. Australia-China collaborations now comprise 16.2 percent of total Australian scientific publications, up from 3.1 percent in 2005. The US (15.5 percent), UK (11.7 percent), Germany (5.9 percent) and Canada (5.0 percent) round out Australia's top five international partners.
- With around one in six Australian scientific publications now involving a China-affiliated researcher, Australia is more intensively engaged with China than the US, UK and Canada at around one in 10. Australia is less engaged than some other countries such as Singapore, which has a proportion of around one in three.
- Despite a prominent discourse around a US-China scientific and technological decoupling, last year saw 56,487 US scientific publications involve a China-affiliated researcher. This was a 6.8 percent increase on 2018, and meant the proportion of US-China research grew from 9.8 percent to 10.7 percent of total US scientific publications.
- Australia's partnership with China in scientific knowledge creation is apparent in both quantity and quality dimensions. Of Australian research in the top one percent of most-cited scientific publications globally, the number involving China-affiliated collaborators grew by 12.8 percent in 2018. In contrast, the number involving collaborators from Australia's other top five research partners - the US, UK, Germany and Canada - all fell. China is now on the cusp of displacing the UK as Australia's second most important international partner on this measure.
- Across 28 subject areas indexed in Scopus, a database of peer-reviewed research, collaboration with China is most prominent in Materials Science, Chemical Engineering and Energy, accounting for 39.4 percent, 35.0 percent and 32.2 percent of Australian publications in these areas, respectively. Materials Science, Chemical Engineering and Energy also account for three out of the top four subject areas in which US researchers are most engaged with China. As a proportion of China's publications in Materials Science, Chemical Engineering and Energy, collaboration with Australia features in 2.2 percent, 2.2 percent and 2.3 percent, respectively. There are five of 28 subject areas in which Australia produces more publications than China: Arts and Humanities, Health Professions, Nursing, Psychology and Undefined.
- Publications in InCites, a different database of peer-reviewed research, are indexed across 22 subject areas. In eight of these China-affiliated researchers feature in more than half of Australia's publications appearing in the top one percent of most-cited publications globally. This ranking is topped by Mathematics (81.3 percent), Materials Science (77.8 percent) and Chemistry (76.2 percent). In these same subject areas, Australia-affiliated collaborators are involved in 4.2 percent, 7.3 percent and 3.9 percent of China's most-cited publications, respectively. There are three subject areas of 22 in which Australia produces more publications appearing in the top one percent of most-cited publications globally than China. These are Space Science, Clinical Medicine and Psychiatry/Psychology.
- Research collaboration with China brings risks requiring management, including those related to national security. A pertinent example is the potential for the Chinese government to influence the process of scientific discovery, as seen in its subjecting domestic COVID-19 research to vetting before publication. However, collaboration also brings benefits. And these

benefits are now being threatened by allegations and headlines not well-supported by facts. Australian research institutions have been accused of engaging in research that ‘supports China’s goals, not ours’, ‘surrendering’ the nation’s research capabilities, allowing Beijing to ‘steal’ intellectual property and facilitating ‘valuable information’ being passed on to Chinese intelligence agencies. The evidence does not support such sweeping claims. Australia’s scientific successes have long involved working with international partners. And with the scale of scientific research undertaken in China much greater than in Australia, it is in Australia’s interests to engage. It is also difficult for China to misappropriate scientific knowledge from Australian researchers that has yet to be created and that is openly shared once it is. When research with international partners involves sensitive technologies and projects of a security-classified nature, or is expected to yield commercially valuable intellectual property, controls exist at the national and institutional levels to manage the risks. Moreover, these controls are regularly reviewed to ensure they remain ‘fit for purpose’ and universities have a strong track record of compliance.

- With the Morrison government emphasising that Australia’s COVID-19 recovery will be industry-led, enabled by science and technology, the China partnership from mining to scientific knowledge creation is well-placed to feature prominently.

1. Introduction

In the mid-2000s Australia had delivered a China-led mining boom that continues today. Australia's success as a producer of raw materials such as iron ore is well known. While domestic demand is negligible, in 2019 Australia's iron ore exports totalled \$96.1 billion (Australian Government Department of Foreign Affairs and Trade, 2020). The partner that has made this possible is China, buying 82.2 percent of Australia's exports. China has also been a major supplier of the capital needed to develop Australian mines (Ferguson et al., 2020). To be sure, China has not bought iron ore from Australia or invested in mines out of charity. It has done so because it is in China's interests and the relationship is one of interdependence and mutual benefit.

Australia's high-income status attests to its successes extending beyond being just a competitive supplier of raw materials. It also punches above its weight in the creation of scientific knowledge. Despite Australia's population only accounting for 0.3 percent of the world's total, last year its researchers were

involved in producing 3.1 percent of global scientific publications (Scopus, 2020). Last year UTS:ACRI researchers drew attention to scientific knowledge being another space where a China boom was unfolding for Australia (Laurenceson and Zhou, 2019). This report documents the latest state of play in Australia's partnership with China in the creation of scientific knowledge and discusses some of the most recent challenges.



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2. Australia's knowledge creation partners: China, the new number one

Laureson and Zhou (2019) highlighted the central role that universities and other research organisations like the Commonwealth Scientific and Industrial Research Organization (CSIRO) play in Australia's knowledge creation ecosystem. The fact that researchers at these institutions generally publish their work in scientific journals and conference proceedings facilitates an analysis of the scale of Australia's scientific knowledge creation and the pattern of its international partnerships.

