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Enter the dragon: China and global academic publishing

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1. Introduction

Today's international research scene is unrecognizable to 30 years ago. There are now more journals, more researchers, more scholarly papers, more publishers, more co-authorship and, crucially, more academics writing in a language which is not their native tongue (Hyland, 2015). One of the most significant changes to global scholarly publishing in recent years, however, is the growth of China (Koshikawa, 2020; Xie & Freeman, 2019). Nevertheless, this rapid expansion has not been an entirely smooth ride with concerns raised about research quality and misconduct. Citations per article have not kept pace with the volume of Chinese publications (Huang, 2018) while article retractions (Lei & Zhang, 2018) and reports of corrupt practices (Qiu, 2015) abound. In this paper I discuss China's new role in global publishing by addressing the following questions:

a) What influence is China having on international publishing?
b) Why have these changes occurred?
c) How are Chinese scholars impacted by these changes?
d) How is the Chinese government responding to the globalization of research.

2. Global publishing and the rise of China

Academic publishing is now a global industry with nearly nine million scholars working in 17,000 universities seeking to publish in English-language journals each year (Schneegans et al, 2021). According to UNESCO (United Nations Educational, Scientific and Cultural Organization) the number of researchers grew three times faster than the world population between 2014 and 2018 with research spending outpacing the global economy and publishing output up 21% over the same period. In 2018 there were about 33,100 active scholarly peer-reviewed English-language journals in the world with more than 3 million new peer reviewed articles each year (Johnson, Watkinson & Mabe, 2018). One of the largest publishers, Elsevier, reported over two million articles submitted and one billion accessed in 2019 (Page, 2020).

Amidst this tsunami of papers, authors affiliated with Chinese institutions are now the most prolific producers of articles worldwide, showing the strongest growth rate between 2018 and 2020 (SMT, 2021). Over the last 15 years, China moved from 14th to 1st position in world output, overtaking the US in 2020 and now producing almost a fifth of all peer-reviewed papers in Science Citation Index (SCI) journals, with the U.S. in second place at 18.3% (Koshikawa, 2020). Table 1 shows the Scimago ranking for citable papers (articles, reviews and conference papers) by country together with how many times they have been cited, citations per document and H Index. While China exceeds the US in the number of scientific papers it produces, these tend to be cited less and the H Index (the number of articles (h) that have received at least h citations) which quantifies both the scientific productivity of country and its scientific impact, is lower than many other countries in the top ten.

Table 1: Scimago Country ranking of published peer reviewed papers in 2021[1]

Rank	Country	Citable documents	Citations	Citations per document	H index
1	China	841099	846129	0.98	1112
2	USA	649063	844047	1.16	2711
3	UK	213389	352482	1.45	1707
4	India	219625	201943	0.85	745
5	Germany	189090	250210	1;2	1498
6	Italy	137883	212588	1,38	1189
7	Japan	135097	118780	0.82	1171
8	Canada	118499	165646	1.27	1381
9	France	116720	166511	1.3	1352
10	Australia.	113751	182241	1.46	1193

By other measures, however, Chinese research papers are doing rather better. According to the Field-Weighted Citation Impact of Scopus data, the quality of research published by Chinese authors is 12% above the world average[2] (Zhang & Liao, 2022). In addition, using fractional counting (which attributes credit for papers by a percentage based on authorship), China accounted for 27.2% of the top 1% of most cited papers in 2018, 2019, and 2020 (Brainard & Normile, 2022). Despite this, the growing internationalisation of research means there has been an increasing proportion of citations from outside the country

[1] https://www.scimagojr.com/countryrank.php?year=2021 (Hong Kong listed separately)
[2] FWCI is the ratio of the total citations received by the country's output, and the total citations that would be expected based on the average of the subject field

of authorship over the last two decades. This has been true for all major scientific countries with the exception of China. In 2004, 42% of citations to Chinese scientific articles came from outside China; by 2014, the proportion had dropped to 38%, suggesting China's expanding article output is being used mostly within China (National Science Board, 2018).