Following the methodology outlined in our earlier work, this report first utilises Scopus, a database of peer-reviewed research, to track the international collaboration patterns seen in Australian journal articles and conference papers. 'Australian publications' refer to those involving at least one author affiliated with an Australian institution. The Scopus database is continuously updated as new publications are indexed.

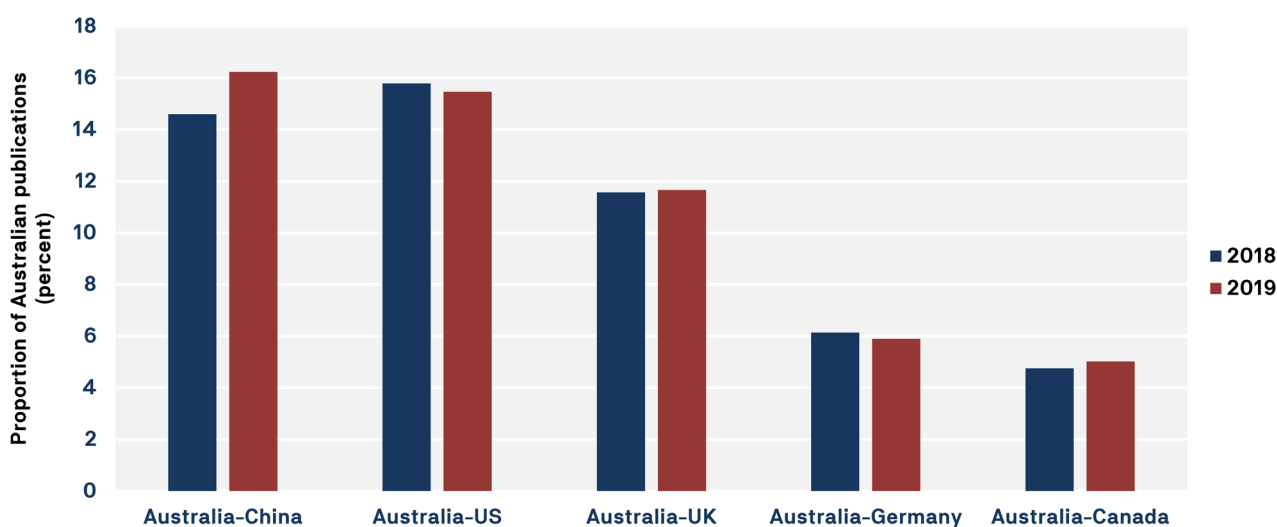
This bibliometric approach is not without its limitations, thus inviting follow-up using alternative methodologies. For example, the Australian Academy of Humanities argue that co-authorship of research publications across

countries fails to capture different modes of collaboration or output across the research spectrum, particularly in humanities disciplines (Cahill et al., 2015).

Caveats acknowledged, in 2019 Australian researchers produced a total of 85,351 scientific publications. This compared with 83,912 in 2018, an increase of 1.7 percent. Disaggregating the total in 2018 and 2019, Figure 1 compares the scale of Australia's collaboration with its top five collaboration partners. This is defined by the countries to which co-authors of publications that involve Australian researchers are most frequently affiliated.

Figure 1 reveals the most recent shift in the relative frequency with which Australian researchers collaborate with those in the top two partner countries, the US and China. Whereas the US was the top collaborator in 2018, China became Australia's leading research partner in 2019. The number of Australian publications involving a US-affiliated researcher declined by 0.3 percent to 13,201 in 2019 from 13,247 in 2018. It nonetheless still comprised a sizeable 15.5 percent of all Australian publications. Meanwhile, the number of Australian publications involving a China-affiliated researcher increased by 13.1 percent, from 12,246 to 13,854, accounting for 16.2 percent of all Australian

Figure 1. Number of publications with collaborating country by proportion of Australian total (percent)



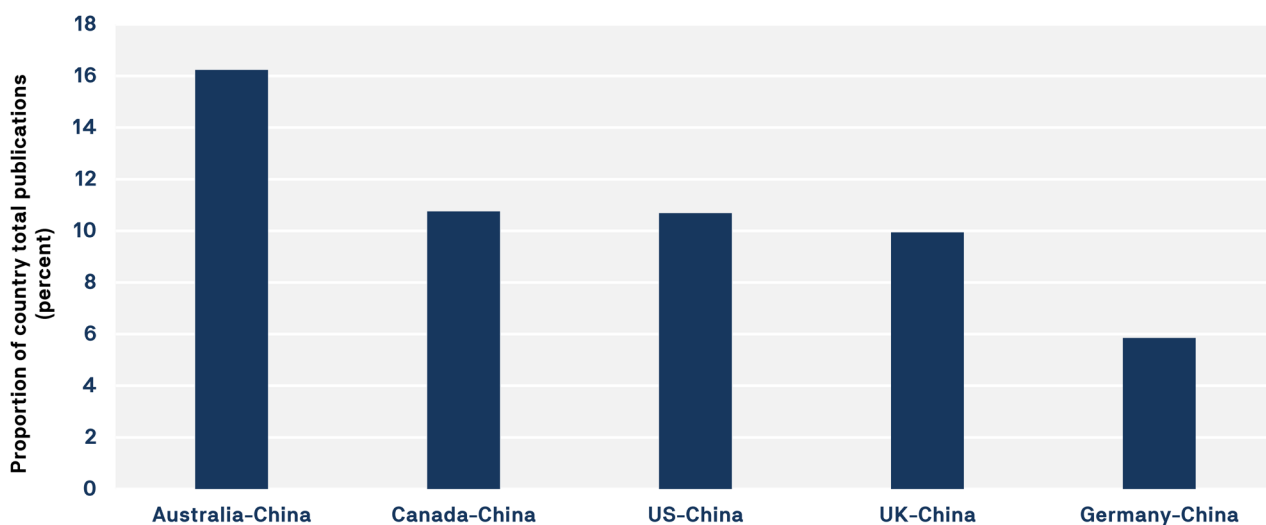
Source: Scopus (2020)

publications. Collaboration with the UK (11.7 percent), Germany (5.9 percent) and Canada (5.0 percent) round out Australia's top five international partners.

Figure 2 compares the intensity of Australia's research engagement with China compared with that exhibited by the US, UK, Germany and Canada. Whereas around one in six Australian scientific publications now involve a China-affiliated researcher, the proportion is around one in ten for the US, UK and Canada, and closer to one in twenty for Germany. That said, there are other countries that engage with China with an even greater intensity than Australia. For example, around one in three Singaporean publications involve a China-affiliated researcher.

Another noteworthy observation is that despite a prominent discourse around a US-China scientific and technological decoupling, last year saw 56,487 US scientific publications involve a China-affiliated researcher. This was a 6.8 percent increase on 2018, and meant the proportion of US scientific publications involving a China-affiliated researcher grew from 9.8 percent to 10.7 percent.

Figure 2. Number of publications with China per country by proportion of country total, 2019 (percent)



Source: Scopus (2020)

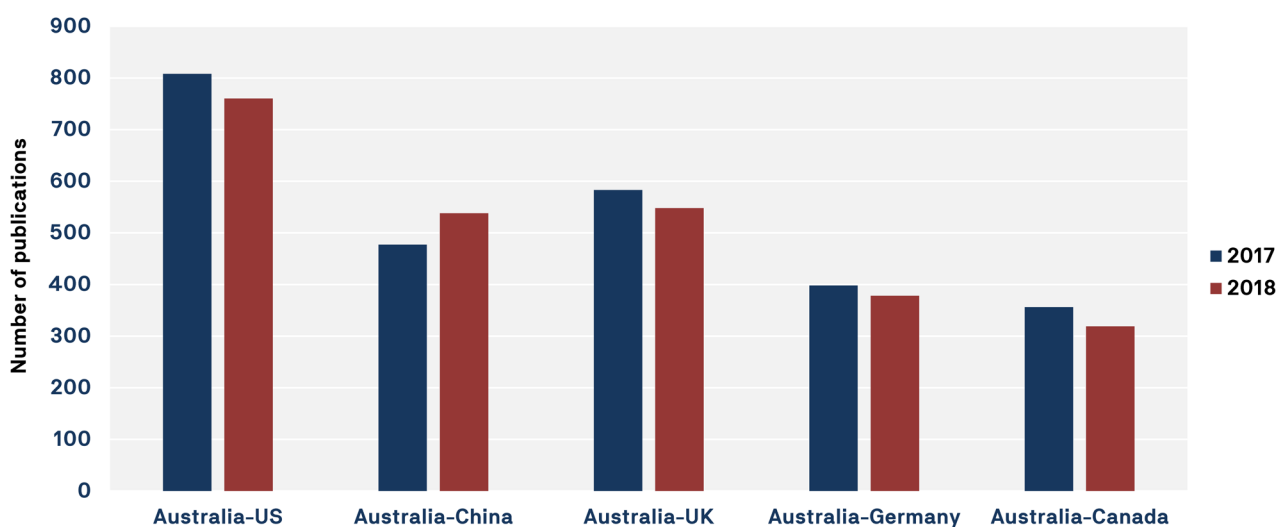
3. Collaboration with China is about quality as well as quantity

This report studies the impact of publications to ascertain the quality of scientific knowledge that Australia creates with international partners. As in Laurenceson and Zhou (2019), the specific metric used is citation performance – the number of publications appearing in the top one percent of most-cited publications globally per subject area (InCites, 2019). A single publication can include multiple authors who can be affiliated with institutions in different regions. These data relating to publication impact are drawn from, InCites a different database of peer-reviewed research. As citations of research tend to lag publication, 2018 rather than 2019 is regarded as the latest available year. In 2018, across all subject areas there were 1754 publications involving a researcher affiliated with an Australian institution appearing in the top one percent of most-cited publications globally. This was a 3.4 percent decline from 1815 such publications in 2017 (InCites, 2019).

In Figure 3 it is apparent that some of the year-on-year movements in the quantity pattern of Australia’s international partnerships also apply with respect to quality. While the US remains Australia’s leading partner country, the number of high-impact joint publications declined by 5.9 percent, from 808 in 2017 to 760 in 2018.

Over the same period, the number with China grew by 12.8 percent, from 477 to 538, placing it just behind the UK with 548. As with the US, the number of high-impact publications produced in collaboration with researchers in the UK, Germany and Canada also fell.

Figure 3. Number of Australian publications in the global top one percent of most-cited publications, including partner country



Source: InCites (2020)

4. Where does China matter most?

The Scopus database breaks down scientific inquiry into 28 subject areas. Column 1 of Table 1 ranks the proportion of Australian publications in each of these areas that are produced in collaboration with China-affiliated researchers. Topping the list are Materials Science, Chemical Engineering and Energy, with China-affiliated researchers involved in producing 39.4 percent, 35.0 percent and 32.2 percent of total Australian publications, respectively.