Within China itself there is also a thriving body of journals, although tightly controlled by a government licensing system and employing a different funding model to those in the West. The Blue Book of China's Academic Journal Development (CAST 2021a) lists 4963 science, technology, and medical journals (STM) in China at the end of 2020, of which 375 (7.6%) are in English. Roughly half of the latter are jointly published by Chinese institutes and foreign publishers, with Springer Nature having the largest share, followed by Elsevier and Wiley (Xu et al, 2019). Among these Chinese journals, 213 are indexed in the SCI and responsible for 30,742 articles in 2020 with a citation percentage above the average (CAST 2021a). Publishing is highly regulated and politically controlled, with licenses to start a new journal title difficult to obtain. With the price of journals averaging just US$4 per issue (CAST, 2021a) and with such a tight regulatory regime, it does not attract many private investors. Journals in China, then, are a community and not a commercial product.

The most prestigious journals are supported by the national government and are indexed in a system of 8 core databases including the Peking University Core and the Chinese Literature and Social Sciences Core Journals list[3]. These are regularly updated to include more journals. The most prominent of these indexes are the Chinese Science Citation Database (CSCD) and the Chinese Social Science Citation Index CSSCI). The former is produced by Clarivate Analytics in partnership with the Chinese Academy of Sciences and was the first non-English index to be hosted on the Web of Science. The CSCD stores over 1,200 China-based science and engineering journals with 5 million papers dating back to 1989. The CSSCI covers about 500 of the most influential Chinese journals in the humanities and social sciences. The importance of these core journal indexes means that authors increasingly submit their best work to journals listed on them for career advancement.

3 The reasons for China's publishing growth and its impact on scholars

Technological changes have contributed to China's publishing emergence so that online publishing and the retrospective digitization of earlier content has provided authors' access

[3] See https://lib.csu.edu.cn/kyzc/qktg/hxqktgzy.htm

to previously unobtainable texts and information. However, four key factors stand out when considering the reasons for China's publishing success: i): international research collaborations, ii) increases in active researchers, iii) incentives and pressures to publish iv) government investment in research and journals. These same factors have also had a considerable impact on how academics experience their professional lives.

i) Co-authorship and international collaborations.

Collaboration and teamwork are among the most striking features of research today, with a worldwide trend towards more co-authors affiliated to more universities in more countries. A recent study of over 100,000 papers on PubMed found the median number of authors increased, from 3 to 6, in the past 20 years with the percentage of single-authored papers falling from 33.9% in 2002 to 2.1% in 2021[4]. Assisted by freely available collaborative platforms such as *Google Docs* or tools like *Authorea* and *Overleaf,* this reflects both the increasing complexity and expense of scientific research and the growth of the assessment culture. Authors gain advantages through sharing resources, ideas, expertise and data, while splitting workloads can speed up progress and allow academics to publish more articles, with every named author getting equal citation credit.

Chinese scientists have been particularly successful in forming international collaborations, especially with scientists from G7 countries. Globally, 24% of all articles had international co-authors in 2016 (NSB 2018) producing a clear benefit to academics in terms of increased articles and citations (e.g. Kwiek, 2021). For Chinese researchers, international co-authorship also helps overcome problems of writing in English and a way of gaining familiarity with international publishing conventions. As a result, 25.4% of China's research output involved international collaborations in 2020, up from 23.7% in 2016 (Zang et al, 2022). Scopus data shows that this output is far above the level of work published by Chinese authors alone in terms of quality and impact. The United States, the United Kingdom, Australia, and Hong Kong remain China's closest partners. It is also the case that many Chinese co-authored papers appear in top international journals and more than half appear on the prestigious *Nature Index* (Anderson 2017).

Many overseas connections are made by students forging links while studying overseas. Some 703,500 Chinese students studied abroad in 2019, making China the largest source

[4] https://quantifyinghealth.com/number-of-authors-of-research-papers/

of international students in the world (Statistica, 2022). Chinese research postgraduates return home not only with an understanding of their subject, but also publishing networks and useful contacts for collaborations. Jiang and Shen (2019), for example, found that a significant proportion of European trained Chinese PhD returnees co-authored papers with their foreign supervisors and maintained this relationship after returning home.

But international collaborations have faced growing problems. The number of scholars declaring affiliations to institutions in both China and the United States on research papers has dropped by more than 20% over the past 3 years while co-authored US-Chinese papers fell for the first time in 2021 (van Noorden, 2022). The politicization of US–Chinese science, as well as the pandemic, has played a part in this and onerous new regulations on the disclosure of foreign research ties and visas for Chinese academics in the US and Australia are dampening collaborations (Armitage & Woolston, 2021). China's policies encouraging academics to publish in Chinese journals and increasing focus on the quality of work rather than papers in international-journals are also likely to impact collaborative work.

ii) Growing number of researchers

China's success in increasing its research and publishing is also due to the fact there are now more Chinese researchers. China is home to about 1.87 million researchers, exceeding the 1.43 million in the U.S. The Big Five (China, European Union, Japan, Russian Federation and USA) still account for 72% of researchers worldwide, but the proportion from China now accounts for the highest share of researchers of any country in the world with 19.1% of the total. So, even with a population of 1.4 billion, research density for China is now above the world's average.

One reason for this is the huge numbers of doctoral students in China. China now produces the largest number of PhD graduates in the world, with an estimated 362,000 doctorate students in 2017 (Wong, 2019). All of them must publish to graduate and to further their careers. The overall employment rate of Chinese doctoral graduates is generally high, with 30% to 60% of graduates at the top research universities going into academia and science research institutes. Established academics must also continue to publish to keep their jobs, gain promotion and increase their salaries. As a result, 78% of Chinese researchers published in international journals outside of China between 1996-2015 (Elsevier 2017).

Another trend in recent years is that of Chinese researchers returning to China after several years working in universities abroad. More than 10% of academics at Chinese universities in 2021 arrived from overseas in the previous three years, nearly triple the global average of 3.7% (Armitage & Woolston, 2021). These returning 'homing turtles' reflect China's improved standing in global research, but also bring with them valuable knowledge of research practices, publishing conventions and English academic literacy.

iii) Incentives and pressures to publish

One of the biggest driving forces in the expansion of academic publishing worldwide in recent years has been the career pressures and material incentives placed on academics by research assessment and reward policies. Career opportunities in China are now tied to acceptance for work in high profile journals indexed in the *Web of Science* Science Citation Index (SCI) databases or the Chinese equivalents mentioned above. These managerial practices, similar to those introduced in the UK, Australia, Hong Kong and elsewhere in the last 40 years, intensively audit the number of papers academics publish, where they are published, and the citations they receive.

Since the early-1990s, Chinese universities have also offered cash rewards to scholars who publish in journals indexed by Web of Science (WoS). Nanjing University initiated this policy and subsequently topped the list of Chinese universities publishing most WoS papers seven years in a row. The policy was then copied throughout China, with rewards increasing annually to reach $3,000 per article in 2020 (Zhang &Liao, 2022). Sichuan Agricultural University, for instance, paid US$2 million to a team of 27 scientists who had published in *Cell (Enago, 2020).* Usually, the money goes to the first author with sums of up to $165,000 for a paper in *Science* or *Nature*, equal to 20 times the annual salary of a new professor (Quan et al 2017).Perhaps this influx of funding for research might be a contributing factor to the fact that almost a third of articles with a corresponding author from China are now published as gold open access. In fact, China's gold OA volume will likely exceed half of the US's total article volume in 2023 (Zhang &Liao, 2022).