Scopus data show that these subject areas also comprise three out of the top four subject areas in which US researchers are most intensively engaged with China-affiliated researchers (Scopus, 2020).

From China's perspective, the ordering is very different. Column 2 shows that in Materials Science, Chemical Engineering and Energy, collaboration with Australia features in 2.2 percent, 2.2 percent and 2.3 percent of China's publications, respectively. The subject areas in which Australia-affiliated researchers are most prominent for China are Nursing (4.2 percent), Business, Management and Accounting (4.2 percent) and Psychology (4.0 percent).

Columns 3 and 4 show the proportion of global publications in each subject area produced by Australia and China. Arts and Humanities, Health Professions, Nursing, Psychology and papers of undefined subject area are the five areas in which Australian researchers account for a greater proportion of the global total than researchers in China.

Next considered is a quality-wise treatment of the subject area breakdown of Australia's international research collaboration. The InCites database classifies publications under the Essential Science Indicators schema according to 22 different subject areas. Column 1 of Table 2 ranks subject areas in which Australian publications that are in the top one percent of most-cited publications globally involve China-affiliated researchers. For example, more than four-fifths of Australia's high-impact publications in Mathematics involve collaboration with China. For eight out of the top 10 subject areas, more than half of

Australia's high-impact publications involve China.

Column 2 shows that in these same subject areas Australian researchers are involved in 10 percent or less of China's high-impact publications, with the exception of Multidisciplinary (33.4 percent).

Columns 3 and 4 show that China's share of high-impact publications globally in most subject areas exceeds Australia's, and often by a large margin. The subject areas in which high-impact publications feature Australia-affiliated researchers more prominently than China-affiliated ones are Space Science, Clinical Medicine and Psychiatry/Psychology.

Table 1. Australia-China joint research in 2019 (by proportion of total Australian and Chinese publications per subject area) vs Australian and China research in 2019 (by proportion of global publications per subject area)

Subject area	Proportion of Australian publications (percent)	Proportion of Chinese publications (percent)	Australian share of global publications (percent)	Chinese share of global publications (percent)
Materials Science	39.4	2.2	2.1	37.0
Chemical Engineering	35.0	2.2	2.3	36.8
Energy	32.2	2.3	2.3	32.9
Chemistry	32.1	2.0	2.2	35.2
Engineering	29.4	2.0	2.1	31.7
Physics and Astronomy	27.0	1.9	2.0	29.2
Computer Science	25.9	2.3	2.3	26.2
Mathematics	23.6	1.8	2.1	28.2
Earth and Planetary Sciences	22.3	3.2	4.1	28.7
Decision Sciences	21.5	2.1	2.3	24.1
Environmental Science	20.1	2.6	3.7	28.0
Pharmacology, Toxicology and Pharmaceuticals	15.5	1.2	2.1	27.5
Biochemistry, Genetics and Molecular Biology	13.6	1.6	3.1	27.1
Business, Management and Accounting	13.0	5.4	4.3	10.4
Agricultural and Biological Sciences	11.6	2.2	4.1	21.5
Economics, Econometrics and Finance	11.2	4.3	4.7	12.3
Multidisciplinary	10.9	2.4	4.1	18.6
Immunology and Microbiology	10.1	1.6	3.4	21.5
Neuroscience	7.8	2.2	4.7	16.5
Medicine	6.3	1.8	4.0	14.3
Social Sciences	5.7	3.3	4.6	8.0
Veterinary	4.2	1.8	3.5	8.1
Nursing	4.2	5.1	6.2	5.1
Psychology	4.0	4.6	5.9	5.2
Arts and Humanities	3.2	3.4	3.6	3.5
Health Professions	2.8	3.1	7.0	6.3
Dentistry	1.4	0.5	2.4	6.7
Undefined	0.0	0.0	6.2	3.9

Source: Scopus (2020)

Table 2. Australia–China high-impact research in 2018 (by proportion of total Australian and Chinese highly-cited publications per subject area) vs Australian and Chinese high-impact research in 2018 (by proportion of global publications per subject area)

Subject area	Proportion of Australian publications (percent)	Proportion of Chinese publications (percent)	Australian share of global publications (percent)	Chinese share of global publications (percent)
Mathematics	81.3	4.2	3.6	69.5
Materials Science	77.8	7.3	7.0	74.3
Chemistry	76.2	3.9	3.3	64.6
Engineering	70.0	8.9	8.2	64.1
Multidisciplinary	66.7	33.3	12.0	24.0
Computer Science	64.7	10.4	11.4	70.4
Physics	60.0	8.7	5.3	36.2
Agricultural Sciences	52.9	6.5	5.3	43.3
Geosciences	40.9	9.8	8.9	36.8
Biology & Biochemistry	40.0	8.6	5.5	25.5
Environment/Ecology	33.7	13.1	15.3	39.3
Microbiology	33.3	22.2	10.3	15.5
Space Science	32.4	50.0	24.8	16.1
Molecular Biology & Genetics	25.0	12.0	10.2	21.3
Immunology	22.7	18.5	13.9	17.1
Economics & Business	19.0	6.8	7.1	20.1
Clinical Medicine	15.3	19.0	13.9	11.2
Plant & Animal Science	15.3	5.5	11.4	32.0
Neuroscience & Behavior	13.2	11.4	10.8	12.5
Social Sciences, general	9.9	6.7	7.5	11.1
Psychiatry/Psychology	8.9	20.0	14.2	6.3
Pharmacology & Toxicology	0.0	0.0	2.0	30.4

Source: InCites (2020)

5. Australia-China scientific knowledge creation: allegations versus facts

Laurenceson and Zhou (2019) drew attention to a number of potential challenges to the future trajectory of Australia's research collaboration with China. These included concerns around the national security and ethical implications, deteriorating conditions for scientific inquiry in China due to an increasingly repressive political regime and a worsening funding environment for universities in Australia, thus potentially reducing their attractiveness for international partners. Each is a risk requiring careful management and these challenges have remained prominent over the past year.