For academics, this accounting and reward regime appears to emphasise rewarding quantity rather than the quality of research, a factor which tends to lead to an emphasis on immediacy, encouraging scholars to publish what they can rather than develop significant long-term projects. Detailed, longitudinal and novel studies are thus sacrificed for shallow-

ness and repetition. It has also led to the emergence of a cottage industry of shady agencies, paper mills and unethical behaviours such as plagiarism, fake peer-review, academic dishonesty and ghost-written papers, encouraging even honest authors to cut-corners (e.g. Hvistendahl, 2013).

In response, the government has recently forbidden Chinese institutions to pay researchers publication bonuses (Mallapaty, 2020). The new policy states that publication will only be used to evaluate basic science and technology research, and not applied research and technology. This removes the publication burden from clinicians, engineers and others working in more applied areas (Tao, 2020). In addition, institutions must not promote or recruit researchers solely on the basis of the number of published papers, or citations. Instead, assessments will now be judged by indicators of quality, such as how innovative the work is, whether it represents a significant scientific advance, or its contribution to solving important societal problems (Tao, 2020). The changes will involve the professional judgements of expert peers and consideration of research in Chinese journals, while institutions that continue to incentivize scientists to publish papers in SCI journals will have funding for special projects suspended (Mallapaty, 2020).

iv) Increased government funding for research

The most fundamental reason for China's extraordinary growth as a publishing powerhouse, of course, is the emphasis the government has placed, through funding, reform, and societal status, on research in recent years. Science and technology is fundamental to the socio-economic development of the country and a measure of national prestige. Research and Development expenditure has grown exponentially and reached US$554 billion in 2018 when adjusted for inflation, up 10% from the previous year. The USA, in comparison, spent just 5% more to $581 billion. The 2020 5-year plan calls for lifting the share of the gross domestic product dedicated to R&D even higher to 2.5% (Koshikawa, 2020).

The number of Research and Development centres in China has also grown rapidly, so that The National Natural Science Foundation of China (NSFC) has increased its budget to almost $3 billion over 30 years and now funds 10% of the world's scientific publishing output. The government has also invested heavily to raise the research standards of its top universities, multiplying its spending 10-fold between 2000 and 2018, while expenditures in the U.S. grew only 1.8 times. The money has created a stratified system of elite, research-

led universities with the top nine universities (C9) together receiving 10% of China's research budget. The most recent 'Double First Class' (DFC) project aims to lift 42 universities to "world-class" status by 2050 by granting them a 30 per cent rise in income to 300 billion yuan in three years (Li, 2020). The 112 Tier 1 and Tier 2 universities receive funding 12 times higher than the remaining 2,500 universities (Ministry of Education of China, 2017).

By concentrating resources, this funding has significantly increased the status of Chinese universities in world rankings. Tsinghua, Peking, Zhejiang, Shanghai Jiao Tong, The University of Science and Technology and Fudan are all listed in the top 100 of the three major ratings organisations: The Quacquarelli Symonds[5], Times Higher Education- Reuters[6] and The Shanghai Ranking of World Universities[7]. Some departments, such as Tsinghua University's civil engineering, computer science, and engineering departments, are now world leading, indicating that the Chinese government's efforts to increase the status of its universities and quality of its research is paying off.

4 The Chinese government response: Improvements and continuing challenges

Despite these impressive successes, there have been setbacks. Chinese research has generally had low impact, and there have been persistent concerns about quality and unethical behaviour. The challenges are the underdeveloped state of national journals, problems with research integrity, and a widespread lack of familiarity with writing and publishing practices.

(i) Improving the quality of local journals

Editors of Chinese journals have long found it difficult to attract high-quality papers as Chinese scholars prefer to publish their 'Best in the West'. A recent survey of 785 Chinese researchers showed that journal reputation and impact metrics drive these decisions, a preference in contrast to authors in the US and UK (Zhang & Liao, 2022). This is partly due to the ways researchers are evaluated for funding and promotion, but also indicates the low status and lack of visibility of local journals, their slow processing of submissions and erratic publishing times. The local journal system also suffers from a lack of transparency. The ways reviewers are selected and managed is obscure with editors often making publishing decisions themselves. In a summary of reviewing practices in China, Wang et al

[5] QS Worldwide University Rankings at: www.topuniversities.com
[6] THES- Reuters rankings at: http://www.timeshighereducation.co.uk/world-university-rankings/
[7] Shanghai rankings at http://www.shanghairanking.com/World-University-Rankings-2020/China.html

(2020) note that international standards of anonymous peer review, transparent review procedures, plagiarism scanning, etc are gradually being adopted, but that "Chinese journals' reviewing procedures leave much to be desired" (ibid p 109).

There are also problems at a macro level. The publishing industry remains fragmented, with almost 96% of journals having a publisher with just a single journal title and only eight publishers with more than 10 journals (Montgomery & Ren 2018). As mentioned in Section 2, publishing is highly regulated and Chinese scientific journals are strictly state-controlled, with almost all supported by central, regional, or local governments. Very few are privately owned and all must meet rigid requirements approved by different administrative levels to meet the licensing demands of The General Administration of Press and Publication (GAPP), which regulates all publishing in China (GAPP, 2011). These licences are restricted and need to be renewed regularly. The byzantine processes required to gain a certificate to publish new journals hinders growth, so that the very top journals publish fewer than 200 articles per year and there is no mega journal (Wang et al, 2018). Moreover, many journals are of poor quality, with an average impact factor of 0.8 in 2013, for example (Wang et al, 2018). Most of the Chinese-language journals comprise generalist scientific journals which lack the specialisation to develop China's publishing ambitions (Liu et al., 2019) as many fields are not represented at all while students struggle to find the publishing outlets they need to graduate.

The government, however, is now encouraging academics to publish their work in Chinese journals. An important initiative here is the *Excellence Action Plan for China's STM Journals*[8], jointly implemented across a range of seven government and academic bodies, including the Chinese Academy of Sciences, in 2019 (CAST, 2021b; Tao, 2019). This is a huge national project of high importance which seeks to rank Chinese journals into categories of influence and importance. At the top end, US$29 million per year for 5 years will be invested to improve the standards of 285 journals - most of which publish in English - and to boost submissions from international researchers (Cyranoski, 2019). In each of the following four years, it will also fund the launch of up to 30 new titles. Twenty-two 'tier one' journals, which publish in English, will each receive between one million and 5.2 million yuan per year and another 29 'tier two' English-language journals will each receive between 600,000 and one million yuan per year. Four hundred thousand yuan will be invested in each of another 199 'tier three' journals, half of which publish in Chinese.

[8] http://210.14.118.46/art/2021/4/26/art_467_153924.html

The scale of this plan is unprecedented and regarded as a milestone in the development of Chinese publishing. The goal is to strengthen China's publishing industry and encourage stronger, high-quality papers while eradicating the most glaring weaknesses of the industry. The government has not announced how the programme's success will be measured, however, but journal impact factors might be used to gauge improvements in quality. Another move has been the launch of the China Research Gateway[9] in 2022 which combines 40 databases with over 70 million full-text articles. With an English language interface this seeks to provide greater visibility to Chinese published research and access to almost all academic journals published in China.

Perhaps equally importantly for local researchers is that, along with the action plan, the government announced that scientists applying for the most prestigious academic prizes, should include domestic publications in their application. The number of "representative works" that will count for basic research evaluation in grant applications or promotions mean that one third of high-quality papers will now flow to domestic journals (Tao, 2020). While these changes to how academics are evaluated envisage a new role for local journals, with only 280 titles identified as top venues, half of which are Chinese language titles, there is insufficient capacity to handle these papers.