US government thinking with respect to China continues to harden. In a report released in June 2020, Brendan Thomas-Noone, a research fellow at the United States Studies Centre, observed that as Washington implements new rules and regulations that move in the direction of a technological decoupling – even if the extent to which this will occur in practice remains unclear – ‘Australia will face growing pressure to limit its science and technology interaction with China in critical dual-use fields in order to maintain technological collaboration with the United States’ (Thomas-Noone, 2020). Tables 1 and 2 show several subject areas, like Materials Science, on which US focus might sharpen.

On January 3 China's National Health Commission reportedly issued a directive stipulating that publication of domestic virology research on COVID-19 be subject to government authorisation (*The Associated Press*, 2020). Such instances again highlight the potential for the Chinese government to arbitrarily extend its influence over the process of scientific discovery (Gu and Li, 2020).

In forcing the Australian government to close the border to international travellers for public health reasons, COVID-19 has also swiftly thrown into doubt the funding model that Australian universities have used to boost their research capacity and attractiveness to international partners. At the aggregate level, a report by the Rapid Research Information Forum chaired by Australia's Chief Scientist estimated

that universities across Australia could lose 7000 research-related academic staff by December 2020 (Larkins et al., 2020).

Such developments mean the trajectory of Australia's partnership with China in scientific knowledge creation is not assured and risks continue to require appropriate management.

Research collaboration with China is not only about risks. It also brings benefits. However, the benefits to Australia of this collaboration are now being threatened by allegations and headlines not well-supported by facts.

On October 14 2019, John Fitzgerald, an Emeritus Professor at Swinburne University and a Fellow at the Australian Strategic Policy Institute (ASPI) told a joint ABC-Fairfax *Four Corners-Background Briefing* investigation that Chinese companies were capitalising on Australia's science and technology expertise. Entering into collaborations with them meant that (Rubinsztein-Dunlop et al., 2019):

Australia's science and technology priorities are being set by the Chinese Government because we enter into collaborations that have really been designed to support China's goals, not ours...Many universities are very happy to proceed with whatever it is... because of the money and prestige involved.

On February 11 this year it was reported in *The Australian* that the Australian Research Council (ARC) had funded research projects involving Chinese partners to the amount of \$262 million over five years (Packham, 2020). Invited to comment on the data, Peter Jennings, the Executive Director of ASPI, described this funding as representing ‘a shocking failure of due diligence’, adding that ‘[i]t really speaks to the appalling naivety of the Australian research community that they can do this, seemingly oblivious to the broader trends of what is happening in Chinese politics’. And on what needed to happen next:

Frankly, this needs to be investigated. There needs to be some sort of independent process to establish how much of our research capability has essentially been surrendered to Chinese interests in the name of scientific collaboration.

On May 23, Jennings followed up with a commentary piece in *The Australian* claiming that ‘Australian universities have been played by savvy counterparts looking to steal or develop intellectual property that will give China a military edge’ (Jennings, 2020). Jennings’ criticisms of Australian universities extend back at least several years. On December 15 2017 he told the ABC that there was a ‘likelihood’ universities were breaking export trade controls (Iggulden, 2017):

The [Department of Defence] should now be looking to audit the performance of universities because we are talking about the mass migration over to Chinese interests and that’s not in Australia’s commercial, or indeed national, security interests.

On May 11 *The Daily Telegraph* offered up the ‘revelation’ that an ARC-funded, University of Sydney virologist had collaborated with Chinese researchers – including from a laboratory affiliated with the People’s Liberation Army – on a study into the origins of COVID-19 (Markson, 2020). As part of the exposé, Clive Hamilton, a Professor of Public Ethics at Charles Sturt University, remarked:

It’s clear that the universities are not properly overseeing the kinds of collaborations that their scientists are undertaking because there are many instances of sensitive research in Australian universities being done in collaboration with Chinese scientists with links to China’s military or who are likely passing valuable information on to China’s companies or intelligence services.

The evidence does not support such sweeping claims. However, such claims are central to policy calls – as in Jennings’ May 23 commentary in *The Australian* – for these institutions to ‘review and reduce the many hundreds of research connections between Australian and Chinese institutions’ (Jennings, 2020).

Australia’s scientific successes have long involved working with international partners. Research collaboration, like international trade and investment, need not be a zero-sum game. Working with Chinese partners on artificial intelligence (AI) research, for instance, does not demonstrate our ‘priorities are being set by the Chinese government’ when the Australian government too has recognised that AI technologies ‘would be powerful tools to boost economic growth and make life better for everyday Australians’ (Andrews, 2019).