ii) Improving research integrity

The generous financial rewards for authors accompanying this publishing growth have also encouraged a number of dubious practices. The past few years have witnessed numerous cases of faked peer reviews, image manipulations, plagiarized or fraudulent papers and authorships for sale, some involving prominent Chinese scientists (e.g. Zuo, 2022). Chinese academics are not the only culprits, of course, but between 2007 and 2018, the retraction rate of Chinese authors' SCI papers was the highest in the world, reaching 22.7 per 10 000 papers, five times that of the USA (Xiao et al, 2022). In 2017, for example, China published 8% of the worlds scientific articles but collected 24% of all retractions (Tang, 2021), a massively disproportionate amount. Many Chinese academics themselves are concerned about the impact of this, with a survey of 1263 biomedical researchers showing that 55% thought that academic misconduct was serious-to-extremely serious and 71% believing that the Chinese authorities paid insufficient attention to it (Liao et al, 2018).

[9] https://www.eastview.com/resources/journals/caj/

Because many of these retractions involve plagiarism or invented data, many institutions in China now employ programmes such as Turnitin and CrossCheck to scan submissions while universities must create academic integrity records as part of staff evaluations. Grant proposals have been checked for possible plagiarism at the National Natural Science Foundation of China (NSFC) since 2010. Further, in 2018 The Ministry of Science and Technology (MOST) and the Chinese Academy of Social Sciences (CASS) were tasked with improving research integrity and managing misconduct. Penalties for major infractions were introduced ranging from terminating grants to restricting promotions.

Fake peer review has also emerged as a major problem in China (e.g. Grove, 2021; Normile, 2017) . This occurs when submitting authors provide editors with e-mail addresses which allow the submitters to review their own manuscripts or have them reviewed by members of a peer circle created to review the papers of each co-participant. Another strategy is that authors pay third-party agencies to provide fabricated reviews. Qi et al. (2017) identified 250 retracted articles due to fake reviews in Retraction Watch in 2015, 75% of which were from China. By June 2018, that figure had increased to more than 600 retractions with the vast majority concerning manuscripts from China. In 2017 the cancer journal, *Tumor Biology*, retracted 107 papers from Chinese authors due to fake peer review. Nearly all the 524 authors were clinical cancer specialists from top public hospitals (Wang, 2017).

Physicians, under pressure to publish for promotion while performing hospital duties, are also key targets of 'paper mills' which offer completed ghost-written articles to clients. *Nature* has identified 370 articles retracted between 2020 and 2021, all from authors at Chinese hospitals, believed to come from paper mills and published in the past three years (Else & Van Noorden, 2021). As an example, of 159 systematic reviews in medicine retracted between 2004 and 2020, more than 70% were led by Chinese medical practitioners (Shi et al, 2021). All this undermines China's efforts to establish a respected research presence on the world stage, wasting the public money spent on building a research base and eating away at trust internationally. Already, confidence in research published in China is eroding with very few references to it outside the country and journal editors doubting submissions from Chinese hospital researchers (Else & Van Noorden, 2021). Chinese academics are finding it harder to build or expand international collaborations and universities outside China have begun to express ethical concerns about forming partnerships (Yang, 2016).

To counter misconduct, many journals have started to monitor Chinese manuscripts, often requiring the submission of raw data and employing analysts to try to spot research problems. In China itself, policing is largely delegated to universities and institutes, but these organizations may be unwilling to investigate alleged misconduct to avoid soiling reputations and losing grant funding. In a collectivist society like China, colleagues are often unwilling to report unethical behaviour they witness to preserve good relations. It is particularly difficult when PhD students are found guilty of misconduct as their supervisors are also often punished too (Tang, 2019). Alternatively, junior scientists might be punished, while senior ones who should be responsible for misconduct retain their status and position. Clearly a culture of integrity needs to be encouraged, at first by training and then by penalties.

iii) Improving academic literacy and publishing awareness

Despite the impressive gains made by China, authors are often challenged by limited English proficiency and a lack of familiarity with anglophone academic writing conventions. Most lack international contacts to create the kinds of mentoring or 'mediating' relationships discussed by Na and Hyland (2019). As a result, Chinese scientists often seek to publish in low impact SCI journals or in obscure non-SCI journals, perhaps giving up publishing internationally altogether.