On ARC funding, Table 3 shows the number of commencing projects funded by the ARC that feature collaboration with China and other countries. Over the past five years, ARC funding of commencing projects involving China have averaged 11.2 percent of the total. Meanwhile, projects involving the US have been funded at 3.4 times this frequency. Projects with the UK and Germany have also been supported more often than those with China. Yet as data in section two show, all of these other countries are now less involved in creating scientific knowledge with Australia than China. Collaboration with China has, in fact, proven highly productive.

Table 3. Total instances of international collaboration per country, 2015–2019 (by proportion of total number of commencing projects)

Country	Proportion of total number of commencing projects (percent)
United States of America	37.6
United Kingdom	23.4
Germany	12.8
China	11.2
Canada	8.3

Source: Australian Research Council (2020)

Next, as the data in Section 4 show, in most areas of inquiry the scale of scientific knowledge creation in China is much greater than in Australia. Last year, a single Chinese company, Huawei, spent more on research and development than all Australian business combined (Laurenceson, 2019). The differential between China and Australia is greatest in many of the same subject areas that some commentators are most inclined to warn against collaboration in. Last year China-affiliated researchers featured in 37.0 percent of global publications in Materials Science, compared with just 2.1 percent for Australia. Moreover, of the Australian share, 39.4 percent involved collaboration with a China-affiliated researcher. In contrast, 1.8 percent of the Chinese total involved an Australia-affiliated researcher. Such differentials are even larger in terms of high-impact publications. Rather than representing a ‘shocking failure of due diligence’, collaboration with China has been a substantial contributor to Australia’s position at the leading edge of global scientific knowledge creation.

The above allegations also misunderstand, or misrepresent, what Australian researchers in universities and institutions like the CSIRO actually do. Their core activity is to create scientific knowledge and then publish the findings. It is difficult for China to misappropriate scientific knowledge that has yet to be created and openly shared once it is. It is ironic that much of the evidence produced to support allegations of nefarious activity, such as that in *The Daily Telegraph* story referenced above, are publications that are publicly-available in English-language, scientific journals.

When joint research involves sensitive technologies and projects of a security-classified nature, or is expected to yield commercially valuable intellectual property, controls exist at the national and institutional levels to manage the risks.

At the national level this includes the *Defence Trade Controls Act 2012* (DTCA). It is striking that despite the large scale of Australia-China scientific research collaboration, commentators such as Fitzgerald, Jennings and Hamilton have been unable to provide a single example

of the controls put in place by the Australian government to manage national security risks having been evaded. In October 2018, Secretary of Defence, Greg Moriarty, confirmed that there had been no instances of non-compliance by Australian universities (Foreign Affairs, Defence and Trade Legislation Committee, 2018). And in December 2017, Moriarty told a Senate Estimates committee that in his experience ‘universities are very conscious of the dangers and the risks around these leakages of technology’ (Foreign Affairs, Defence and Trade Legislation Committee, 2017).

No instances of DTCA violations have been produced since Moriarty’s 2018 statements. Certainly, allegations of negligence have continued to flow but repeating an allegation does not make it a fact. Box 1 discusses, for instance, claims appearing in *The Australian* on February 10 that the CSIRO had undermined Australia’s national security through collaborative research with China that supposedly enhanced the People’s Liberation Army Navy’s ability to conduct submarine warfare. Yet when the Department of Defence – which oversees defence trade controls – was asked whether CSIRO’s conduct in relation to China had ‘raised concerns’, its response was ‘no’, adding that it ‘works closely with CSIRO to identify and monitor research that is, or may be, related to defence to ensure national security interests are protected appropriately’ (Australian Government Department of Defence, 2020).

Hamilton has accused universities of having ‘hidden behind the Defence Trade Controls Act which prohibits the export of sensitive technology but does not prohibit Chinese military scientists working on sensitive projects in Australian laboratories’ (Markson, 2020). As Australian research institutions have repeatedly responded when subjected to such claims, however, the vetting and visa approval processes for postgraduate students and visiting scholars are not handled by them but rather the Australian government’s security agencies.

The controls that are in place to manage risks are regularly reviewed. In April 2018 then-Defence Minister, Marise Payne, announced an independent review of defence trade

controls to ensure that they remained ‘fit for purpose’ (Universities Australia, 2019). Australian universities actively engaged with the review. Similarly, in August 2019, there was keen participation from universities when Education Minister Dan Tehan announced the establishment of a taskforce ‘to protect universities from foreign interference’. The result was a set of best-practice *Guidelines to counter foreign interference in the Australian university sector* released just three months later (Universities Australia, 2019a; 2019b).

Risk management processes at an institutional level are also regularly reviewed, sometimes prompted by media reports that draw attention to allegedly problematic collaborations. For example, in July 2019 University of Technology Sydney (UTS) undertook to review its collaboration agreement with China Electronics Technology Group (CETC) after being confronted with claims that its joint research may have facilitated human rights abuses committed by the Chinese government in Xinjiang Uyghur Autonomous Region. However, the review found that the claims were unsubstantiated. It also confirmed that research projects with CETC had been submitted for approval by relevant Australian government authorities when required. Nonetheless, the review also resulted in a number of general recommendations to enhance the risk management practices already in place (University of Technology Sydney [UTS], 2019a).