This context not only encourages some authors to turn to paper mills and unscrupulous agents, but also makes them vulnerable to predatory journals. Based on the Gold Open Access 'writer pays' model of publishing, these journals misrepresent their country of origin, fabricate their editorial boards, accept submissions with only cursory review and extort high fees from authors (e.g. Beall, 2013). Pressures to publish and unfamiliarity with international journals make Chinese scholars susceptible to these journals. A recent study of 332 Chinese PhD students found that while they stated they would not submit to predatory journals, they frequently confused predatory with open access journals and largely considered only Chinese-language journals as predatory (Wang et al, 2021). To address this, the Chinese Academy of Sciences published a list in 2020 of 65 'risky' journals they should avoid and added another 36 in 2021 (Lee, 2021).

One common source of support are agencies which employ professional mediators who are either practicing scientists or specialists in the author's field. The success of these third parties, however, greatly depends both on their expertise and relationship with the author.

Simply handing a draft paper to a mediator appears to have limited impact on its eventual acceptance by a journal. Another option is for authors to have their text translated into English, but once again outcomes are shaped by the quality of the source text, the expertise of the translator and the translator's involvement with the author (Na & Hyland, 2019).

Collaboration is another source of support for international publication. Chinese scientists often seek advice from friends or colleagues, underlining how writing for publication is very much a networked activity (Na & Hyland, 2020). These networks comprise colleagues personally known to authors and who share or complement their disciplinary knowledge. As discussed above, one network resource is overseas researchers, and another is supervisors whose co-authoring support of their PhD students may continue into their later careers. Finally, local English teachers may be helpful in advising on draft texts (Na & Hyland, 2020). Perhaps the most immediate improvements in the quality of Chinese scholars' submissions may result from a systematic programme of education in academic writing and publishing.

5 Final observations and remaining issues

China now has more researchers than the United States, outspends the US and European Union in research and development and publishes more scientific papers each year than any other nation in the world. The quality of these papers is also increasing with more appearing in top ranked journals and gaining more citations overall. China is also doing more to address its unenviable reputation for research misconduct and corrupt publishing practices, created by a system where academics are pressured to publish rapidly and copiously. Related to this, the Chinese government is also taking giant steps to overhaul and improve its cumbersome journal system and inject more funds into creating a world class publishing system.

It is also the case that China needs to go further to ensure it consolidates its position as a leading publishing nation and continues to contribute excellent research to the international community. Among these needs are the continued movement towards a broader and more comprehensive evaluation system beyond papers in ranked journals. This might encourage a wider range of more significant, detailed and novel projects while helping to improve academic integrity. It is also the case that the domestic journal system is in urgent need of reform. Hierarchical state management, obscure multiple ownership systems, poor editorial procedures and opaque review practices create inefficiencies which frustrate authors and

potentially deter quality submissions (e.g. Xu & Wahls, 2012; Wang et al, 2021). The new Excellence Action Plan, however, may improve this situation as China makes strides to improve the quality of its research journals, but without also expanding their number and specialisms it will be hard to accommodate its ambitions to build an array of journals to rival those in the west.

In addition to these initiatives, however, there also needs to be changes at the level of individual researchers; particularly fundamental and urgent need for a systematic programme of professional development. Here, the kinds of academic literacy and publishing courses which are now common in many parts of the world are beginning to emerge (e.g. Li *et al.* 2018) as well as organised assistance for aiding researchers to identify and employ support networks of various kinds (Na & Hyland, 2020). However, progress in this area is slow and researchers often rely on translation by English teachers or professional agents (Na & Hyland, 2019). Another type of support, however, has grown to assist writers. The Alliance for Scientific Editing in China[10] was established in 2015 to standardize the service provided by scientific editing companies, once a minefield of dubious practice and indifference, and advocate for the provision of high-quality English editing services. It currently consists of eight companies, most of which are the members of the Committee on Publication Ethics (COPE), which seek to implement the Best Practice Guidelines on Ethics for Author and Publication Support Service Providers[11]

There are, however, deeper and perhaps more intractable issues confronting China's continuing rise in research and publishing. Recent Web of Science data shows that US–China co-authored papers are falling as a share of world publications (Wagner & Cai, 2022). The COVID-19 pandemic is likely to be a contributory factor, as confidence in the independence of academic publishing in China was recently again undermined by evidence of Chinese government pre-publication vetting of COVID research (e.g. Cooper, 2020; Kirchgaessner, et al, 2020).)[12] which appears to be an effort to control the narrative around the origins of the virus. This follows controversies in 2018 concerning how, under pressure from Beijing, international publishers such as Cambridge University Press, Springer Nature, Sage and Taylor & Francis had removed "sensitive" articles from their journals. Cooper's (2022) analysis suggests that more than 28,000 articles have been suppressed on

[10] https://www.asec.org.cn/file/3-ASEC-GoodEditingPractice.pdf
[11] https://www.asec.org.cn/file/3-ASEC-GoodEditingPractice.pdf
[12] See also announcement by Fudan university https://web.archive.org/web/20200409053204/http://www.it.fudan.edu.cn/Data/View/3657

the platforms of international publishers accessible by Chinese scholars or the public. This is a blow to the reputation of academic research publishing in China and to Chinese academics seeking to get their work known internationally.

Equally worrying, however, are the potential outcomes of international political tensions. The United States' suspicion of intellectual property theft and unauthorised technology transfer by Chinese scholars has led the US government to investigate hundreds of US-based scientists over their collaborations in China since 2018, resulting in the suspension of funding, termination of employment, and, in rare cases, criminal investigations (Lauer, 2021). While criticised as 'racial profiling' (Mervis, 2021) and 'criminalising China' (Lewis, 2021), scientists who collaborated with colleagues in China published fewer papers overall and saw them cited less often during the investigation period (Jia et al, 2022). Mutual suspicion and recriminations have certainly made it harder now for foreign academics to get visas to China, and for Chinese researchers to travel overseas (Redden, 2019). These deteriorating political relations are leading researchers and universities in both countries to hesitate in initiating and strengthening collaborations. While such collaborations are perhaps not essential to China's growing publishing muscle, they nevertheless contribute to the country's increasing academic visibility and its ability to engage in the global exchange of ideas.

Against this, China's international publishing status is likely to improve by the recent moves to require its scholars to publish in local journals and by evaluating researchers on the quality of their work rather than the volume of their international papers. Considerable uncertainty surrounds the implementation of the new guidelines, however. It is unclear how eliminating quantitative metrics will be managed and there are concerns that alternative methods, such as peer reviews, may simply fuel nepotism and an already widespread clique culture. In addition, while the stated preference for domestic journals may boost Chinese publishers, only 300 journals have been identified in the new hierarchy, insufficient to meet the huge demand from authors.

We are, however, likely to see fewer submissions from Chinese authors to SCI journals, especially lower-quality papers in journals outside of the top-ranking quartiles, with OA journals, which feed on publication fees, likely to be hardest hit. We may, however, also see new collaborations and partnerships between Western and Chinese publishers to pick

up the considerable demand for Chinese journals and which will increase their global visibility. It is undeniable, however, that the initiatives China has taken are bold and ambitious as it tries to strengthen its own local publishing infrastructure and encourage quality research among its academics. At the moment, all that can be said for sure is that China's emergence as a publishing superpower may change its shape, but it is unlikely to stall.

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I confirm there is no conflict of interest in volved in this paper.

Data sharing is not applicable as no new data were created in this research.