UTS was confronted by new allegations appearing in a report by Samantha Hoffman, a researcher at ASPI, released on October 14 2019. This report had cited a Chinese media article, which included an accompanying photo, that claimed UTS had agreed to establish a joint artificial intelligence laboratory with Haiyun Data, another company linked to human rights abuses in Xinjiang (Hoffman, 2019). The release of the ASPI report was timed to coincide with a joint ABC *Four Corners-Background Briefing* investigation asking the question: ‘Are Australian universities putting our national security at risk by working with China?’ (Rubinsztein-Dunlop et al., 2019). But when the ABC contacted UTS about the claim, the university responded on October 9 2019 that the article the ASPI report had relied on was inaccurate and a ‘complete

misrepresentation’ of the engagement the university had with Haiyun Data, stating that, ‘UTS’ Centre for Artificial Intelligence has no relationship whatsoever with HYData, and has received no funding from them’ (UTS, 2019b).

Box 1. CSIRO–Qingdao National Laboratory for Marine Science and Technology joint Centre for Southern Hemisphere Oceans Research

On February 10 2020, *The Australian* published a news report headlined ‘Security risk in China marine project’, on a joint project by the CSIRO and the Qingdao National Laboratory for Marine Science and Technology in China: the Centre for Southern Hemisphere Oceans Research (CSHOR), intended to contribute to global efforts to ‘effectively anticipate and adapt to climate change’ (Packham, 2020).

The report did not explicitly allege that the joint research would have military or security applications, but noted that the collaborating Chinese laboratory also undertook other research with such applications. The report quoted Michael Shoebridge, Director of ASPI’s Defence, Strategy and National Security program, who said that the joint research could have ‘potentially powerful military applications’ in addition to legitimate climate-change research. The report also cited Dr Ross Babbage, a former defence and intelligence official, as saying ‘There is no question that everything that is gathered as part of this joint activity will be available for national security purposes for the Chinese’.

In answer to questioning from One Nation Senator Malcolm Roberts regarding the possibility that the joint research ‘could be used for other purposes by the Chinese’ at the Senate Legal and Constitutional Affairs Committee Estimates hearing on March 2 2020, Mike Pezzullo, Secretary of the Department of Home Affairs, replied that to infer such a conclusion ‘you’ve got to...take a logic jump that says, ‘Oceanographic research, dot, dot dot...gets you to an ability to see through water to the depth of 500 metres’. And that, unbeknownst to anyone in the Commonwealth that this has been perhaps unwittingly or unknowingly trafficked to a foreign power’ (Legal and Constitutional Affairs Committee, 2020).

At the Senate Foreign Affairs, Defence and Trade Committee hearing on March 4 2020, Liberal Senator Concetta Fierravanti-Wells asked ‘if there was a point at which Defence felt that some of CSIRO’s conduct raised question marks’. The Department of Defence took the question on notice and on April 21 2020 responded: ‘No. Defence works closely with CSIRO to identify and monitor research that is, or may be, related to defence to ensure national security interests are protected appropriately’ (Australian Government Department of Defence, 2020).

In answers to questioning from Labor Senator Kim Carr, Judi Zielke, Chief Operating Officer of CSIRO, confirmed during the Senate Economics Legislation Committee Estimates hearing on March 4 2020 that CSIRO maintains dialogue with the Department of Defence, that assessment of the joint project had determined there was ‘no military application or any concerns under the defence export controls work’, and that ‘[t]here were no security arrangements required above normal operations’ (Economics Legislation Committee, 2020).

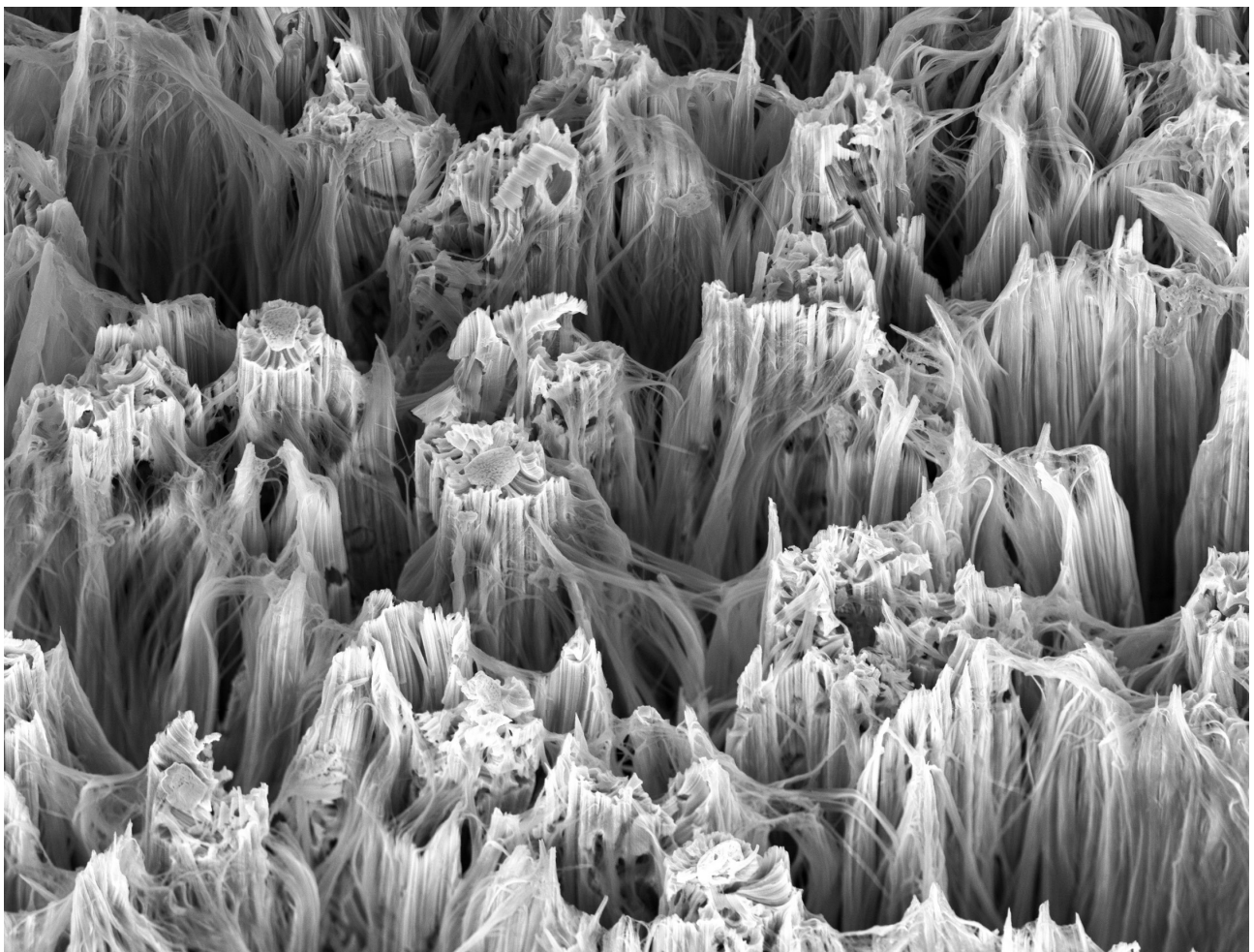
The article also suggested that the CSIRO’s lead scientist on the joint project, Dr Wenju Cai, was a part of the Chinese government’s Thousand Talents Plan (Packham, 2020). Liberal Senator Eric Abetz, a member of the Senate Economic Legislation Committee, asked in relation to the report whether it was ‘ethical and legal for scientists at CSIRO to be at the same time drawing financial benefits from the Chinese talent programs such as the Thousand Talents Plan’ at Estimates on March 4 2020. Ms Zielke answered that CSIRO’s code of conduct did not permit this, and that CSIRO had ‘investigated [the suggestion in the report] as a result of [the report in *The Australian*], and that was definitely not the case’. She further clarified that ‘The website that is mentioned in the article incorrectly had [Dr Cai] listed in relation to it’ (Economics Legislation Committee, 2020).

In CSIRO’s letter to the editor of *The Australian* in response to the report, Dr Larry Marshall, the Chief Executive of CSIRO, described the report as ‘highly speculative and misleading’ (Marshall, 2020).

6. Conclusion

COVID-19 saw Australia's economy shrink in the first quarter of 2020. On May 26 Prime Minister Scott Morrison emphasised that an effective COVID-19 recovery will need to be industry rather than government-led (Morrison, 2020). Expanding on the government's plans, on June 9 Minister for Industry, Science and Technology, Karen Andrews, identified 'science and technology as the enablers of industry' (Riley, 2020). Partnerships with China are set to feature prominently. Despite the slump in China's economic growth overall, in the first five months of 2020 the value of Australia's exports to China increased over the same period the year before, led by sales of iron ore. Despite COVID-19, the economic complementarities between the Australian and Chinese economies have not disappeared, nor has the stock of Chinese purchasing power with an interest in buying the goods and services that Australia excels in producing. Appropriate risk mitigation frameworks notwithstanding, public policy

settings that continue to facilitate mutually beneficial flows of goods, services and scientific knowledge creation capabilities will be vital.



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About the authors



James Laurenceson

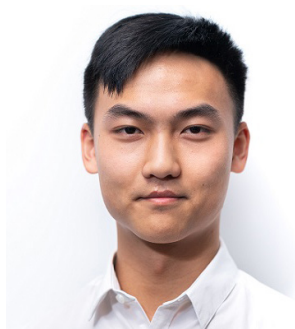
Professor James Laurenceson is Director of the Australia-China Relations Institute at the University of Technology Sydney.

He has previously held appointments at the University of Queensland (Australia), Shandong University (China) and Shimonoseki City University (Japan). He was President of the Chinese Economics Society of Australia from 2012 to 2014.

His academic research has been published in leading scholarly journals including *China Economic Review* and *China Economic Journal*.

Professor Laurenceson also provides regular commentary on contemporary developments in China's economy and the Australia-China economic and broader relationship. His opinion pieces have appeared in *The Australian Financial Review*, *The Australian*, *The Sydney Morning Herald*, *South China Morning Post*, amongst many others.

 @j_laurenceson



Michael Zhou

Michael Zhou is a Project and Research Officer at the Australia-China Relations Institute, University of Technology Sydney.

Michael completed a Bachelor of Commerce majoring in Economics at the University of Western Australia. His research interests include the Australia-China economic relationship, China's economic development, and regional trade. He has studied in China at Shanghai Jiao Tong University under the New Colombo Plan, and has previously interned at the Australian Chamber of Commerce Shanghai and the Perth USAsia Centre.

 @michael_m_zhou

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Australia-China Relations
Institute
澳中关系研究院



**Australia-China Relations Institute
University of Technology Sydney**

PO Box 123

Broadway NSW 2007

Australia

✉ acri@uts.edu.au

🐦 [@acri_uts](https://twitter.com/acri_uts)

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